

**NOAA Office of Ocean Exploration and Research  
*Okeanos Explorer* Education Materials Collection, V 1&2,  
*Why Do We Explore?* and *How Do We Explore?*  
Onsite Educator Professional Development  
2015-2016 PDO Pre/Post Assessment Analysis**

**Submitted by:**

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**June 30, 2017**



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## I. Key Findings

1. Overall, OER WDWE and HDWE PDOs were successful at accomplishing the goal and objectives of the PDOs.
2. Most WDWE (85.6%) participants had **NOT** attended previous Office of Ocean Exploration and Research PDOs while most HDWE (72.4%) participants had attended previous PDOs. Additionally, PDO participants who attended a past PDO had attended a cross section of all PDOs.
3. Most PDO participants were experienced (WDWE-11.6; HDWE-12.4 years) K-12 teachers (WDWE = 82.9%; HDWE = 78.5%) of students from a wide range of backgrounds and school circumstances.
4. Most PDO participants taught science yet many participants taught a variety of subjects to K-12 and college students. Participants in WDWE and HDWE PDOs most commonly taught grades 6-8 and 9-12, but at least 17.5% of participants in each PDO taught K-5 students. Since recruitment efforts OER WDWE and HDWE PDOs focus on grade 6 and above, this level of participation by K-5 teachers was higher than expected.
5. Most PDO participants came from the coastal or Great Lakes states where workshops were offered.
6. The overall experience for participants in either PDO was very positive.
  - At least 98% of participants stated that the WDWE and HDWE PDO furthered their PD goals.
  - The PDOs taught them content and about resources and lessons they can use.
  - At least 76.2% of respondents plan to integrate PDO materials into their instruction. Additionally, between 46% and 88% intend to use lessons from WDWE and/or HDWE, the website, the OceanAGE page, and the *Okeanos Explorer* or Digital Atlas.
  - At least 99.1% of PDO participants stated that the WDWE and HDWE PDOs would enable them to enhance their students' learning.
  - At least 98.3% of PDO participants said they would participate in another PDO conducted by Ocean Exploration in the future.
7. During 2015-2016, the mean number of students each teacher expected to reach with WDWE materials was a 97; 119 student with HDWE materials (mean for both is 107). During the 2011-2012 WDWE PDOs each teacher expected to reach 103 students; during the 2012-2013 HDWE PDOs each teacher expected to reach 121 and during 2013-2015 the mean was 122 students. The variability of this data is likely due to the highly variable estimates provided by teachers.
8. On all WDWE and HDWE items where pre/post comparisons were made, the post mean was significantly greater than the pre mean. On most items common to both the WDWE and HDWE assessments, the pre-means from HDWE were greater than the pre-means from the WDWE PDO.
9. The PDO's were implemented as planned most (96.4%) of the time.
10. Participants reflected frequently on important aspects of the PDO and lessons.
11. Facilitator responses regarding participant reflections indicate that frequent discussion of lesson utility in the participants institutions occurred. Participants reflected on how aspects of the PDO and activities could be adapted for use with their students, would introduce students to scientists and exploration related careers, and

were correlated to local and national standards. Participants also reflected on the value of the OLEP&FCs and how they were motivated to increase the amount of ocean science they taught to their students.

12. The 2015-2016 WDWE and HDWE PDOs were very successful at accomplishing the performance measures identified for each of the objectives. Applicable Performance Measures for each Objective were supported with at least one data source indicating that all six of OERs objectives were adequately met.
13. All (100.0%) of the 12 short-term outcomes (knowledge, attitudes, aspirations, and skills) were accomplished and nine (90.0%) of the 10 intermediate (practice) outcomes were accomplished. One outcome was not accomplished because the timing between subsequent PDOs does not allow enough time for participants to incorporate a component of a previous PDO into their instruction and gauge students' responses and reactions to the OER material. As such, this outcome is not measured as part of the PDOs evaluated here.

## II. Detailed Results

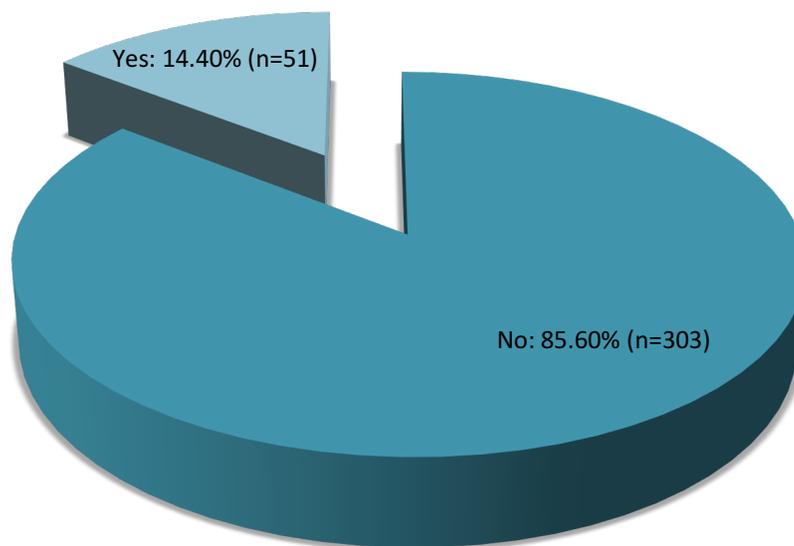
The following sections describe and provide analysis of data from six instruments: the NOAA Office of Ocean Exploration and Research: *Why Do We Explore?* Professional Development Pre- (Appendix A) and Post- Surveys (Appendix B), the NOAA Office of Ocean Exploration and Research: *How Do We Explore?* Professional Development Pre- (Appendix C) and Post- Surveys (Appendix D; all completed by PDO participants), and Workshop Summary Forms (WDWE, Appendix E and HDWE, Appendix F; completed by workshop facilitators).

### A. Why Do We Explore? Professional Development Pre- and Post- Surveys

i. Pre Assessment Only; N=356 (not all respondents completed every item on the survey).

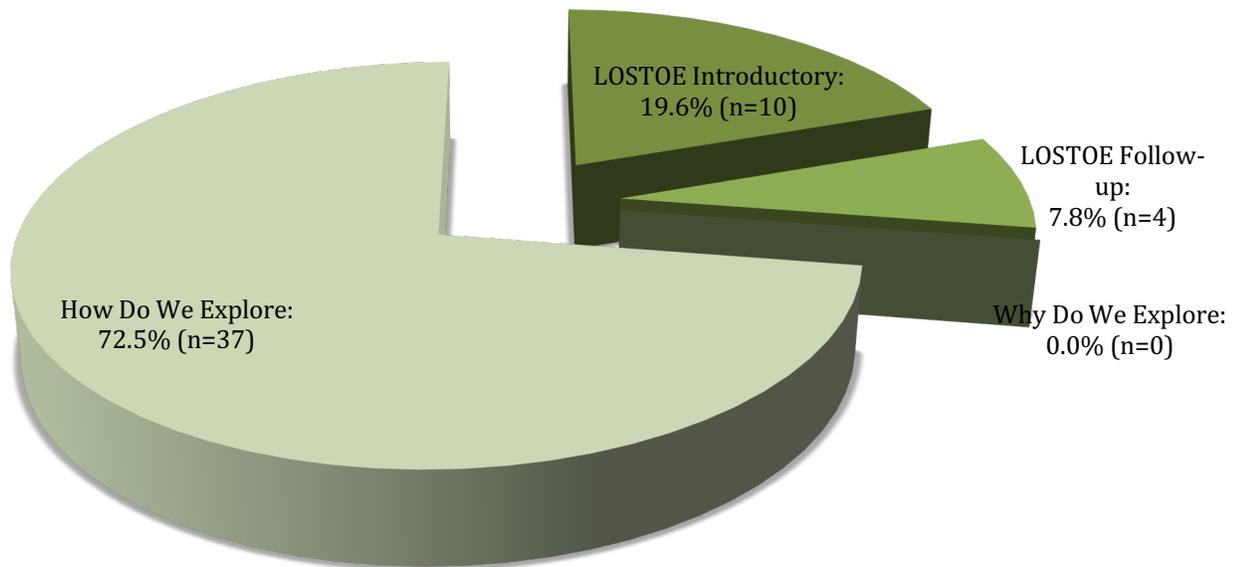
- Number of responses: 354
- Past participation in in-person PDOs: 85.6% (303 of 354) of participants had **not** attended any past in-person PDOs while only 14.4% (51 of 354) had.

## Attended Past In-Person Professional Development



- Participants indicated which in-person PDO they attended. Below are the responses from the 51 participants who provided this information.
  - 19.6% (10 of 51) previously attended a LOSTOE Introductory PDO; 2.8% of all WDWE participants.
  - 7.8% (4 of 51) previously attended a LOSTOE Follow-up PDO; 1.1% of all WDWE participants.
  - 0.0% (0 of 51) previously attended a Why Do We Explore PDO; 0.0% of all WDWE participants.
  - 72.5% (37 of 51) previously attended a How Do We Explore PDO; 10.4% of all WDWE participants.

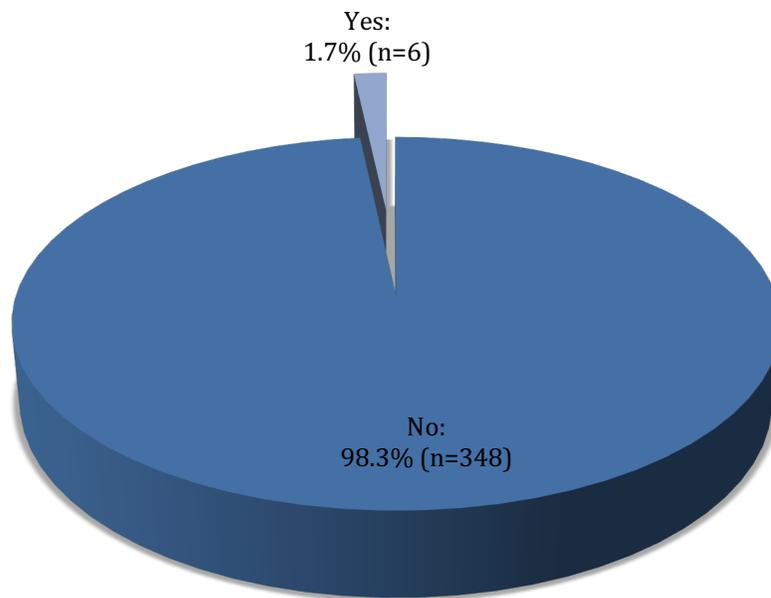
## If Yes, Which One?



The most frequently attended past in-person PDOs were HDWE PDOs.

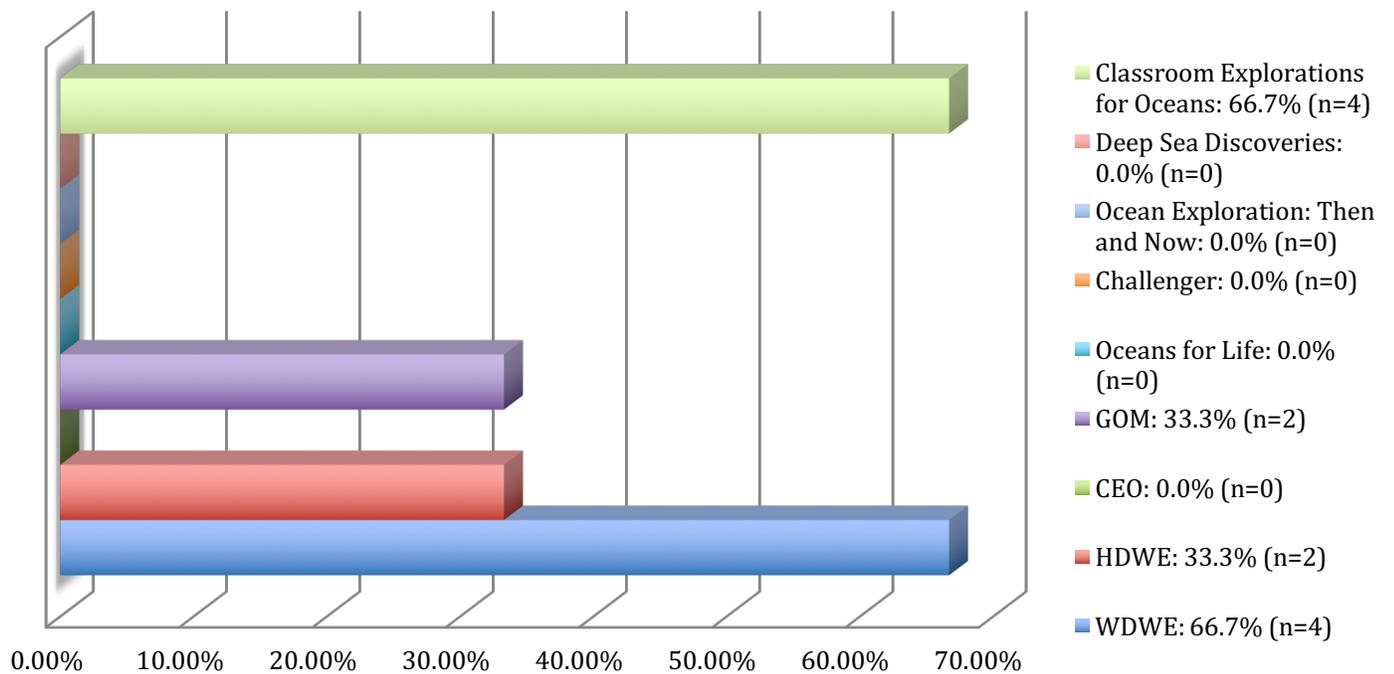
- Past participation in on-line PDOs: 1.7% (6 of 354) participated in past on-line PDOs while 98.3% (348 of 354) did not.

## Participated in On-Line Professional Development



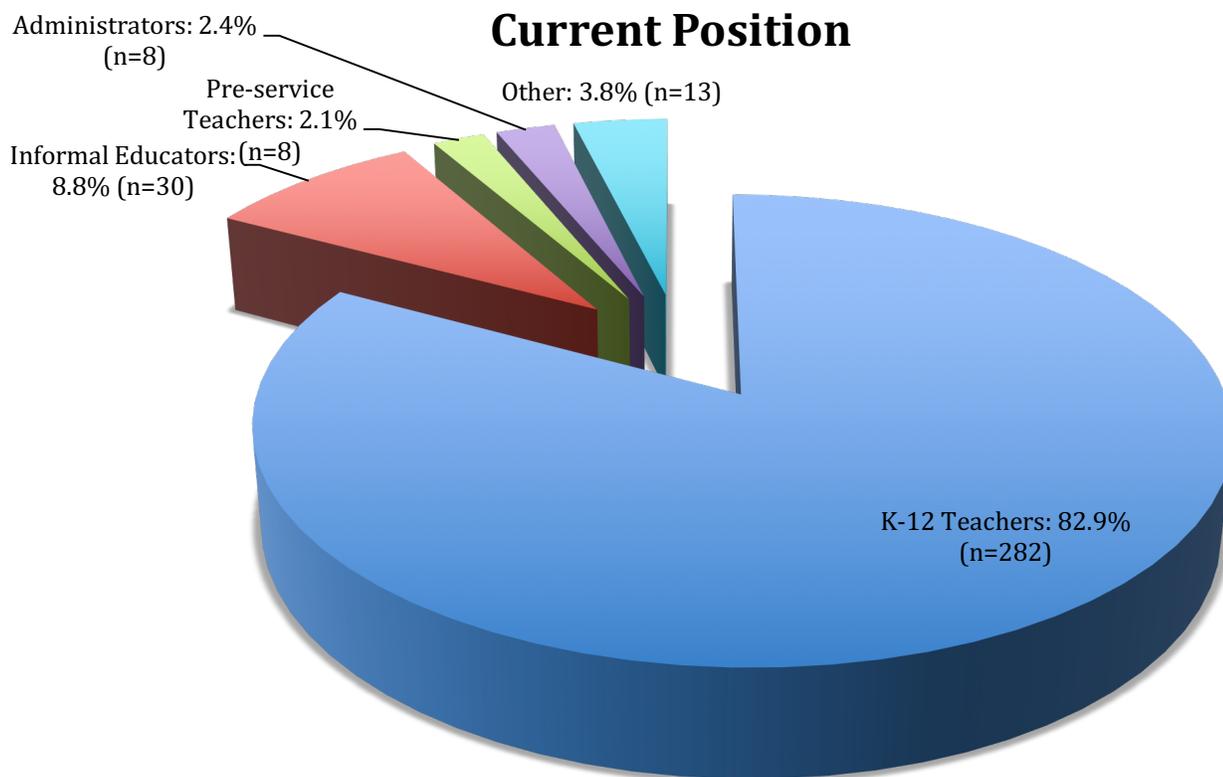
- Most participants did not participate in a past on-line PDO. Below are the responses from the 6 participants who did participate in a past on-line PDO.
  - 66.7% (4 of 6) participated in past on-line WDWE offerings; 1.1% of all WDWE participants.
  - 33.3% (2 of 6) participated in past on-line HDWE offerings; 0.6% of all WDWE participants.
  - 0.0% (0 of 6) participated in past on-line CEO offerings; 0.0% of all WDWE participants.
  - 33.3% (2 of 6) participated in past on-line GOM offerings; 0.6% of all WDWE participants.
  - 0.0% (0 of 6) participated in past on-line Oceans for Life offerings; 0.0% of all WDWE participants.
  - 0.0% (0 of 6) participated in past on-line Challenger offerings; 0.0% of all WDWE participants.
  - 0.0% (0 of 6) participated in past on-line Ocean Exploration: Then and Now offerings; 0.0% of all WDWE participants.
  - 0.0% (0 of 6) participated in past on-line Deep Sea Discoveries offerings; 0.0% of all WDWE participants.
  - 66.7% (4 of 6) participated in past on-line Classroom Explorations for Oceans; 1.1% of all WDWE participants.

### If Yes, Which Ones?



The most frequently attended past on-line PDOs were WDWE and Classroom Explorations for Oceans PDOs.

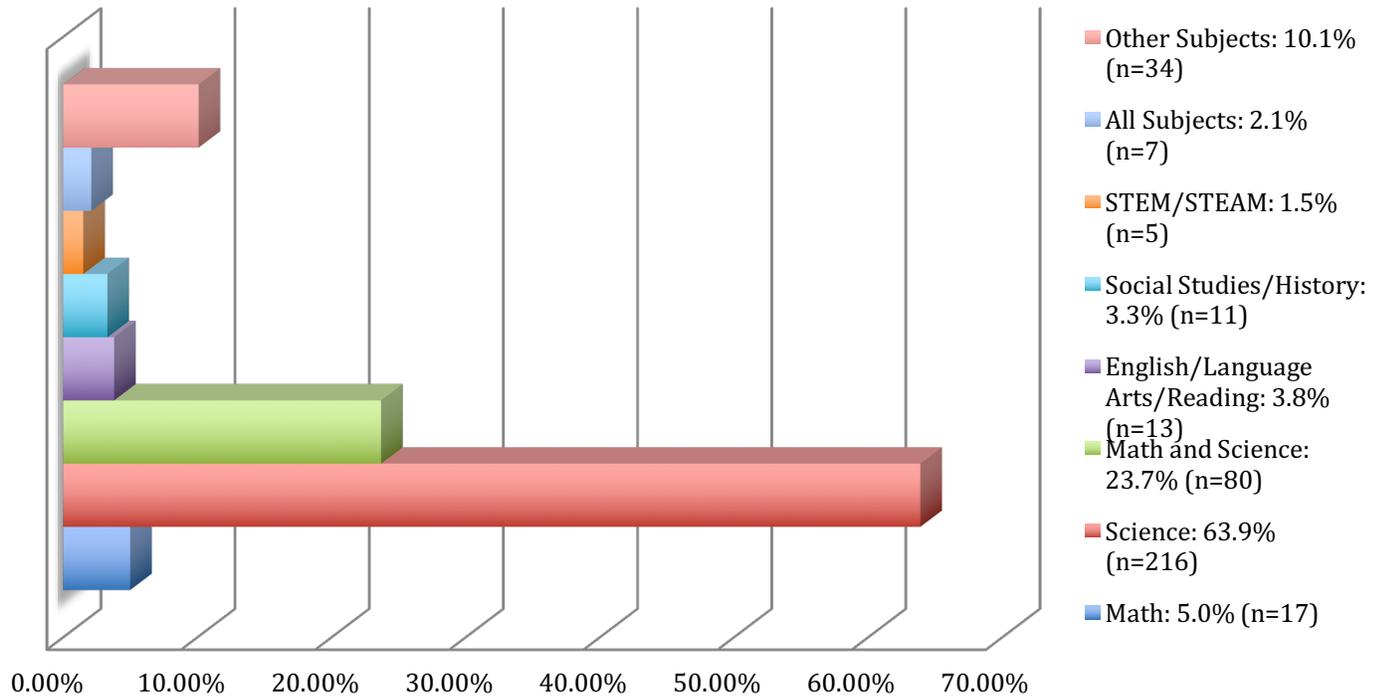
- Current Position: 82.9% (282 of 340) of participants were K-12 teachers; 8.8% (30 of 340) were informal educators; 2.1% (7 of 340) were pre-service teachers; 2.4% (8 of 340) were administrators; and 3.8% (13 of 340) identified themselves as “other”.



By far, most participants were K-12 teachers.

- Subjects taught: 63.9% (216 of 338) of participants taught science; 5.0% (17 of 338) of participants taught math; 23.7% (80 of 338) taught math and science; 3.8% (13 of 338) of participants taught English/language arts/reading; 3.3% (11 of 338) of participants taught social studies and/or history; 1.5% (5 of 338) of participants taught STEM/STEAM; 2.1% (7 of 338) of participants taught all subjects; and 10.1% (34 of 338) taught other subjects.

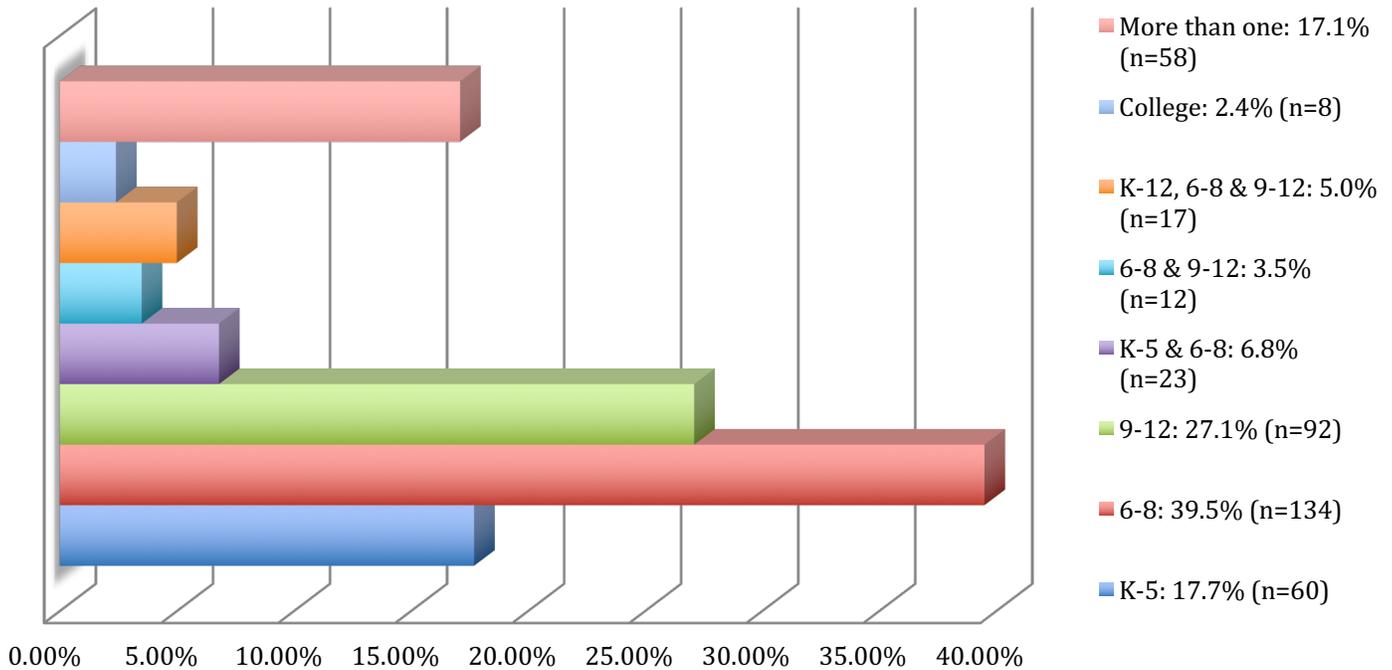
## Subjects Taught



Nearly all PDO participants taught at least some science and many participants taught multiple subjects.

- Grade level:** 17.7% (60 of 339) taught at the K-5 level; 39.5% (134 of 339) taught at the 6-8 level; 27.1% (92 of 339) taught at the 9-12 level; 6.8% (23 of 339) taught at the K-5 and 6-8 levels; 3.5% (12 of 339) taught at the 6-8 and 9-12 levels; 5.0% (17 of 339) taught at the K-5, 6-8, and 9-12 levels; 2.4% (8 of 339) taught at college level; and 17.1% (58 of 339) of respondents taught at more than one level.

## Grade Level Taught

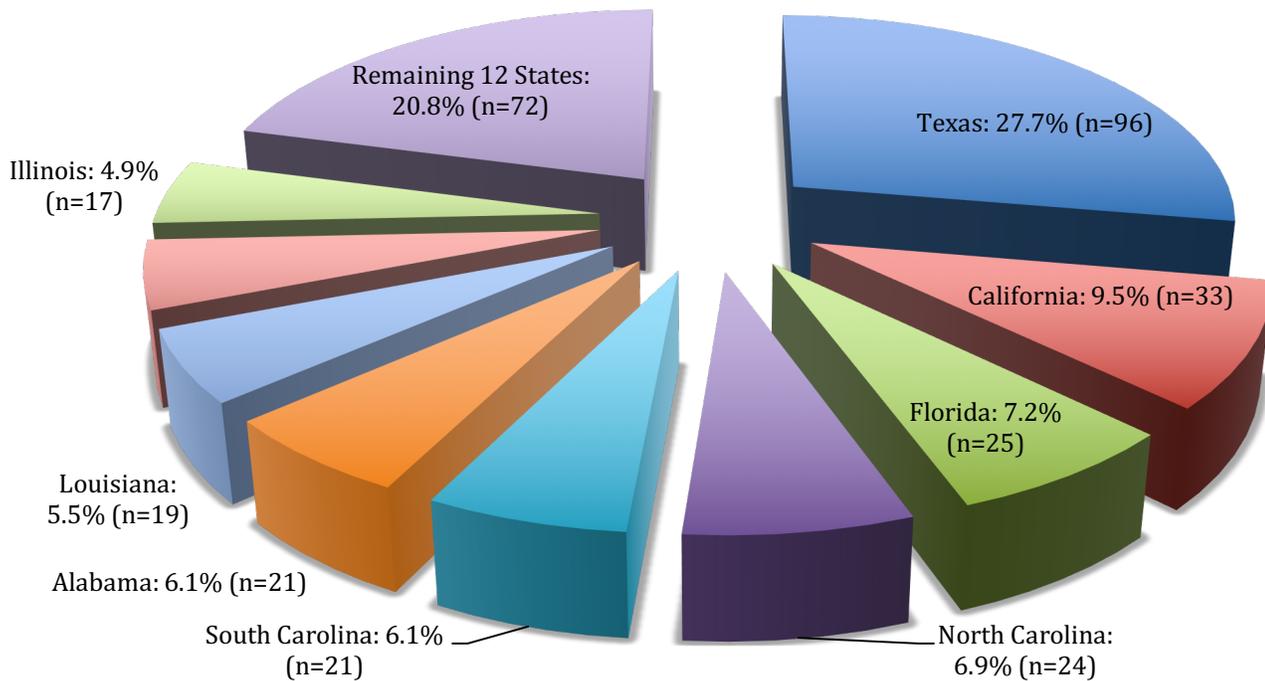


Teachers of grades 6-8 and 9-12 most commonly attended WDWE PDOs. This result is not surprising since the WDWE PDOs are designed for teachers of students in these grades. However, almost 18.0% of participants taught K-5 students. This result is surprising since WDWE PDOs are not designed or advertised for K-5 teachers.

- Years teaching:** The 335 participants in the WDWE PDOs have been teaching for a mean number of 11.6 years with a standard deviation of 9.81, a median of 8 years, a mode of 10, and a range of 0-44 years.

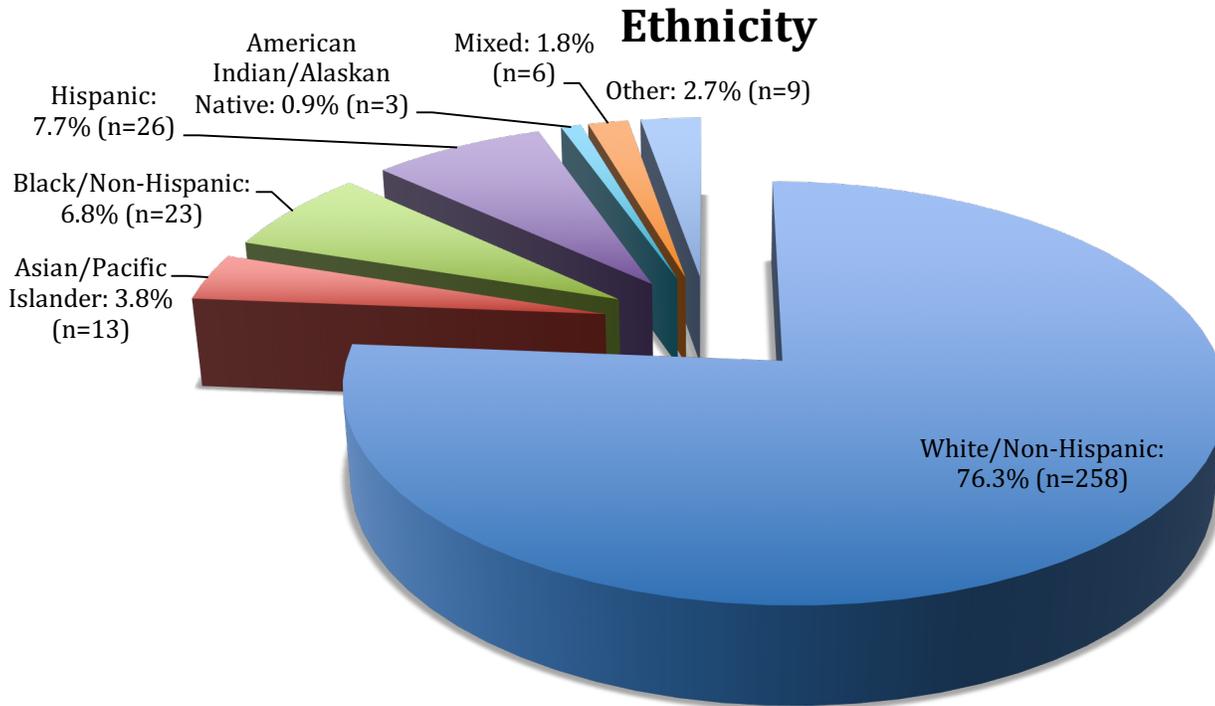
- State where teaching: The teachers attending WDWE PDOs represented 21 states. Of the 346 participants who responded to this item, 96 (27.7%) were from Texas, 33 (9.5%) were from California, 25 (7.2%) were from Florida, 24 (6.9%) were from North Carolina, 21 (6.1%) were from South Carolina, 21 (6.1%) were from Alabama, 19 (5.5%) were from Louisiana, 18 (5.2%) were from Oregon, and 17 (4.9%) were from Illinois. The remaining 72 (20.8%) participants represented the remaining 12 (57.1%) states.

## State Represented



Participants in the workshops most frequently came from coastal states where workshops were offered. Additionally, 18 (85.7%) of the represented states were Coastal, one (4.8%) was a Great Lakes state, and two (9.5%) were interior states.

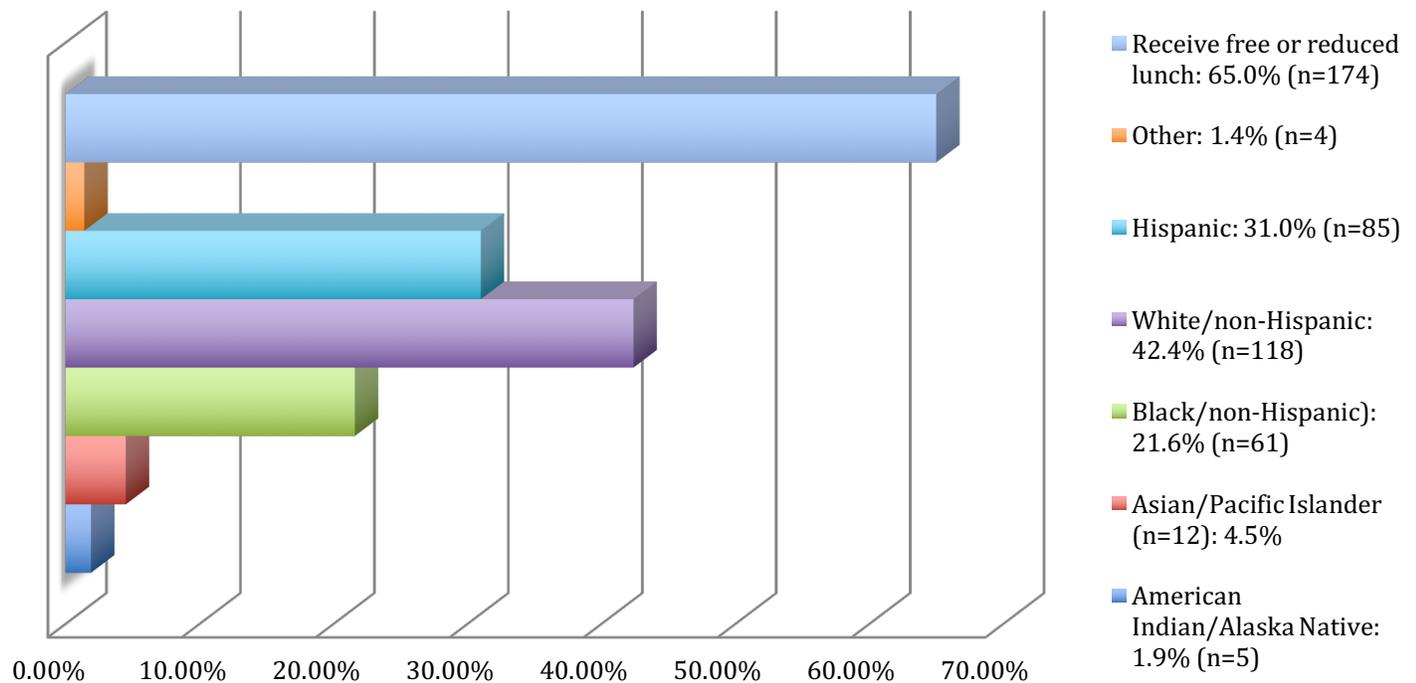
- Ethnicity:** Of the 338 participants who responded, 76.3% (258) identified themselves as white/non-Hispanic; 3.8% (13) identified themselves as Asian or Pacific Islander; 6.8% (23) identified themselves as Black, non-Hispanic; 7.7% (26) identified themselves as Hispanic; 0.9% (3) identified themselves as American Indian or Alaskan Native; 1.8% (6) identified themselves as “mixed”; and 2.7% (9) identified themselves as “other”.



The great majority of PDO participants were white/non-Hispanic with other ethnicities (combined) representing less than 20.0% of participants.

- **Student Characteristics (Mean %):** For this item, participants provided the percent of their students in each of the following categories. Below, mean %s for each of these categories are presented. Due to the variability of individual responses, %s do not add up to 100%.
  - American Indian or Alaska Native (n=5): 1.9%
  - Asian or Pacific Islander (n=12): 4.5%
  - Black, non-Hispanic (n=61): 21.6%
  - White, non-Hispanic (n=118): 42.4%
  - Hispanic (n=85): 31.0%
  - Other (n=4): 1.4%
  - Receive free or reduced lunch (n=174): 65.0%

## Student Characteristics

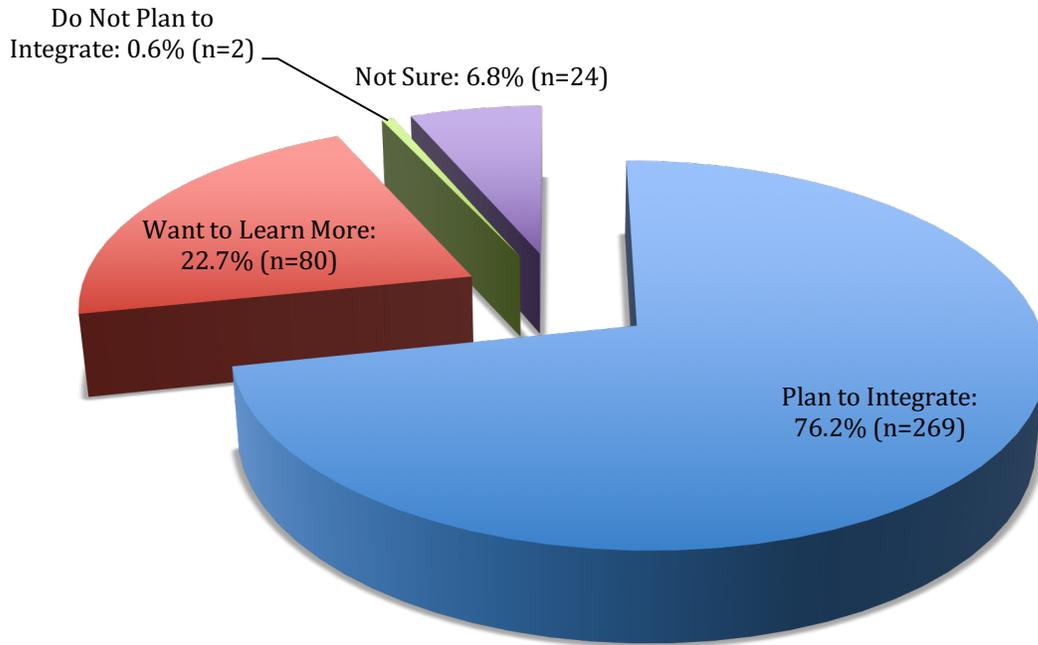


Participants indicated that more than 50% of their students receive free or reduced lunch. Less than 50% of participant's students were identified for each of the other categories.

ii. **Post Assessment Only**

- Number of responses: 353 responses (not all respondents completed every item on the survey).
- Plans to integrate WDWE materials: Of the 353 responses to this item, 269 participants (76.2%) plan to integrate material received during the workshop, 80 (22.7%) want to learn more before they integrate material, 2 (0.6%) do not plan to integrate materials, and 24 (6.8%) are not sure. Some participants selected more than one response.

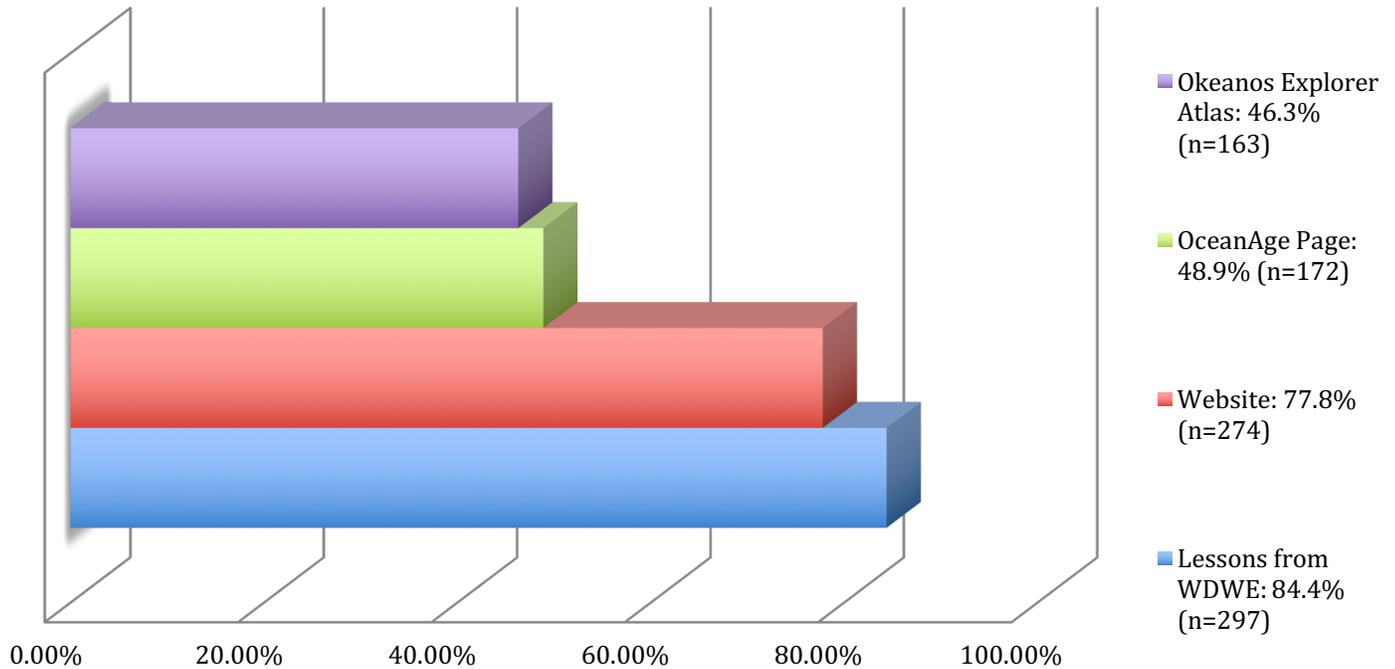
### Plans to Integrate Materials



A large majority of participants plan to integrate materials from the PDO into their instruction while only 7.4% were unsure or do not plan to integrate materials from the PDO into their instruction.

- Intend to use: Of the 352 participants who responded to this item, 297 (84.4%) intend to use lessons from WDWE, 274 (77.8%) intend to use the website, 172 (48.9%) intend to use the OceanAGE page, and 163 (46.3%) intend to use the *Okeanos Explorer* or Digital Atlas. Most participants selected more than one response.

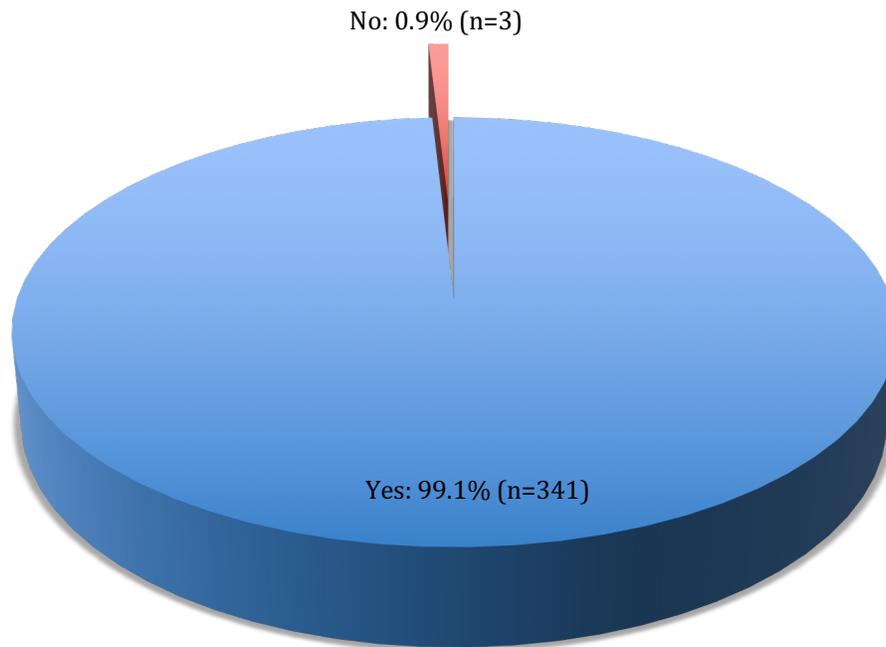
### Intention to Use



- Number of students reached with materials and web resources: The mean number of students each teacher expected to reach with WDWE content and materials was 97 (range= 0-1000), n=319.

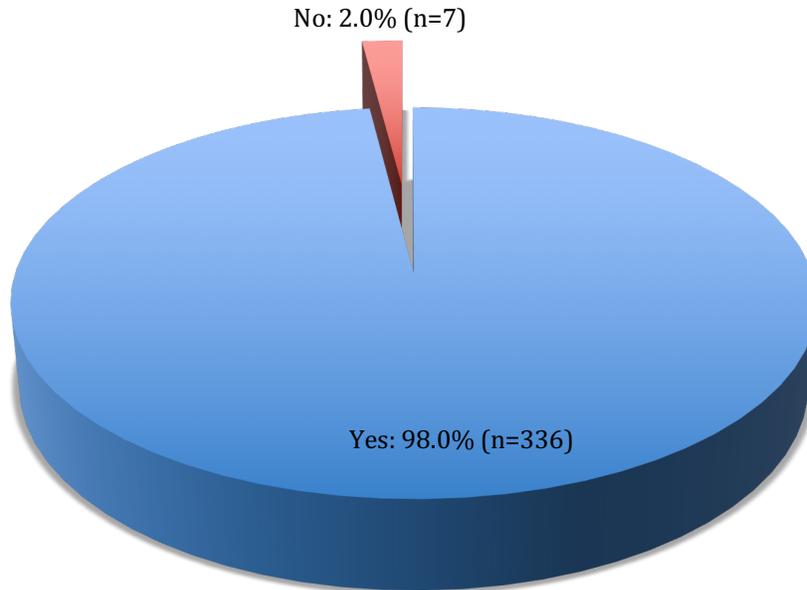
- Enhanced student learning: 99.1% (341 of 344) of PDO participants stated that the WDWE PDO enhanced their students' learning.

## Enhanced Student Learning



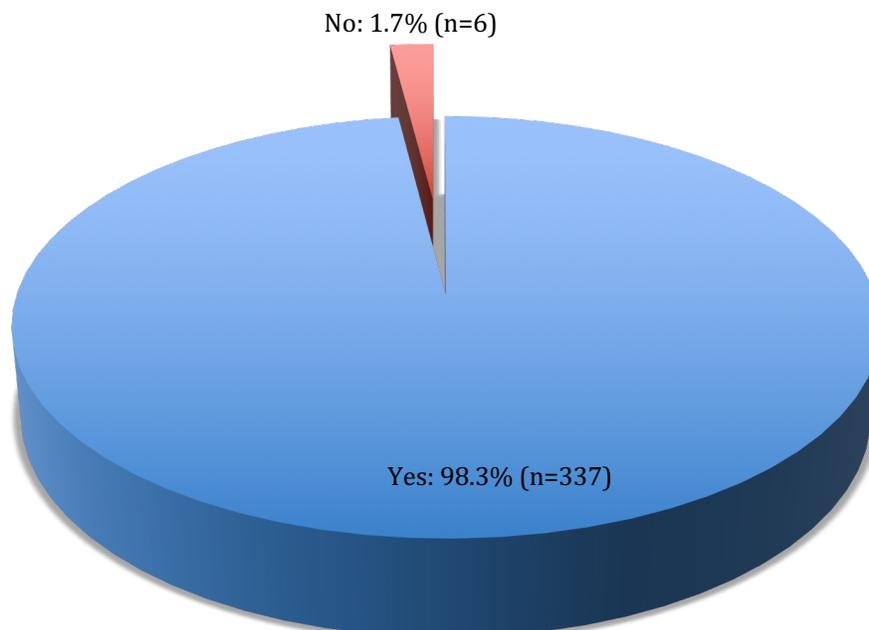
- Furthering PD goals: 98.0% (336 of 343) of PDO participants stated that the WDWE PDO furthered their own PD goals.

## Furthering PD Goals



- Future PDO participation: 98.3% (337 of 343) of PDO participants stated that they **would** participate in another PDO conducted by Ocean Exploration. The remaining 1.3% (7 of 547) of PDO participants stated that they **would not or might not** participate in another PDO conducted by Ocean Exploration.

## Future PDO Participation



**\*Note:** For detailed responses to “how PD enabled you to enhance student learning”, “how PD furthered participant goals”, “suggested changes/improvements”, and “additional comments” review the original data files.

**iii. Pre-Post Assessment Comparisons**

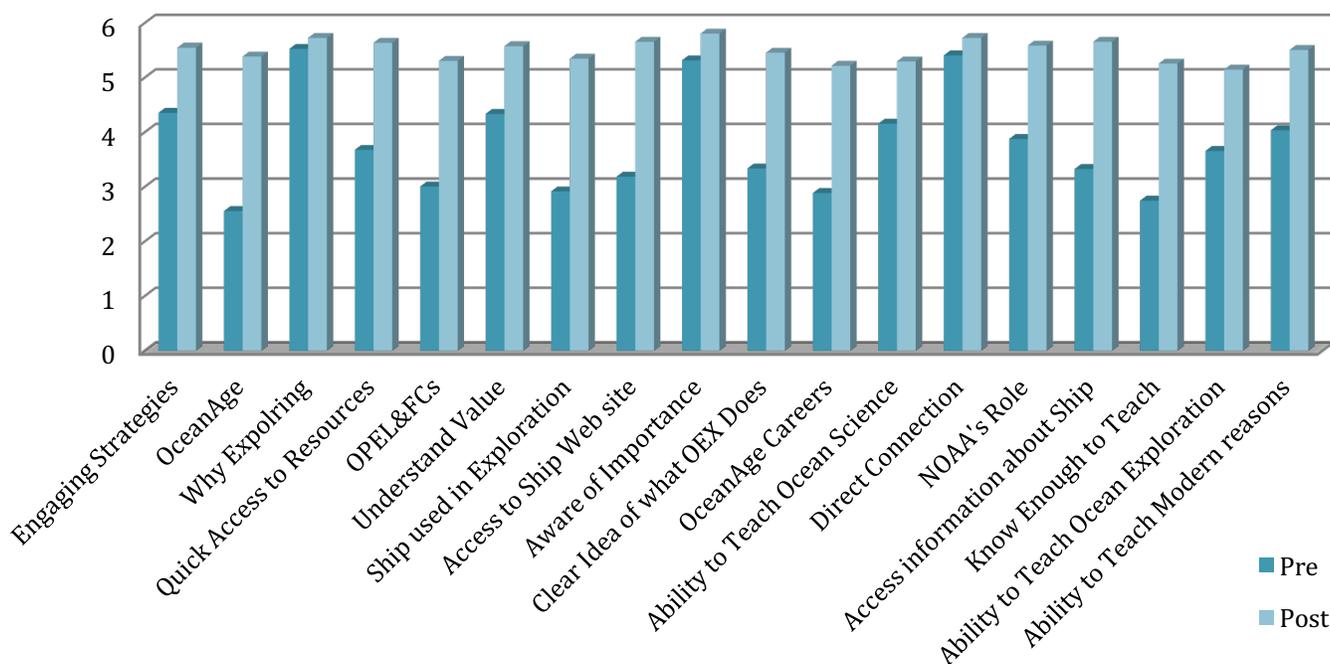
The following table and chart present each item common to both the pre and post assessments. Scores could range from 1-6 with 1 being Strongly Disagree and 6 being Strongly Agree. Means, standard deviations and number of respondents for each item are presented in the table. Responses to each item were compared using a t-test (t-test calculator used: <http://www.graphpad.com/quickcalcs/ttest1/?Format=SD>). The results of that comparison are indicated as Y (there was a significant difference) or N (there was not a significant difference). The table below shows a significant pre to post increase on all items at the  $p < 0.0001$  level. The magnitude of this difference is indicated by the magnitude of Cohen’s *d*. Cohen’s *d* uses the difference in means and standard deviation of the means to determine an effect size (the size of the effect indicated by the significance test) represented by the number of standard deviations the post mean is greater than the pre mean. Standard interpretation of Cohen’s *d* is: *d* of .2 = small ( $\leq 0.40$ ), .5 = medium (0.41-0.79), .8 = large ( $\geq 0.80$ ) (effect size calculator used: <http://www.uccs.edu/lbecker/index.html#means%20and%20standard%20deviations>).

Item	Mean (PRE)	sd (PRE)	n (PRE)	Mean (POST)	sd (POST)	n (POST)	Sig diff?	p (if yes)	d (effect size)	D meaning
a. I know engaging instructional strategies to help my students understand the importance of ocean exploration.	4.36	1.33	349	5.55	0.57	352	Y	<.0001	1.27	Large
b. I know about the OceanAGE Careers page on the Ocean Explorer website.	2.56	1.41	349	5.39	0.83	352	Y	<.0001	2.83	Large
c. I think it is important for students to understand why NOAA is exploring the ocean.	5.53	0.62	354	5.73	0.44	351	Y	<.0001	0.44	Medium
d. I have quick access to a wide range of resources that support my teaching of the importance of	3.68	1.38	354	5.64	0.54	353	Y	<.0001	2.00	Large

ocean exploration.										
e. I am familiar with Ocean Literacy Essential Principles and Fundamental Concepts.	3.01	2.65	353	5.31	0.75	352	Y	<.0001	1.22	Large
f. I am confident in my understanding about the value of exploring the ocean.	4.34	1.35	352	5.58	0.56	351	Y	<.0001	1.30	Large
g. I know how the capabilities and assets of the NOAA Ship <i>Okeanos Explorer</i> are used in ocean exploration.	2.92	1.37	350	5.35	0.66	352	Y	<.0001	2.52	Large
h. I know how to access NOAA Ship <i>Okeanos Explorer</i> education resources on the Ocean Explorer Web site.	3.19	1.49	353	5.66	0.53	352	Y	<.0001	2.34	Large
i. I am aware of the importance of ocean exploration.	5.32	0.87	355	5.81	0.41	350	Y	<.0001	0.80	Large
j. I have a clear idea of what the NOAA Ocean Exploration Program does.	3.34	1.31	355	5.46	0.66	352	Y	<.0001	2.29	Large
k. I know how I can use the OceanAGE Careers web pages with my students.	2.89	1.33	340	5.22	0.93	351	Y	<.0001	2.48	Large
l. I am confident in my ability to teach ocean	4.16	1.25	339	5.30	0.70	350	Y	<.0001	1.29	Large

science to my students.										
m. I think it is important that students understand the direct connection between ocean exploration and their daily lives.	5.41	0.73	340	5.73	0.49	353	Y	<.0001	0.60	Medium
n. I have a good understanding of NOAA's role in ocean exploration.	3.88	1.30	338	5.59	0.59	353	Y	<.0001	1.86	Large
o. I know how to access information about the NOAA Ship <i>Okeanos Explorer</i> .	3.33	1.38	337	5.66	0.54	352	Y	<.0001	2.39	Large
p. I know enough about the NOAA Ship <i>Okeanos Explorer</i> to teach my students about her mission, capabilities, and assets.	2.75	1.30	334	5.26	0.73	353	Y	<.0001	2.72	Large
q. I am confident in my ability to teach deep ocean exploration content to my students.	3.66	1.33	332	5.15	0.73	349	Y	<.0001	1.59	Large
r. I am confident in my ability to teach the modern reasons for ocean exploration to my students.	4.04	1.24	337	5.51	0.59	348	Y	<.0001	1.68	Large

## Pre/Post Comparisons



The effect size is large on all items except two (Items c and m in the table below) where the effect size is medium. For items c and m it is important to note that the pre means are all high (> 5.4) leaving relatively little room for an increase in the scores at the post time point. Additionally, one would expect people who chose to come to this PDO to rate these items high.

#### iv. **WDWE Summary**

Most participants (>85.6%) have not participated in past on-site PDO offerings, even fewer (1.7%) have participated in on-line PDOs. Like participants in past PDOs, WDWE participants taught a variety of subjects to K-12 and college students. Seventy point one percent taught students in grades 6-12; the remaining 33.8% taught students in grades K-5, college, or multiple grade levels. The majority (82.9%) of participants were K-12 in-service teachers. Most participants were experienced teachers (11.6 years) from a wide range of backgrounds and school circumstances.

The overall experience for participants was very positive. The PDOs advanced their PD goals and taught them content and made them aware of resources and lessons they can use. Eighty-four point four percent of respondents plan to integrate WDWE materials into their instruction and 77.8% intend to use lessons from WDWE and the website. Additionally, at least 98.0% of participants stated that the WDWE PDO furthered their PD goals and they would participate in another PDO conducted by OER.

The mean number of students each participant expected to reach with WDWE content and lessons was 97. The average number of students reached by each participant can be quite variable and is less than that reported on past OER PDO assessments. Although reasons for this variability are not known, it is possible that the content presented in the WDWE PDOs cannot be used in as many courses or is not appropriate for as many courses as past PDOs, or the courses where WDWE content will be used may be offered less frequently and attract fewer students.

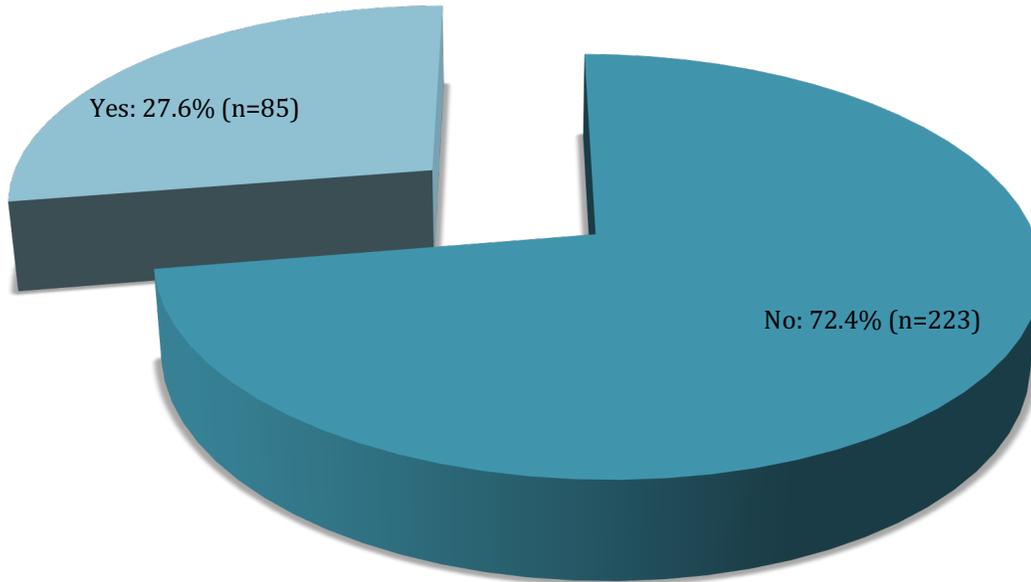
Although all pre- to post- differences were significant, the effect sizes for items c and m were medium. This is not unexpected and is primarily due to participants' pre- assessment scores being relatively high and changing little on the post- assessment. It is likely that WDWE PDOs attract participants who already view these concepts as important.

**B. How Do We Explore? Professional Development Pre- and Post- Surveys**

**i. Pre Assessment Only**

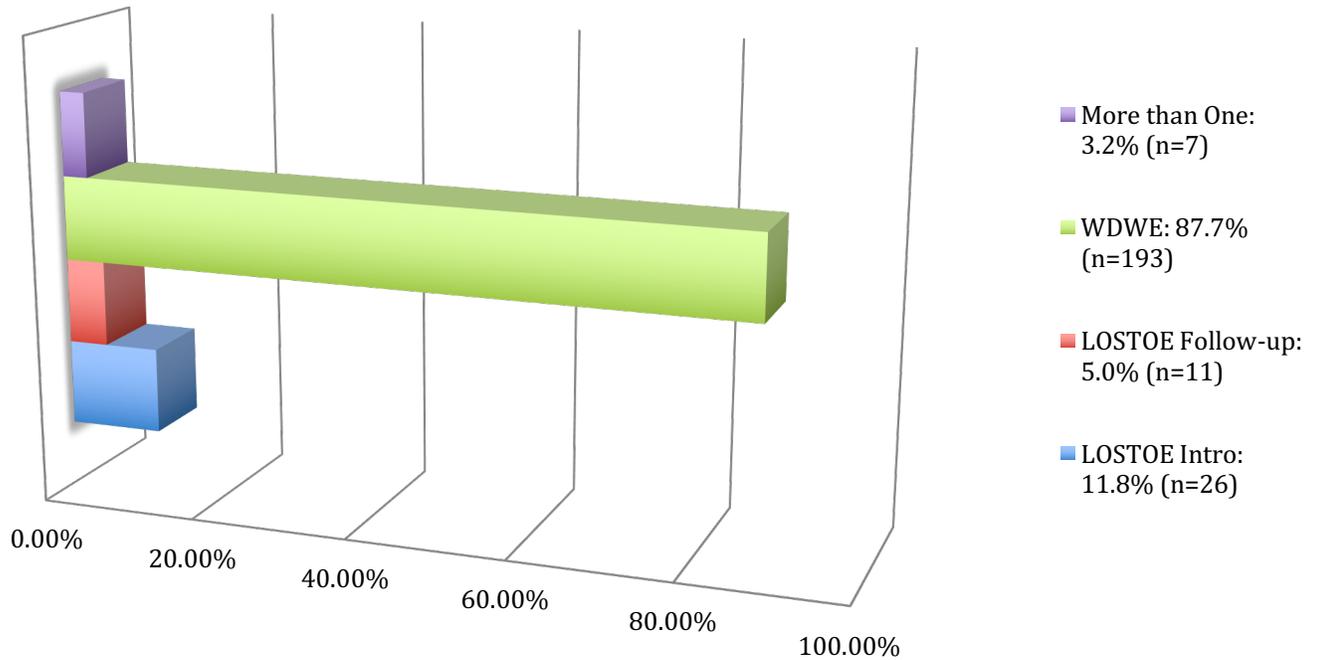
- Number of responses: 309 responses
- Past participation in in-person PDOs: 72.4% (223 of 308) of participants have attended a past in-person PDO while 27.6% had not.

**Attended Past In-Person PDO**



- Below are the responses from the 220 participants who provided this information.
  - 11.8% (26 of 220) attended a LOSTOE Introductory PDO; 8.4% of all HDWE participants.
  - 5.0% (11 of 220) attended a LOSTOE Follow-up PDO; 3.6% of all HDWE participants.
  - 87.7% (193 of 220) attended a Why Do We Explore; 62.5% of all HDWE participants.
  - 3.2% (7 of 220) attended more than one in-person workshop in the past; 2.3% of all HDWE participants.

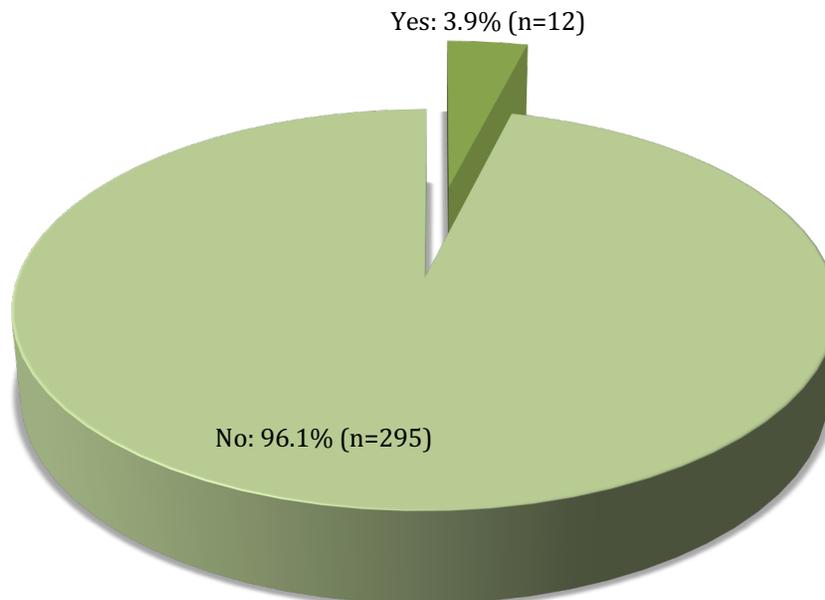
## If Yes, Which One?



The most frequently attended PDOs were the WDWE PDOs. The others were attended by less than 12% of the participants who had attended previous PDOs.

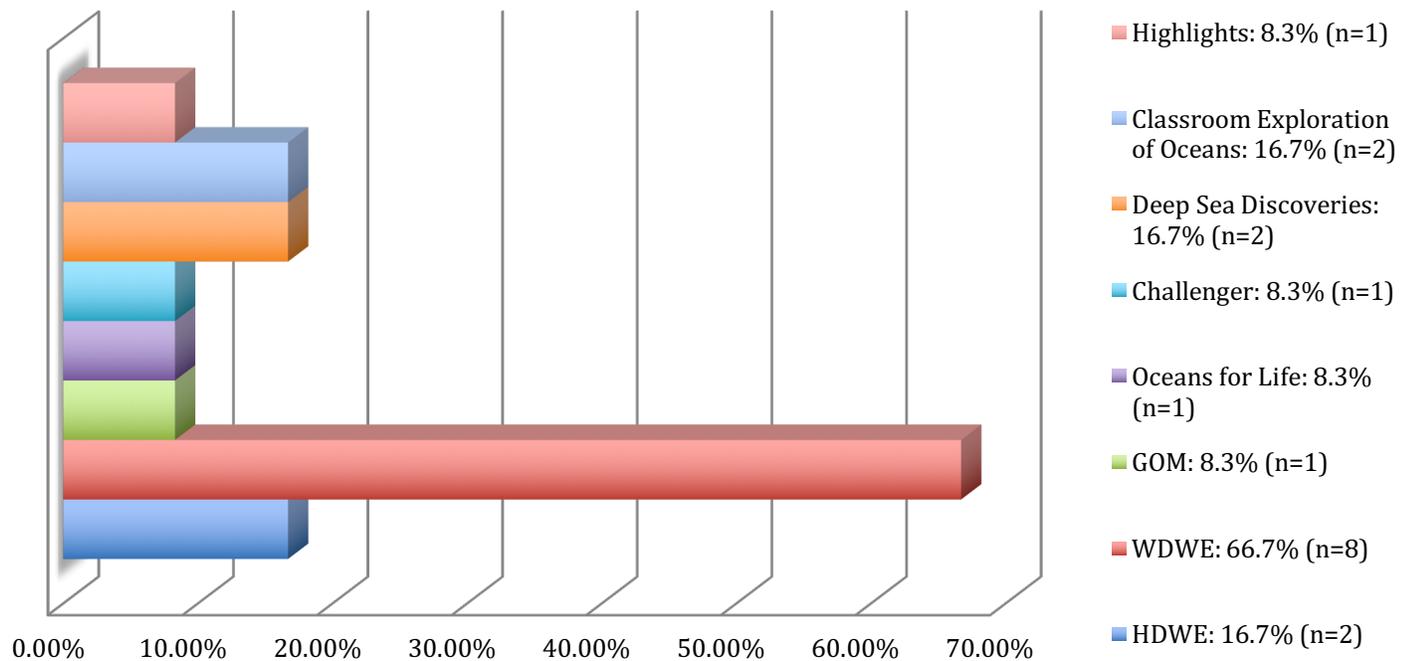
- Past participation in on-line PDOs: 3.9% (12 of 307) participated in past on-line PDOs while 96.1% (295 of 307) did not.

## Past Participation in On-Line PDOs



- Most participants did not participate in a past on-line PDO. Below are the responses from the 12 participants who did participate in a past on-line PDO.
  - 16.7% (2 of 12) participated in past on-line HDWE offerings; 0.7% of all HDWE participants.
  - 66.7% (8 of 12) participated in past on-line WDWE offerings; 2.6% of all HDWE participants.
  - 0.0% (0 of 12) participated in past on-line CEO offerings; 0.0% of all HDWE participants.
  - 8.3% (1 of 12) participated in past on-line GOM offerings; 0.3% of all HDWE participants.
  - 8.3% (1 of 12) participated in past on-line Oceans for Life offerings; 0.3% of all HDWE participants.
  - 8.3% (1 of 12) participated in past on-line Challenger offerings; 0.3% of all HDWE participants.
  - 0.0% (0 of 12) participated in past on-line Ocean Exploration: Then and Now offerings; 0.0% of all WDWE participants.
  - 16.7% (2 of 12) participated in past on-line Deep Sea Discoveries offerings; 0.7% of all WDWE participants.
  - 16.7% (2 of 12) participated in past Classroom Exploration of Oceans offerings; 0.7% of all WDWE participants.
  - 8.3% (1 of 12) participated in past on-line Highlights offerings; 0.3% of all HDWE participants.

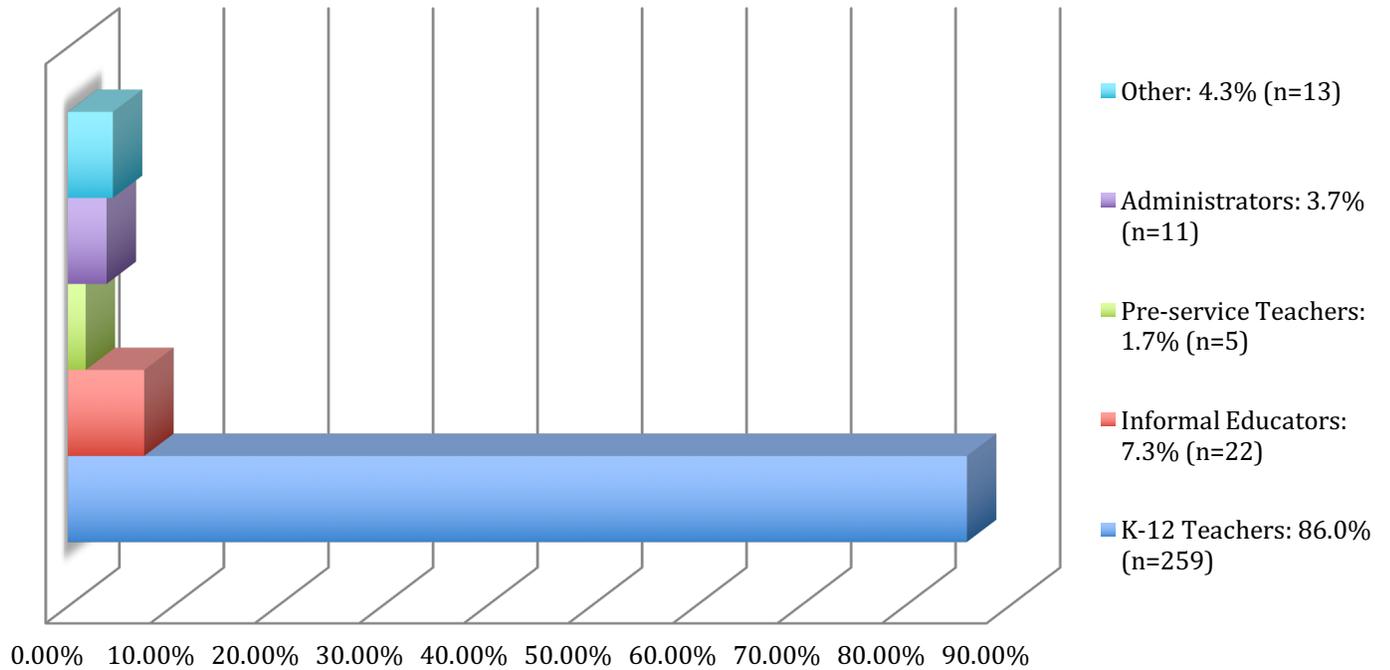
### If Yes, Which One?



The most frequently attended past on-line PDO s were WDWE, Deep Sea Discoveries, HDWE, and Oceans for Life PDOs. Additionally, 38.1% (8 of 21) participants attended more than one on-line workshop in the past (2.0% of all HDWE participants).

- Current Position: 86.0% (259 of 301) of participants were K-12 teachers; 7.3% (22 of 301) were informal educators; 1.7% (5 of 301) were pre-service teachers; 3.7% (11 of 301) were administrators; and 4.3% (13 of 301) identified themselves as “other”. Some participants selected more than one response.

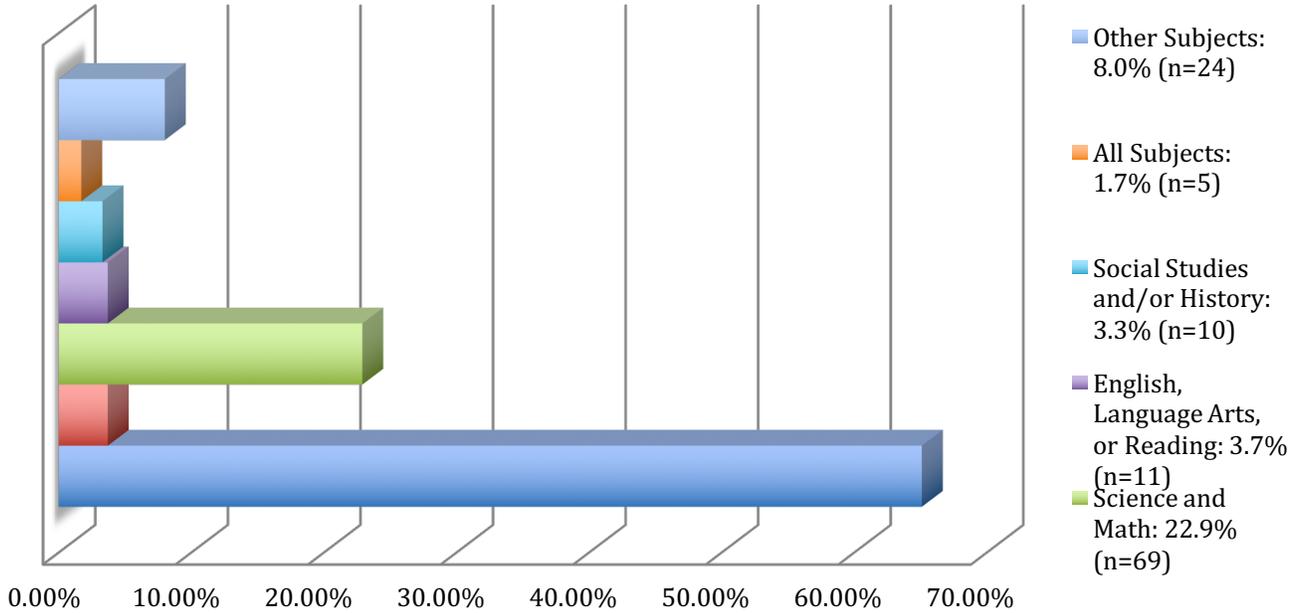
## Current Position



By far, most participants were K-12 teachers.

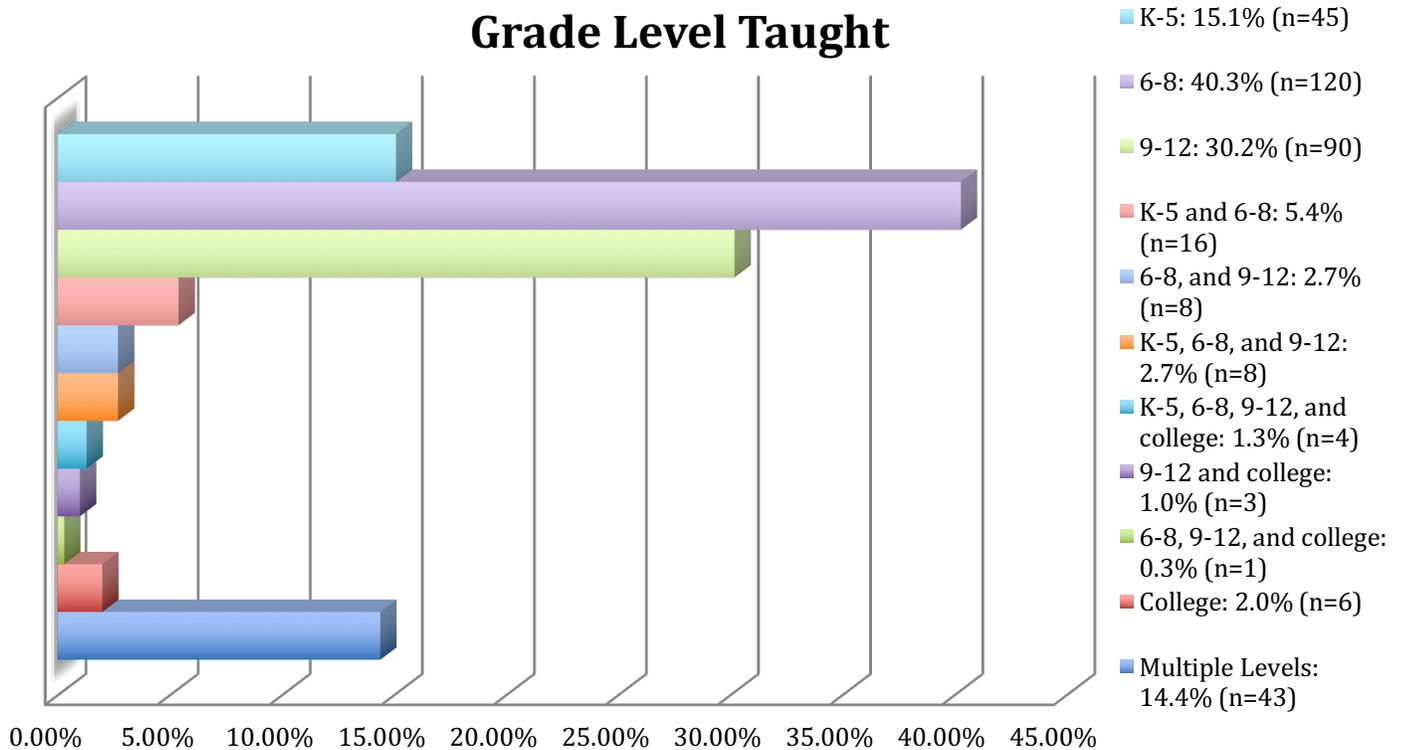
- Subject area: 65.1% (196 of 301) of participants taught science; 3.7% (11 of 301) of participants taught math; 22.9% (69 of 301) taught math and science; 3.7% (11 of 301) of participants taught English/language arts/reading; 3.3% (10 of 301) of participants taught social studies and/or history; 1.7% (5 of 301) of participants taught all subjects; and 8.0% (24 of 301) taught other subjects. Some participants selected more than one response.

### Subjects Taught



Nearly all PDO participants taught at least some science and many participants taught more than one subject.

- **Grade level:** 15.1% (45 of 298) taught at the K-5 level; 40.3% (120 of 298) taught at the 6-8 level; 30.2% (90 of 298) taught at the 9-12 level; 5.4% (16 of 298) taught at the K-5 and 6-8 levels; 2.7% (8 of 298) taught at the 6-8 and 9-12 levels; 2.7% (8 of 298) taught at the K-5, 6-8, and 9-12 levels; 1.3% (4 of 298) taught at the K-5, 6-8, 9-12, and college levels; 1.0% (3 of 298) taught at the 9-12 and college levels; 0.3% (1 of 298) taught at the 6-8, 9-12, and college levels; 2.0% (6 of 298) taught at college level; and 14.4% (43 of 298) of respondents taught at more than one level.

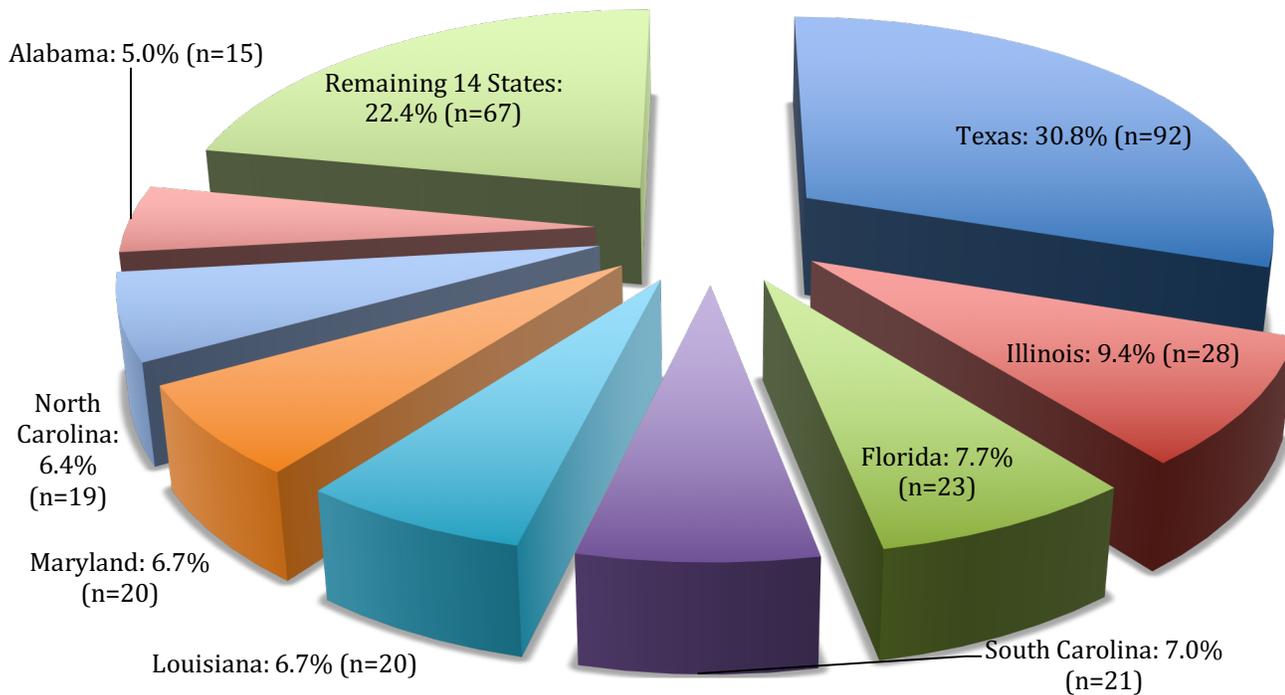


Teachers of grades 6-8 and 9-12 most commonly attended HDWE PDOs. This result is not surprising since the HDWE PDOs are designed for teachers of students in these grades. However, 15.0% of participants taught K-5 students. This result is surprising since WDWE PDOs are not designed or advertised for K-5 students.

- **Years teaching:** The 296 participants in the WDWE PDOs have been teaching for a mean number of 12.4 years with a standard deviation of 9.38, a median of 10 years, a mode of 3, and a range of 0-45 years.

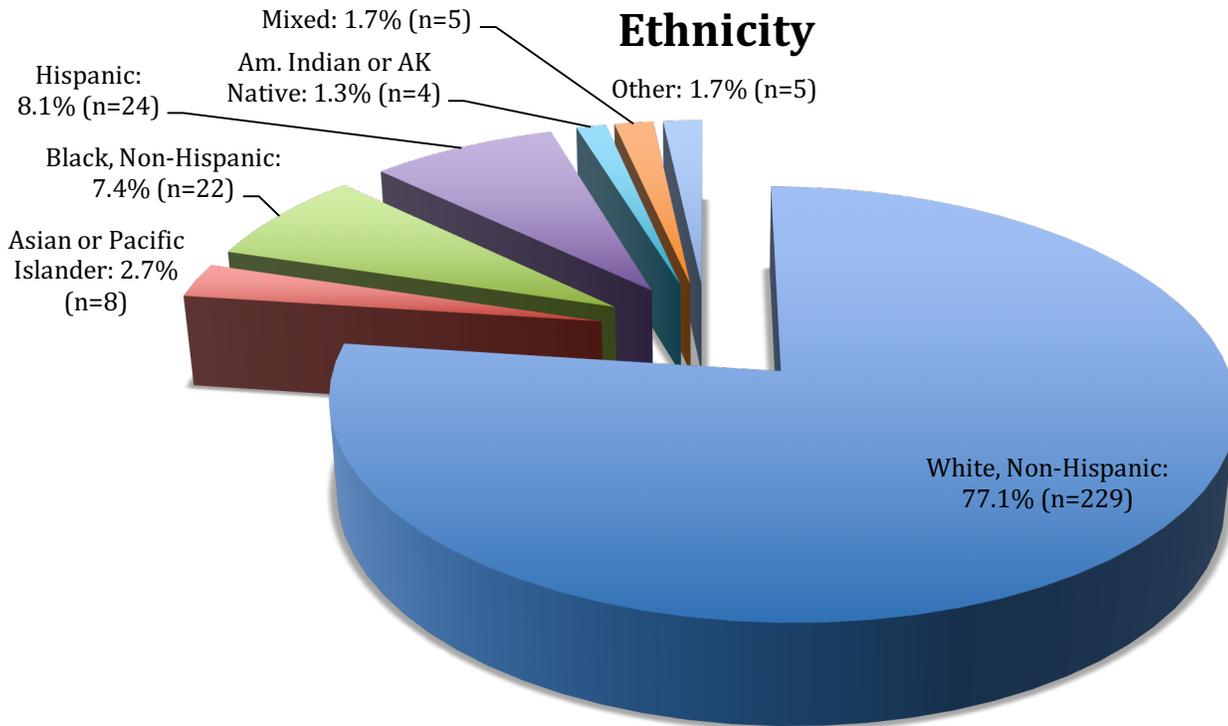
- State teaching:** The teachers attending HDWE PDOs represented 22 states. Of the 299 participants who responded to this item, 92 (30.8%) were from Texas, 28 (9.4%) were from Illinois, 23 (7.7%) were from Florida, 21 (7.0%) were from South Carolina, 20 (6.7%) were from Louisiana, 20 (6.7%) were from Maryland, 19 (6.4%) were from North Carolina, 15 (5.0%) were from Alabama, and the remaining 67 (22.4%) participants represented the remaining 14 (63.6%) states.

## States Represented



Participants in the workshops most frequently came from Coastal or Great Lakes states where workshops were offered. Additionally, 16 (72.7%) of the represented states were Coastal, 4 (18.2%) were Great Lakes states, and 2 (9.1%) were interior states.

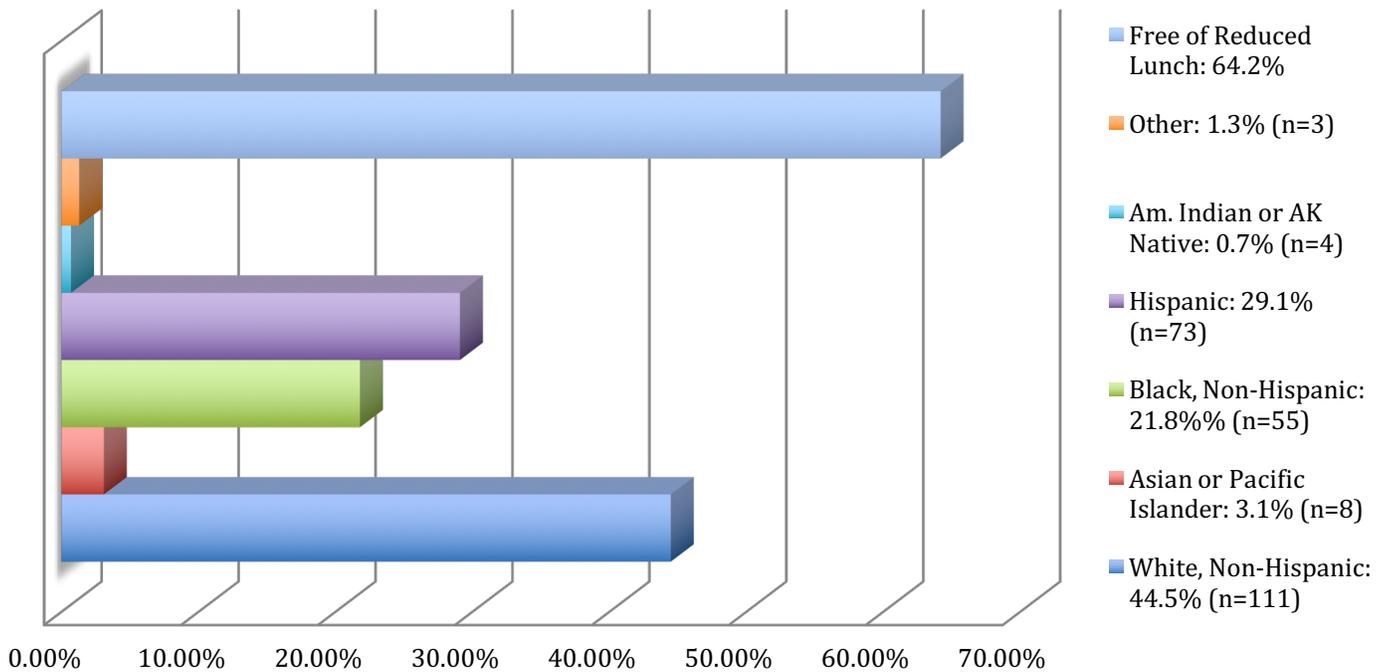
- **Ethnicity:** Of the 297 participants who responded, 77.1% (229) identified themselves as white/non-Hispanic; 2.7% (8) identified themselves as Asian or Pacific Islander; 7.4% (22) identified themselves as Black, non-Hispanic; 8.1% (24) identified themselves as Hispanic; 1.3% (4) identified themselves as American Indian or Alaskan Native; 1.7% (5) identified themselves as “mixed”; and 1.7% (5) identified themselves as “other”.



The great majority of PDO participants were white/non-Hispanic with other ethnicities (combined) representing less than 23.0% of participants.

- **Student Characteristics (Mean %):** For this item, participants provided the percent of their students in each of the following categories. Below, mean %s for each of these categories are presented. Due to the variability of individual responses, %s do not add up to 100%.
  - American Indian or Alaska Native (n=247): 0.7%
  - Asian or Pacific Islander (n=248): 3.1%
  - Black, non-Hispanic (n=250): 21.8%
  - White, non-Hispanic (n=249): 44.5%
  - Hispanic (n=250): 29.1%
  - Other (n=247): 1.3%
  - Receive free or reduced lunch (n=233): 64.2%

## Student Characteristics

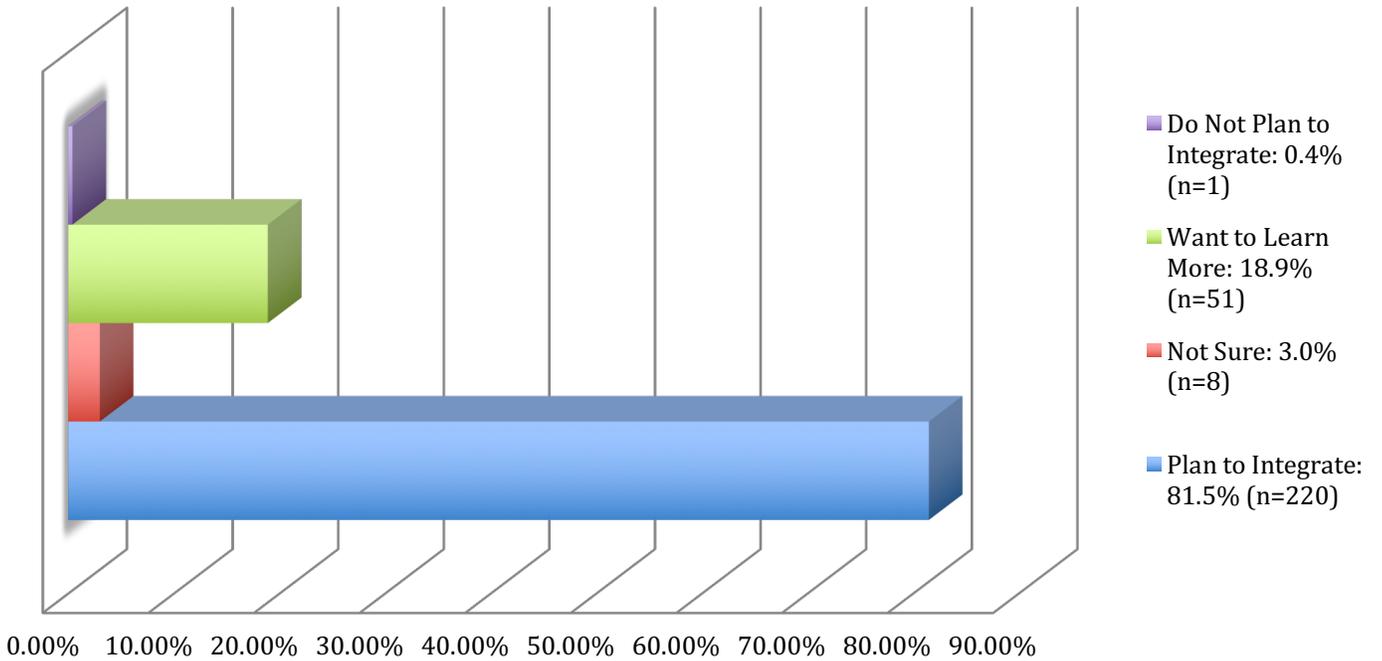


Participants indicated that more than 60% of their students receive free or reduced lunch while less than 45% of participant's students were identified for each of the other categories.

**ii. Post Assessment Only**

- Number of responses: 270 responses
- Plans to integrate HDWE materials: Of the 270 responses to this item, 220 participants (81.5%) plan to integrate material received during the workshop, 51 participants (18.9%) want to learn more before they integrate material, 1 participant (0.4%) does not plan to integrate materials, and 8 participants (3.0%) are not sure. Some participants selected more than one response.

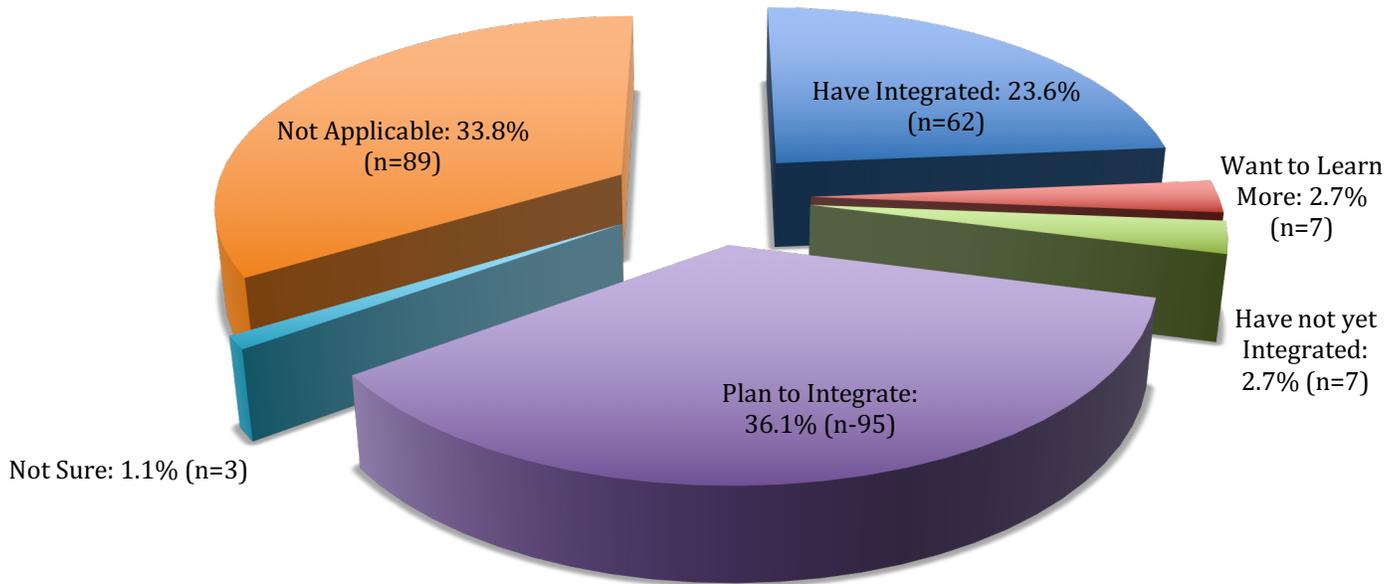
**Plans to Integrate Materials**



A large majority of participants plan to integrate materials from the PDO into their instruction while only 7.4% were unsure or do not plan to integrate materials from the PDO into their instruction.

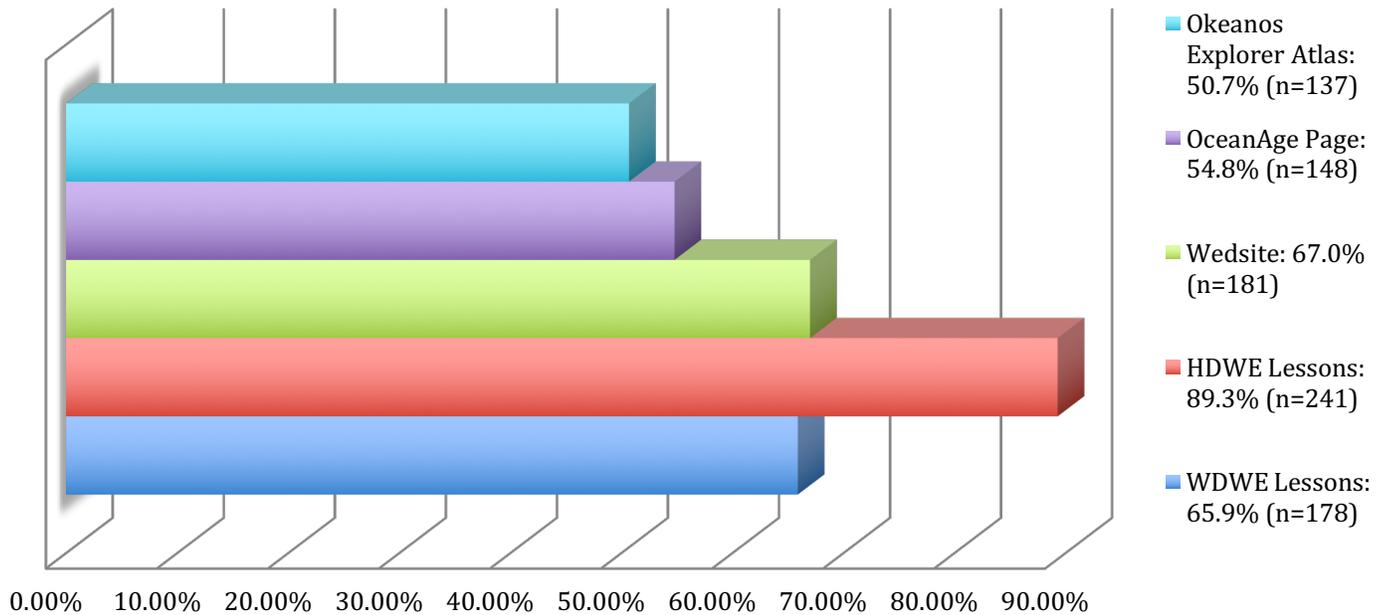
- Have integrated WDWE material: Of the 263 participants who responded to this item, 62 participants (23.6%) have integrated material from the WDWE workshop, 7 participants (2.7%) want to learn more before they integrate material, 7 participants (2.7%) have not yet integrated the material, 95 participants (36.1%) have not yet integrated the material but plan to, 3 participants (1.1%) are not sure if they will integrate material, and 89 participants (33.8%) indicated this item does not apply to them.

## Have Integrated WDWE Materials



Intend to use: Of the 270 participants who responded to this item, 178 (65.9%) intend to use lessons from WDWE, 241 (89.3%) intend to use lessons from HDWE, 181 (67.0%) intend to use the website, 148 (54.8%) intend to use the OceanAGE page, and 137 (50.7%) intend to use the Okeanos Explorer Atlas.

## Intention to Use

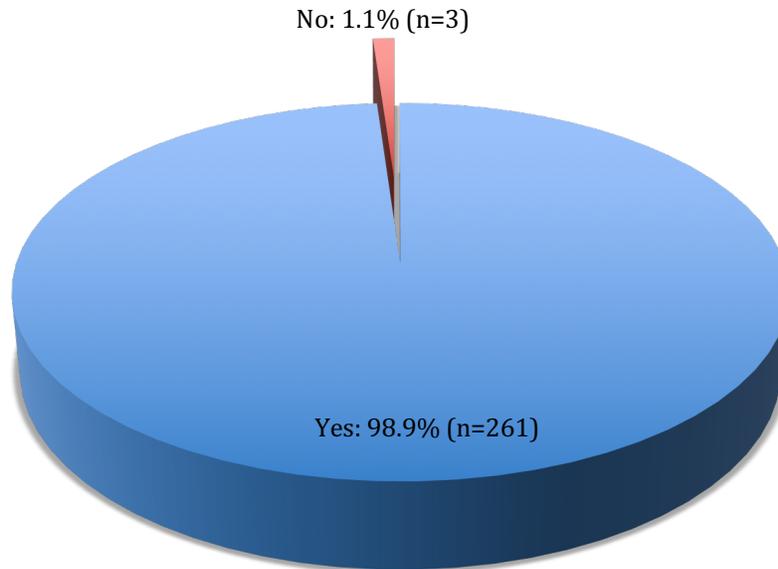


At least 50% of HDWE participants indicated they would use each of these resources.

- Number of students reached with materials and web resources (n=248): The mean number of students each teacher expected to reach with HDWE content and materials was 119 (range 5-5001).

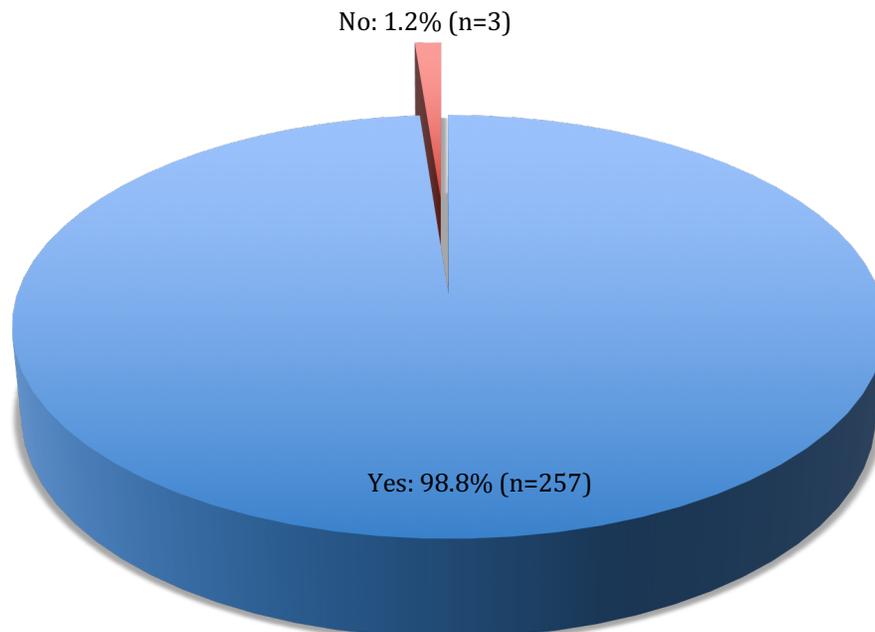
- Enhanced student learning: 98.9% (261 of 264) of PDO participants stated that the HDWE PDO will enhance their students' learning.

## Enhanced Student Learning



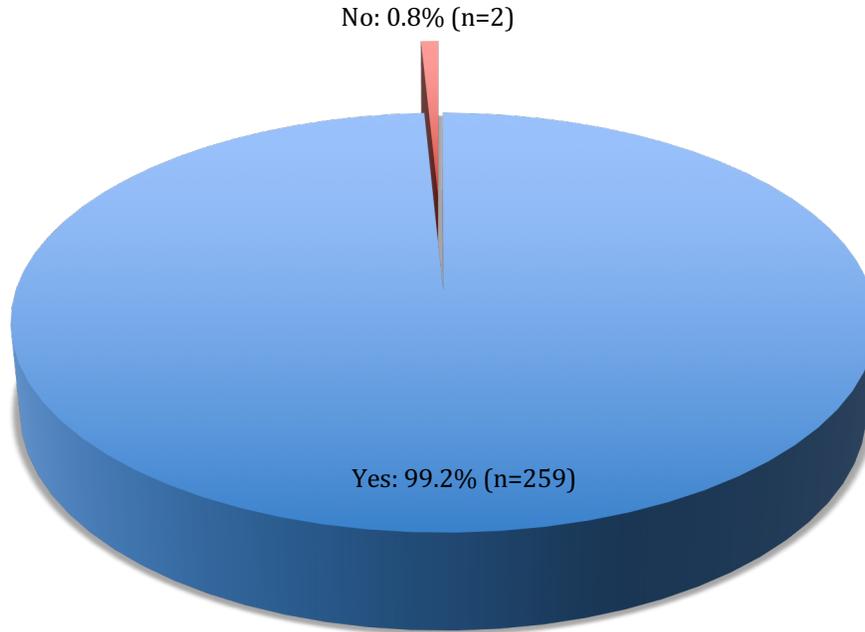
- Furthering PD goals: 98.8% (257 of 260) of PDO participants stated that the HDWE PDO furthered their own PD goals.

## Furthering PD Goals



- Future PDO participation: 99.2% (259 of 261) of PDO participants stated that they **would** participate in another PDO conducted by Ocean Exploration. The remaining 0.7% (3 of 406) of PDO participants stated that they **would not** participate in another PDO conducted by Ocean Exploration.

## Future PDO Participation



**\*Note:** For detailed responses to “how PD enabled you to enhance student learning”, “how PD furthered participant goals”, “suggested changes/improvements”, and “additional comments” please review the original data files of each response.

### iii. Pre-Post Assessment Comparisons

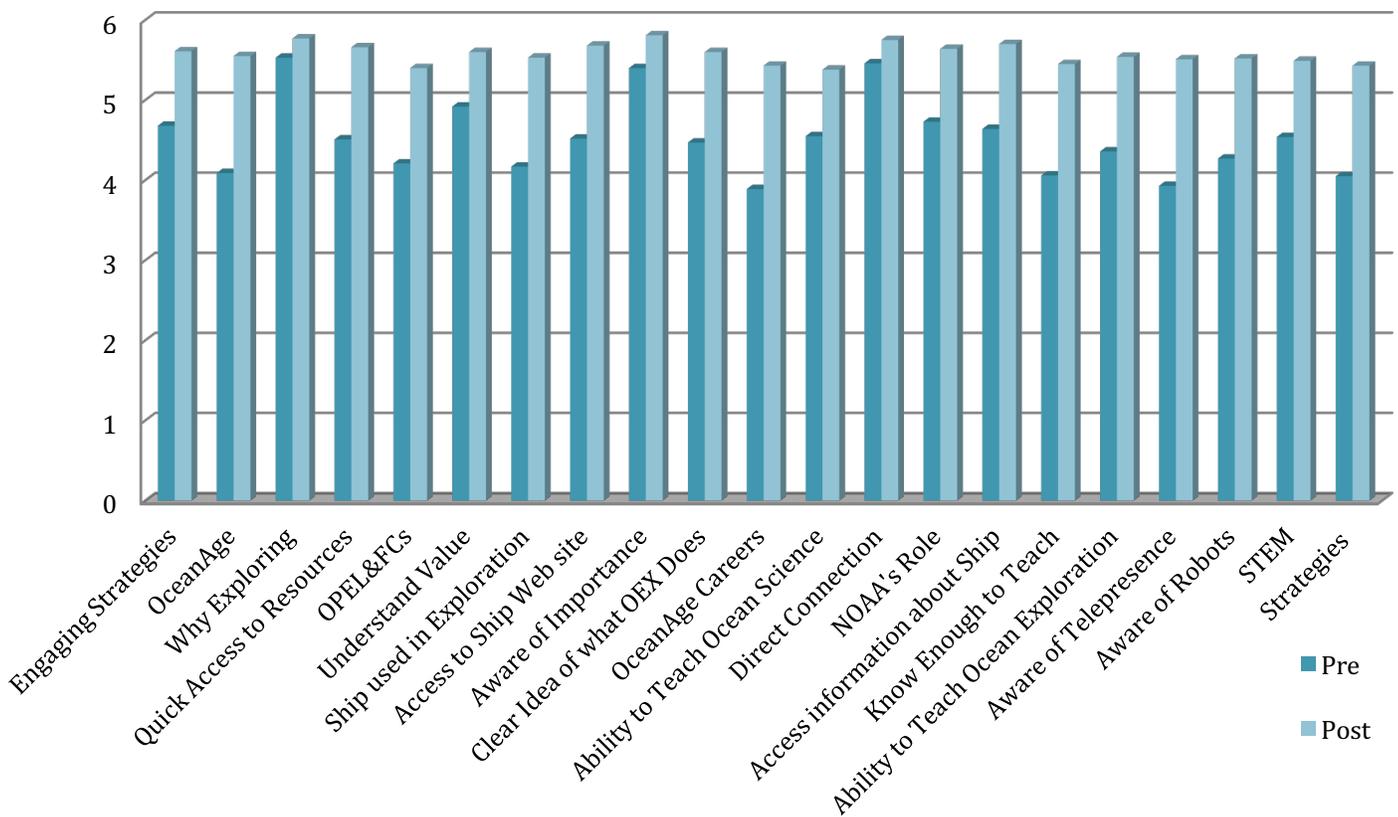
The following table presents each item common to both the pre and post assessments. Scores could range from 1-6 with 1 being Strongly Disagree and 6 being Strongly Agree. Means, standard deviations and number of respondents for each item are presented. Responses to each item were compared using a t-test (t-test calculator used: <http://www.graphpad.com/quickcalcs/ttest1/?Format=SD>). The results of that comparison are indicated as Y (there was a significant difference) or N (there was not a significant difference). The table below shows a significant pre to post increase on all items at the  $p < 0.0001$  level. The magnitude of this difference is indicated by the magnitude of Cohen’s *d*. Cohen’s *d* uses the difference in means and standard deviation of the means to determine an effect size (the size of the effect indicated by the significance test) represented by the number of standard deviations the post mean is greater than the pre mean. Standard interpretation of Cohen’s *d* is: *d* of .2 = small (<0.40), .5 = medium (0.41-0.79), .8 = large (>0.80) (effect size calculator used: <http://www.uccs.edu/lbecker/index.html#means%20and%20standard%20deviations>).

Item	Mean (PRE)	sd (PRE)	n (PRE)	Mean (POST)	sd (POST)	n (POST)	Sig diff?	p (if yes)	d (effect size)	d meaning
a. I know engaging instructional strategies to help my students understand the importance of ocean exploration.	4.68	1.09	306	5.61	0.53	268	Y	<.0001	1.09	Large
b. I know about the OceanAGE Careers page on the Ocean Explorer website.	4.09	1.43	304	5.55	0.58	269	Y	<.0001	1.34	Large
c. I think it is important that students understand why NOAA is exploring the ocean.	5.53	0.62	306	5.77	0.50	270	Y	<.0001	0.42	Medium
d. I have quick access to a wide range of resources that support my teaching of the importance of ocean exploration.	4.51	1.12	306	5.66	0.53	269	Y	<.0001	1.31	Large
e. I am familiar with Ocean Literacy Essential Principles and Fundamental Concepts.	4.12	1.34	308	5.40	0.65	268	Y	<.0001	1.21	Large
f. I am confident in my understanding about the value of exploring the ocean.	4.92	0.96	306	5.60	0.58	267	Y	<.0001	0.86	Large
g. I know how the capabilities and assets of the NOAA Ship <i>Okeanos Explorer</i> are used in ocean exploration.	4.17	1.23	305	5.53	0.60	269	Y	<.0001	1.40	Large
h. I know how to access NOAA Ship <i>Okeanos Explorer</i> education resources on the Ocean Explorer Web site.	4.52	1.31	307	5.68	0.52	269	Y	<.0001	1.16	Large
i. I am aware of the importance of ocean exploration.	5.40	0.72	303	5.81	0.44	270	Y	<.0001	0.69	Medium

j. I have a clear idea of what the NOAA Ocean Exploration Program does.	4.47	1.15	304	5.60	0.58	270	Y	<.0001	1.25	Large
k. I know how I can use the OceanAGE Careers web pages with my students.	3.89	1.22	303	5.43	0.70	269	Y	<.0001	1.54	Large
l. I am confident in my ability to teach ocean science to my students.	4.55	1.01	299	5.38	0.72	267	Y	<.0001	0.95	Large
m. I think it is important that students understand the direct connection between ocean exploration and their daily lives.	5.46	0.68	303	5.75	0.47	269	Y	<.0001	0.50	Medium
n. I have a good understanding of NOAA's role in ocean exploration.	4.73	1.01	303	5.64	0.55	270	Y	<.0001	1.11	Large
o. I know how to access information about the NOAA Ship <i>Okeanos Explorer</i> .	4.64	1.12	303	5.70	0.47	269	Y	<.0001	1.24	Large
p. I know enough about the NOAA Ship <i>Okeanos Explorer</i> to teach my students about her mission, capabilities, and assets.	4.06	1.19	303	5.45	0.64	269	Y	<.0001	1.45	Large
q. I am confident in my ability to teach deep ocean exploration content to my students.	4.36	1.01	303	5.54	0.70	269	Y	<.0001	1.36	Large
r. I am aware of how telepresence communication technologies are used in the explorations of the <i>Okeanos Explorer</i> .	3.93	1.28	302	5.51	0.64	269	Y	<.0001	1.56	Large
s. I am aware of how underwater robots are used on board	4.27	1.24	302	5.52	0.60	266	Y	<.0001	1.28	Large

the <i>Okeanos Explorer</i> .										
t. I have a good understanding of how the sciences, advanced technologies, mathematics, and engineering are integrated to support ocean exploration.	4.54	0.98	302	5.49	0.61	268	Y	<.0001	1.16	Large
u. I am confident in my understanding of the strategies used in ocean exploration	4.05	1.18	299	5.43	0.61	267	Y	<.0001	1.47	Large

### Pre/Post Comparisons



The effect size is large on all items except three (Items c, i, and m in the table above). For these three items with a medium effect size, it is important to note that the pre means are high (> 5.4) leaving relatively little room for an increase in the scores at the post time point.

#### iv. HDWE Summary

Most participants (72.4%) in HDWE PDOs have participated in past on-site PDO offerings, but very few (about 3.9%) have participated in past on-line PDOs. Like participants in past PDOs, HDWE participants taught a variety of subjects to K-12 and college students. Seventy-three point two percent (73.2%) taught students in grades 6-12; the remaining 26.8% taught students in grades K-5, college, or multiple grade levels. The majority (86.0%) of participants were K-12 in-service teachers. Most participants were experienced teachers (12.4 years) from a wide range of backgrounds and school circumstances.

The overall experience for participants was very positive. The PDOs advanced their PD goals and taught them content and about resources and lessons they can use. Eighty-one point five percent (81.5%) of respondents plan to integrate HDWE materials into their instruction while 59.7% already have or plan to integrated material from the WDWE workshop into their instruction. Additionally, between 50.7% and 89.3% intend to use lessons from WDWE and/or HDWE, the website, the OceanAGE page, and the *Okeanos Explorer* Atlas. Most participants stated that the HDWE PDO furthered their PD goals (98.8%) and they would participate in another PDO conducted by OER (99.2%).

The mean number of students each participant expected to reach with **HDWE content and lessons was 119**. The average number of students reached by each participant can be quite variable and is less than that reported on past OER PDO assessments. Although reasons for this variability are not known, it is possible that the content presented in the HDWE PDOs cannot be used in as many courses or is not appropriate for as many courses as past PDOs, or the courses where WDWE content will be used may be offered less frequently and attract fewer students.

Although all pre to post differences were significant, the effect sizes for items c, i, and m were medium. This is not unexpected and is primarily due to participants' pre- assessment scores being relatively high and changing little on the post- assessment. For all of these items, it is likely that HDWE PDOs attract participants who already view these concepts as important and/or learned enough about Ocean Exploration in previous workshops to have this perspective now.

#### C. WDWE and HDWE Assessment Comparisons

When comparing results from WDWE and HDWE, there are a few differences. While at least 72% of HDWE PDO participants have participated in past in-person PDO offerings, < 15.0% of WDWE PDO did the same. All participants taught a variety of subjects to K-12 and college students. About 70% (WDWE=70.1%; HDWE=73.2%) taught students in grades 6-12; the remaining 30% (WDWE=29.9%; HDWE=26.8%) taught students in grades K-5, college, or multiple grade levels. About 83% (WDWE=82.9%; HDWE=86.0%) of participants were K-12 in-service teachers and the average number of years in practice is about 12 (WDWE=11.6 years; HDWE=12.4 years).

The overall experience for participants was very positive. The PDOs advanced their PD goals and taught them content and made them aware of resources and lessons they can use. The majority of participants plan to integrate WDWE and HDWE materials into their instruction and intend to use lessons from the PDOs and the website. At least 98% (WDWE=98.0%; HDWE=99.2%) of participants stated they would like to participate in another PDO conducted by OER. Additionally, on all items where pre/post comparisons were made for either PDO, the post mean was significantly greater than the pre mean.

**Teachers expected to reach an average of 108 students (WDWE=97; HDWE=119)** with WDWE and HDWE content and lessons. These averages are quite variable and are less than those reported on past LOSTOE assessments. Although reasons for this change are not known, it is possible that the content presented in the WDWE and HDWE PDOs cannot be used in as many courses as past PDOs or the courses where WDWE and HDWE content will be used may be offered less frequently and/or attract fewer students.

Although all pre to post differences were significant, the effect sizes for items c and m were medium. This is not unexpected and is primarily due to participants' pre- assessment scores being relatively high and changing little on the post- assessment. For all of these items, it is likely that HDWE PDOs attract participants who already view these concepts as important and/or learned enough about Ocean Exploration in previous workshops to have this perspective now.

#### D. Facilitator Summary Forms

Between Fall 2015 and Summer 2016, 14 Alliance Partners hosted at least one WDWE and one HDWE PDO for a total of 28 PDOs (a mean of 2.0 PDOs/Alliance Partner). The 14 (50.0%) *Why Do We Explore?* and 14 (50.0%) *How Do We*

Explore PDOs were conducted by seven PDO facilitators. Facilitators conducted as few as two PDOs and as many as six PDOs for a mean of 4.0 PDOs per facilitator during this time period. Facilitators for all 28 (100.0%) of the PDOs returned the Facilitator Summary Form. The following analysis is based on the data provided on those summary forms.

**i. Why Do We Explore? N=14**

**Item 1. Were you able to accomplish the entire PDO agenda?**

- Yes – 92.9% (13 of 14)
- No – 7.1% (1 of 14)

Of the 14 WDWE PDOs conducted in 2015-2016, 13 (92.9%) workshops were completed in their entirety. The aspects of the workshop that was not completed were:

**If no, what was omitted?**

- I set up the buoyancy activity, but then forgot to invite teachers to try it during lunch.

The reason for not completing the agenda was the facilitator forgot to do the activity.

**Item 2. During guided reflections, did PDO participants:**

**A. indicate they were motivated to incorporate more ocean science into their classroom teaching?**

- Yes – 100.0% (14 of 14)
- No – 0.0% (0 of 14)

In all (14; 100.0%) of the PDOs, facilitators reported participants were motivated to incorporate more ocean science into their classroom teaching. Some examples include:

- Most said that they would integrate at least few of the lessons or activities into their curriculum—many liked the photo cubes and the shapes. 2
- Some expressed that they felt more knowledgeable and in turn, more comfortable with exploring ocean topics even if they don't normally focus on traditional biology, chemistry or geology (this from a teacher that is nutrition and human health).
- They also liked the Wet Map boxes; some teachers already did something similar but not with the 3-D paper maps/models. They liked the added visual.
- They felt that many of the activities would connect to current curriculum/lesson plans, and that they could easily adjust elements that weren't a good fit. For example, several mentioned that they could do New World/ Fractals, with adjustments to help students better understand the construction of a fractal (using exact measurement, math tools, etc.) or that they would emphasis the observation and exploration and less on the construction of fractals.
- Yes, this was expressed during introductions too. I ask the teachers what they would like to come away with, and four of them said they wanted more ocean science information to include in their current curriculum. One teacher wanted it for her Earth Science curriculum.
- Come on Down was a hit. We 'jig sawed it' and had a competition between groups using dry erase boards.
- Many of them would use the modified Methane Hydrate activity.
- There were six pre-service teachers from the University of San Diego's credential program at this workshop. They wanted to teach ocean science when they began teaching their own classrooms. There were also two elementary-level science coordinators that were looking for ocean-based content.
- "What's the Big Deal because I can engage the students while teaching a variety of subjects (energy, chemistry, etc.)" and "Methane Circus for 8<sup>th</sup> grade Earth Science while teaching geological timeline and to compare fossils....also to use as an inquiry activity."
- These educators were VERY reluctant to share out as a group. They seemed to have good discussions at their tables, but very few wanted to share with the rest of the group. They were

excited about the materials and the one teacher is fairly new and teaches 6 sections of oceanography and was THRILLED with all the resources.

- One said they were incorporating the ocean acidification/buffering activity right away.
- “I’m already teaching about X, but this would be a way to incorporate an ocean example into the unit”.
- Many identified specific lessons they would use and when. And most said they came specifically looking for OS lessons, activities, and material to use with students.
- Almost none of them had seen the OLEPFC before and they were very excited about those and looking at them. Several indicated doing ocean-related units in the classroom with little content or support. They really liked the essays as examples of nonfiction reading for Common Core, but wanted those at different reading levels. The fact that some readings were provided in Spanish made them VERY excited.

These examples indicate numerous ways teachers will use what they gained during the PDO in their classroom and with their students.

**B. identify ways to connect students to the work and lives of ocean scientists, including those working with the *Okeanos Explorer*, using the OE Web site?**

- Yes – 100.0% (14 of 14)
- No – 0.0% (0 of 14)

Facilitators of all (14; 100.0%) of the PDOs reported participants were able to connect students to the work and lives of ocean scientists, including those working with the *Okeanos Explorer*, using the OE Web site. Examples identified by PDO participants included:

- Showed participants OceanAGE and pointed out “calling all Explorers”. 3
- Teachers plan to use “Calling All Explorers” to enhance career knowledge. 3
- Teachers were really excited about the OceanAGE careers pages and resources. We explored several profiles to highlight information and access. They loved that it has scientists, ROV drivers, techs, etc. Helps them show the diversity of careers and that not everyone has to be a scientist to do cool things.
- Two of the 9-to-12-grade teachers offer students time to explore careers. They were very interested in the OceanAGE web pages, and the range of careers presented. One teacher made the point that students don’t have to be interested in animals; they could be engineers, ship crew, technicians, and others. All teachers liked the blogs that go along with the mission logs.
- They love this idea and talked about following the missions, but they really want an “ask a scientist” feature.
- Several teachers asked very specific questions about mapping and the ROV’s that I did not know. I asked them to please find the answer on the website and they did and shared their answers with the group.

Facilitators reported participant interest in scientists’ lives and work focused on the OceanAGE Careers webpages but other sources of information and avenues were investigated to pursue this further.

**C. understand how the lessons correlate to the OLEPs, and NGSS?**

- Yes – 92.9% (13 of 14)

Participants in most (13; 92.9%) PDOs discussed and indicated an understanding of how the presented lessons correlate to the OLEPs and NGSS. Examples of these discussions are:

- We reviewed the NGSS briefly. Texas does not use or refer to NGSS in its own standards, so we only use it to emphasize the broad connections across state standards and to emphasize practice and deeper understanding. We do make connections to TEKS (TX state standards).
- Quick overview of NGSS, as these teachers are not familiar, nor do they have to know these national concepts/standards.

- Many teachers were unaware of the OLEPs and were appreciative of the new tool. We briefly discussed all the online recourses- scope and sequence- if they were interested in diving deeper or accessing resources online.
- Many were new to OLEPs, but appreciated the resources and how it supported what they did in the classroom already.
- We also looked at Climate Literacy and Earth Science Literacy websites to make additional connections and show those resources.
- This connection was stronger with NGSS than with OLEP. NGSS will be coming to the classroom in 2017, so teachers are getting ready. WDWE offers authentic, real-world experiences which fits well with NGSS.
- Learning shapes cover all OLEPs
- “To Boldly Go” learning shapes for 5<sup>th</sup> grade.
- Methane hydrate will be great for “creating a model” in NGSS.
- I used a couple of the activities, most notably *What’s the Big Deal?*, to review the Science and Engineering Practices (making models) and the Cross-cutting Concepts. We also reviewed the alignments with OLEPs at the end of the curriculum book.
- Although they did not make many comments about the OLEP’s, I found this group very attentive when we discussed them and I showed them the OLEP website. They shared that the parishes are developing their own science standards and I think they were interested in using the site to help them to update their own science standards.
- They liked looking through the OLEP and one was excited about NGSS and not as familiar with them. A few indicated how these lessons naturally show the science/engineering practices more than other lessons they had seen. One was planning to immediately use the Oceans of Energy hydroelectric power generator with her 8th graders because it ties into NGSS well.
- As soon as NGSS was introduced, teachers asked how specific questions about how to find the addendum online. Teachers used phrases that were word-for-word NGSS Science & Engineering Practices, such as “this photocube activity is great for *obtaining, evaluating and communicating information.*” Teachers were less familiar with OLEPs.
- They were not as excited about standards this time, but enjoyed looking at the NGSS and OLEPs alignments. Several indicated the natural link between the scientific process standards of NGSS and NOAA OER.
- No – 7.1% (1 of 14)

Participants in one PDO did not discuss how the presented lessons correlate to the OLEPs and NGSS because they have not adopted common core or NGSS yet.

During many of the PDOs teachers (with the help of facilitators) discussed how lessons were correlated to NGSS and OLEPs and identified these connections while doing the lessons. However, participants were more familiar with NGSS than OLEPs. Additionally, many participants teach in states where NGSS have yet to be adopted. The PDO where these correlations were not discussed was held in a state that had not adopted NGSS or Common Core making such discussions irrelevant for these participants.

**D. identify how the lessons, materials and resources presented during the workshop meet their local and national standards?**

- Yes – 92.9% (13 of 14)
- No – 0.0% (0 of 14)
- NA – 7.1% (1 of 14)

In most (13; 92.9%) of the workshops facilitators reported that participants identified how the lessons, materials and resources presented during the workshop met their local and national standards. Examples provided by facilitators include:

- Yes, we revisited the TEKS (TX standards) after many of the activities/lessons to make connections and confirm that they do indeed align. We also discussed how the lessons could support nearly all the science process skills, which are essential.
- We highlighted how the activities connected to TX standards (TEKS) as we concluded each activity. They had no difficulty making alignment suggestions, which they appreciated.
- Many noted that Wet Maps is a great way to address maps, geography and topography in a new and creative way. They liked the addition of the 3D model of data, as they thought it helped the students “see” the data differently.
- One high school teacher liked *History’s Thermometers*, not only as an example as a proxy (like tree rings), but also tie into the carbon cycle.
- All teachers liked the real-world connection, videos, and images.
- What’s the Big Deal will be used in weather unit for 6<sup>th</sup> grade.
- Atoms are part of the 5<sup>th</sup> and 6<sup>th</sup> grade units and making a methane hydrate model with spicy drops would meet some standards.
- Several teachers are piloting a maritime course and ROV identification will be great for their curriculum.
- Teachers should be starting NGSS in their classrooms in 2017.
- What’s the Big Deal: used to teach bonding (there were several chemistry teachers in the workshop and they really liked how What’s the Big Deal was a hands-on model for bonding----really glad we have a model plastic model that shows the hydrogen and oxygen in the water molecules of the methane hydrate because they especially liked the idea of using molecular models) plus some middle school teachers said “students can have an understanding of what molecules actually look like and how they are formed”.
- They did not seem excited to talk about Maryland standards at all, but they did like the correlation to NGSS.
- Teachers also discussed connections to Common Core.
- This discussion occurred after all lessons.

**E. discuss and reflect about how presented content and materials can be adapted to fit the specific needs of their students?**

- Yes – 100.0% (14 of 14)
- No – 0.0% (0 of 14)

In all (14; 100%) of the workshops facilitators reported participants discussing and reflecting about how presented content and materials can be adapted to fit the specific needs of their students. Examples are provided below:

- After each lesson introduction/demonstration, the group explored adaptations or accommodations that might be necessary to make it relevant and accessible to their students. During Wet Maps, the teachers discussed needing to keep the data sheets and box in the same positions, or maybe even securing the box to the table so they can’t get ‘mixed up’ if they move the box around or get their rows backward.
- Other teachers mentioned that with the Learning Shapes, they would color code the shapes to help students recognize all the text shapes vs the title shapes. They also suggested having the text on sheets of paper so that all the students could read the information if they didn’t have their own set of shapes (they acknowledged that some students don’t share as well, or read as quickly as others).

- Good discussions about adapting materials to meet student needs, such as expanding or simplifying for other grades, accommodating for G/T or EL students and thinking about how these activities could be used in place of older or “over used” activities.
- After each activity, the teachers discussed what their accommodations would need to be for their own students. There were always options for taking it to the next level, as well as simplifying it. Since these teachers work together several times a year during PD sessions, they exchanged ideas and made suggestions easily.
- Written quote from teacher “In the To Boldly Go activity: Can be modified according to age group. Adding more pictures, vocabulary words, adding math, literacy, and ELL etc.”.
- Some teachers did MATE or other robotics, and can use the ROV materials to tie into it.
- “ROV: cooperative assignment with google slides”
- Geocubes are ‘beautiful, awesome, and entertaining’ Keeps students on task.
- One participant felt that the “Methane Circus” could be used 1<sup>st</sup>-12<sup>th</sup> grade.
- Photo cubes will be used for force and motion and to teach public about climate change at an aquarium.
- The Geocubes were a big hit with this crowd---“easy for my students to use by themselves” and to use geocubes to teach 6<sup>th</sup> grade physical science “renewable and nonrenewable resources”.
- There was a lot of discussion about modifying to lower grades as we had a bunch of early education teachers this time. They were focused on imagery, wording, and reducing the vocabulary.
- Yes, lots of discussion about scaling lessons down for younger grades (ex. history’s thermometers), differentiating for varied groups (ex. To boldly go game), and using for ELL students (ex. Photocubes). One retired post-secondary teacher is now working with HS students and he made a point of saying how much the whole workshop helped him understand different levels of instruction.
- There was A LOT of excited discussion about ways to use lessons as they were presented or with modifications for each teacher’s specific population of students.
- There were a few from alternative schools with students with behavioral issues so they talked about how much prep it would take for them as teachers to modify these for their kids. They liked the idea of the learning shapes with students illustrating their own ideas on those.

**F. identify how they will use OE resources with their students?**

- Yes – 100.0% (14 of 14)
- No – 0.0% (0 of 14)

In all (14; 100%) of the workshops facilitators reported participants identified how they will use OE resources with their students. Examples are provided below:

- Many mentioned that the videos from the ROVs are of great interest, as they could easily use them within existing lessons (their own curriculum), as well as with the NOAA lessons they are just learning. They liked the Digital Atlas, but expressed that they would want to play around with it much more before they felt comfortable using it. They thought the students might be able to ‘explore and use’ independently easier than if they led it as a group.
- Nearly everyone expressed interest in the videos available online, especially at the expeditions to the Gulf of Mexico. They shared how they would use them as introductions, or have students do independent research to seek out information for assignments.
- Also shared that OceanAGE careers would be a great resource when they explore career opportunities.
- “Bingo: great activity I am going to implement this in my class ☺”

- “To Boldly Go great for my 8<sup>th</sup> graders. I would love to see it used for a review”
- “Molecules with Dots (candy) and toothpicks: Molecules with Dots is a great idea to use as a model when teaching. “
- Use carbonate-buffering activity with Bromo Blue to teach cellular respiration.
- Use ROV lesson with Lego Robotics teachers.
- Identify seafloor resources like methane in marine science.
- Many of the teachers said they would use the ocean acidification activity with their students.
- For *To Boldly Go*, the participants liked that it was kinesthetic, visual, and connected to text. Also that it could be repeated without it being teacher-driven by playing the game repeatedly.
- A teacher noted she would use *Come on Down* in March/April to introduce ocean engineering and technology to her deep ocean unit.
- Again the geocubes were a hit: “My students would have a blast manipulating the cubes. This activity would allow the students to be able to make their own questions.”
- I encouraged them to try out some of the materials before we meet again at HDWE so they can give us a report – many nodded their heads.
- This was much discussed during and after each lesson. There were many suggestions for ways to use specific lessons with students.

**Item 3. If you had returning participants (who had taken either WDWE or HDWE), please note if they have implemented any of the materials from their first workshop. N = 8\***

- Yes – 50.0% (4 of 8)
  - Yes, one teacher had used Wet Maps and another had used the digital atlas and the live-streaming video. (2; 25.0%)
  - One participant used the hydraulic robot arm with her students. (1; 12.5%)
  - One teacher used materials with gifted students to make them think rather than just doing “canned” activities. (1; 12.5%)
- No – 50.0% (4 of 8)
  - Only a couple participants were returning. They have not implemented anything yet due to time and opportunity. (4; 50.0%)

In half (4; 50.0%) of the workshops facilitators reported returning participants implemented materials from their previous workshop. However, there were very few returning participants.

\* Multiple versions of Facilitator Summary Forms used by facilitators. In only eight PDOs facilitators used the version with this question.

**Item 4. Please make note of any special considerations regarding the meeting room, the technology, our on-site colleagues, topics of special interest for the next workshop, etc.**

- None (5; 16.7%)
- When the group is large (40) the timing is slowed significantly. (1; 7.1%)
- Wi-Fi challenges. Both for facilitator and participants. (1; 7.1%)
- No sound in room; bring speakers. (1; 7.1%)
- Multiple room set-ups required in order to do activities and web searches. (1; 7.1%)
- Room is loud. (1; 7.1%)
- Room is too small. (1; 7.1%)
- Everything is excellent. (1; 7.1%)
- Host is excellent. (1; 7.1%)
- Nice room and view. (1; 7.1%)

Areas for improvement continue to be offered. Issues with the site, technology, and the room are most common. Many of these can be overcome with persistence and attention from the hosts. However, there were very few comments.

Overall, the PDO's were implemented as planned and participants reflected frequently on important aspects of the PDO and lessons. When an aspect of a PDO were not completed as planned (1, 7.1%), it was a result of the facilitator forgetting to introduce the activity. Facilitator responses regarding participant reflections indicate that frequent discussion of lesson utility in the participants institutions occurred. Participants reflected on how aspects of the PDO and activities could be adapted for use with their students, would introduce students to scientists and exploration related careers, and were correlated to local and national standards. Participants also reflected on the value of the OLEP&FCs and how they were motivated to increase the amount of ocean science they taught to their students. Some areas for improvement still exist, but these can be ameliorated with attention to details at the sites and streamlined technology requirements.

### **ii. How Do We Explore? N = 14**

#### **Item 1. Were you able to accomplish the entire PDO agenda?**

- Yes – 100.0% (14 of 14)
- No – 0.0% (0 of 14)

Of the 14 HDWE PDOs that were conducted in 2015-2016, 14 (100%) workshops were completed in their entirety.

#### **Item 2. During guided reflections, did PDO participants:**

##### **A. indicate they were motivated to incorporate more ocean science into their classroom teaching?**

- Yes – 100.0% (14 of 14)
- No – 0.0% (0 of 14)

In all (14; 100%) of the PDOs, facilitators reported participants were motivated to incorporate more ocean science into their classroom teaching. Examples include:

- No response
- Support/expand existing curriculum, such as seafloor geology, robotics (use ROV and robot arm), exploration examples (videos and live feeds), talk more about careers, build models (sonar), CTD chemistry.
- Many identified specific lessons they would use and when. And most said they came specifically looking for OS lessons, activities, and materials to use with students.
- They felt that many of the activities would connect to current curriculum/lesson plans, and that they could easily adjust elements that weren't a good fit. For example, several mentioned that they could do New World/Fractals, with adjustments to help students better understand the construction of a fractal (using exact measurement, math tools, etc.) or that they would emphasize the observation and exploration and less on the construction of fractals.
- Several teachers who each taught marine science thought the robot arm activity was exceptional. One of the informal educators suggested having students look at the aquarium exhibits and the animals to create inspiration for robot arm extensions that use animal adaptations. This after sharing some robot arm extensions that my students produced similar to spiders; I shared with my students how engineers are looking at adaptations of animals for inspiration because these adaptations have been evolving for thousands or millions of years.
- A chemistry teacher from New Orleans loved how Wet Maps was like the "Black Box" experiment in chemistry. Another teacher said Wet Maps "gives me the perspective of the scientific method and measurement which are the first topics in my chemistry class."
- Florida has marine science in their standards and several teach marine science, so they were excited about the content. A few will be teaching marine science for the first time this year, so they were particularly thrilled.
- Use multibeam sonar lessons to relate studies of local pond depth to deep ocean studies.
- These were a good group of educators with a wide range of grade levels- pre-K through college. They enjoyed all the lessons and one is starting a marine science/oceanography class for the first time and was especially thrilled.

- Yes, many were enthused by the workshop. I am including a quote from one of the participants here that I received via email. “The workshop was GREAT!! I am looking forward to the follow-up in Feb. and I am planning on attending one of the summer PDs. Thanks for a wonderful first experience with y'all!!!”
- Yes, one teacher was reworking all her curriculum and wanted to include more ocean science. That is why she was at the workshop.
- During final reflections I asked teachers to raise their hand if they would use at least one, if not more, of the HDWE lessons in their classrooms. All 17 teachers raised their hands.
- Use Wet Maps to teach reading and interpreting topographic maps

These examples indicate numerous ways teachers will use what they gained during the PDO in their classroom and with their students.

**B. identify ways to connect students to the work and lives of ocean scientists, including those working with the *Okeanos Explorer*, using the OE Web site?**

- Yes – 100.0% (14 of 14)
- No – 0.0% (0 of 14)

In all (14; 100%) of the PDOs, facilitators reported participants were able to connect students to the work and lives of ocean scientists, including those working with the *Okeanos Explorer*, using the OE Web site. Examples identified by PDO participants included:

- We explored careers and the OceanAGE web resources during the second day with each group (HDWE), though it was mentioned and introduced on first day (WDWE). Teachers liked all the information on each highlighted individual, appreciated the variety. We discussed the importance of all the professionals, outside the primary scientists/researchers, that contribute to an expedition. (WDWE and HDWE done back to back at this location)
- Noted they like the website with all the profiles. Some mentioned using this with high school students.
- There was a lot of interest in careers.
- They liked the Reddit AUA idea and they start school this coming week and the ship is currently out at sea. They were looking forward to using the ship as engagement to start the school year.
- They liked the Reddit AUA idea and talked about how they would want more of that type of thing for their students.
- They liked the OceanAGE careers page and the AUA feature with Reddit and want to see more of that.
- Yes, several teachers, including one of the pairs who had participated in DISL’s ROV program really liked the OceanAGE career webpage(s) and indicated they would use it in their classes to show the diversity of job possibilities.
- Most teachers did a career lesson or career day. They liked OceanAGE website, and the videos (Gulf of Mexico) with scientists explaining the expedition and the objects/animals they saw. One teacher used web “scavenger hunt” for her students to find three careers they were interested in following. She was going to include the OceanAGE pages now.
- For career explorations in the classroom, use extension in OceanAGE Careers.
- I love the Live Feed!
- Discussed lots of business connections related to the development and marketing of different ROVs for different purposes.
- Explore Strange New Worlds: “Use to teach about mapping a landscape, start with a familiar landscape and expand later to ocean mapping, tools, etc.”
- We spent a lot of time talking about the possibility of a teacher or group of teachers being at the ECC for a mission. Here were their thoughts:
  1. They need a formal written document explaining what would happen, what the teacher would do (participate, skype to class, answer written-in questions from other classes, etc.) and for how long. This document should include WHY this would benefit the teacher and the school. It should also state the tech

requirements of the school and the need for a savvy IT person to set up the link on the school side while the teacher is out.

2. It would be much easier to sell if the “grant” provided funding to the school/district to pay for the substitute teacher. They MIGHT get it covered otherwise, but this would help sell it to admin, especially if there might be short notice on the date.
3. If provided a window (“You will go for \_\_\_ days during the months of April/May and we will likely give you 48 hours notice for when you should arrive.”), they could likely get there with 2 days notice, but 5 would be ideal.
4. Duration- it wouldn’t be worth it for less than 3 days, but ideally 5 (perhaps 3 school days and a weekend to reduce sub plans needed). More than that is just logistically difficult for most.
5. It would be really cool if people applied as teams of teachers (either multidisciplinary within a grade band or an elementary, middle, and HS teacher within a district—they select their team and justify in their “application” why they chose their team).
6. Housing and food isn’t required. Most said they could make it work if you couldn’t provide that, but that it would be amazing and even better if you could.

Facilitators reported participant interest in scientists’ lives and work focused on the OceanAGE Careers webpages, but other sources of information and avenues were investigated to pursue this further.

### **C. understand how the lessons correlate to the OLEPs, and NGSS?**

- Yes – 100.0% (14 of 14)
- No – 0.0% (0 of 14)

Participants in all (14; 100%) PDOs discussed and indicated an understanding of how the presented lessons correlate to the OLEPs and NGSS. Examples of these discussions are:

- Many were new to OLEPs, but appreciated the resources and how it supported what they did in the classroom already.
- We also looked at Climate Literacy and Earth Science Literacy websites to make additional connections and show those resources.
- Quick overview of NGSS, as these teachers are not familiar, nor do they have to know these national concepts/standards.
- Some were not familiar with OLEPs, so found this interesting and useful. Texas doesn’t correlate with NGSS, but we discussed state correlation and whether or not they would be challenged to link to TEKS. All said most activities fit really well into TEKS, especially the skills and processes.
- GA has not adopted common core or NGSS.
- All activities were correlated with the Ocean literacy standards and the robot arm correlations to the NSES.
- Several middle school teachers taught mathematics, science and history ----one of them said that Fractal Geometry (Strange New Worlds) would enable them to discuss maps, scale, and proportions in a fun and interesting way.
- They didn’t seem as intense about standards as some other groups I’ve had, but they saw correlations and discussed it. We talked about the nature of science, as many science teachers start the school year with that and this ties in perfectly with that, especially with NGSS.
- Discussed S&EP, especially ‘using models’ since we were doing a lot of that in the workshop.
- Yes, but they were not terribly well motivated to look at the standards.
- None (except those who attended WDWE in the fall) had even heard of the OLEP and didn’t want to dig into the fundamental concepts, even with some prodding. They aren’t NGSS states up here so no one really wanted to look at those.
- This group was not as excited about NGSS as past groups were, but they did like looking through them and the OLEPs.
- Many had never heard of the OLP, so we discussed the history of the OLP effort, I showed them the website and we discussed the OLP, especially #7. Some expressed concern about the engineering design aspect, and how

they would include it in their classes, but that they could see how the innovation aspect of ocean exploration could allow them to address this.

- NGSS will begin in 2017 for California.
- About half the teachers did not know about OLEP. I ask those teachers who were familiar with them to explain how they used it in their classrooms.
- I went through OLEPs in the Appendix and also showed them where to find the NGSS matrix on the web. I placed a copy on each table for reference. I asked how they correlate NGSS now, and most said they go by the performance expectations.
- During reflections, I reviewed the NGSS connections. One teacher said his school is requiring that teachers start NGSS now (before 2017), but he said he is already doing a lot of the project-based learning and open inquiry and the NOAA live feed and data (Fledermaus) will help a lot.
- Teachers have implemented Common Core and NGSS will be coming in 2017-ish. They had the alignments on their tables and we referenced as needed.
- Several participants were marine science teachers and they use the OLEPs as their standards since SC does not have state marine science standards and were excited to have some more activities that are correlated to them.

During many of the PDOs teachers (with the help of facilitators) discussed how lessons were correlated to NGSS and OLEPs and identified these connections while doing the lessons. Several states had not adopted NGSS yet and OLEPFCs were unfamiliar to many participants.

#### **D. identify how the lessons, materials and resources presented during the workshop meet their local and national standards?**

- Yes – 100.0% (14 of 14)
- No – 0.0% (0 of 14)

In all (14; 100%) of the PDOs, facilitators reported that participants identified how the lessons, materials and resources presented during the workshop met their local and national standards. Examples provided by facilitators include:

- We highlighted how the activities connected to TX standards (TEKS) as we concluded each activity. They had no difficulty making alignment suggestions, which they appreciated.
- Many noted that Wet Maps is a great way to address maps, geography and topography in a new and creative way. They liked the addition of the 3D model of data, as they thought it helped the students “see” the data differently.
- This discussion occurred after all lessons.
- The chemistry teachers felt that the Ocean Yo-Yo activity would be a great introduction to titration.
- Water column investigations fit with their standards on deep ocean hydrothermal vents. Also, “sea floor mapping (wet maps) incorporates many science inquiry standards.”
- They talked about standards some, but were not as focused on that this year.
- See above for NGSS. Teachers also discussed connections to Common Core.
- They talked about standards some, but were not as focused on that this year.
- We talked about the recent approval by the state of a new science course of study in Alabama and how this represented a good opportunity to incorporate OLP and new activities. No one explicitly addressed the national standards in their comments. This is Alabama after all 😊.
- California has adopted Common Core and NGSS.
- Oceanographic Yo-yo. I think the water sample activity would be great for my younger students. Collecting data is something useful that would hit some standards. I could then go into how the data help scientists in real-world situations. The Web site is very useful about careers.
- Most teachers were working under Common Core, but can apply hands-on activities to journal writing and reading.
- My gifted K-2 teacher will use Wet Maps to teach students “How to ask the right questions...now how to map an unseen image.”

**E. discuss and reflect about how presented content and materials can be adapted to fit the specific needs of their students?**

- Yes – 100.0% (14 of 14)
- No – 0.0% (0 of 14)

In all (14; 100%) of the workshops, facilitators reported participants discussing and reflecting about how presented content and materials can be adapted to fit the specific needs of their students. Examples are provided below:

- Good discussions about adapting materials to meet student needs, such as explaining or simplifying for other grades, accommodating for G/T or EL students and thinking about how these activities could be used in place of older or “over used” activities.
- After each activity, the teachers discussed what their accommodations would need to be for their own students. There were always options for taking it to the next level, as well as simplifying it. Since these teachers work together several times a year during PD sessions, they exchanged ideas and made suggestions easily.
- Lots of conversations about adaptations that would be needed (or desired) to help students adjust or to better fit lessons to existing curriculum. Many mentioned using Build a Robot as a way to demonstrate engineering, as well as link to existing robotic lessons.
- There was A LOT of excited discussion about ways to use lessons as they were presented or with modifications for each teacher’s specific population of students.
- One of the teachers uses an interactive notebook and she will have each student make a multibeam map in their notebooks using the Wet Map activity.
- “The Oceanographic YoYo correlates with our lesson on pH. We can incorporate this as a lab with practice on recording and graphing.” And “Wet Maps (will be used) because hands-on interactive activities always get the point across best!”
- They had a lot of conversations at their table groups and talked about how they might modify certain activities. One talked about doing Wet Maps with different materials as an entire class and following up with smaller groups.
- Yes, we discussed how to scale up or down to suit different levels. Also, how to use all lessons in sequence for older students, with the 5/6 and 7/8 activities serving as review, formative assessments or scaffolding.
- This was a unique group. Many of them worked at alternative schools or psychiatric facilities for students with mental health issues or behavior issues. They were excited about the activities but had a lot of modifications they would have to make because of the limitations on materials and technology they can use.
- They all LOVED the Wet Maps and the Invent a Robot activity. They talked about how it was nice to have a STEM activity that didn’t require sharp cutting tools or heat (glue guns). They liked that a lot of the activities were STEAM and many mentioned wanting to integrate art into their lessons.
- There was another request for readings at different reading levels, but they liked the essays and content for Common Core related readings. We talked about different ways to do the Invent a Robot activity with different groups depending on the amount of time and comfort with true open inquiry and STEM design the class is (how much rapport the teacher had built, trust, etc.).
- One teacher indicated that she would use the learning shapes as in the activity, but also for other subjects (mathematical equations vs graph shapes). Another teacher indicated that she would use the guided imagery text and then ask her students to draw the scene they ‘saw’ in their imagination as an exercise for their listening skills.
- A math teacher really liked the fractals activity. Two other teachers like it too as a way of demonstrating levels of complexity. One taught biology from atoms to universe.
- Strange New Worlds. Good activity for cross curricular with math teachers. Awesome way to have fun and engage students in experiencing the “smallness” of the universe, ecosystems, organisms, and cells.
- Wet Maps: I would use building blocks with the lower grades (instead of coloring and cutting out the strips of paper). They can build a 3-4 map with the blocks (using the information they got from the dowels and the

box). Love this activity. It can be applied and modified for many grade levels. It can be articulated with math lessons, map reading, etc.

- Invent a Robot: Hydraulic arm—This one was intimidating or confusing for some of us. This is why we SHOULD use it in the classroom to get students thinking of themselves as engineers and scientists. (NOTE: as suggested, I left this activity totally open with no instructions. I let some teachers look after they were becoming frustrated).
- I will use a lot of this in my oceanography course.
- Use Strange New Worlds in upper elementary as a combination of art and science.

#### **F. identify how they will use OE resources with their students?**

- Yes – 100.0% (14 of 14)
- No – 0.0% (0 of 14)

In all (14; 100%) of the workshops facilitators reported participants identified how they will use OE resources with their students. Examples are provided below:

- Nearly everyone expressed interest in the videos available online, especially at the expeditions to the Gulf of Mexico. They shared how they would use them as introductions, or have students do independent research to seek out information for assignments.
- Also shared that OceanAGE careers would be a great resource when they explore career opportunities.
- Many mentioned the videos being a great asset to help make existing lessons more interesting, and the benefit to the HDWE lessons. Loved all the video of seafloor; a few mentioned they would use the What Little Her Saw to help do biodiversity and observation.
- When asked what was most valuable, they mentioned diversity of lessons, collaborating with peers, bathymetry maps, robot arms, web resources
- This was much discussed during and after each lesson. There were many suggestions for ways to use specific lessons with students.
- Use the puzzle as a bell ringer activity.
- Wet Maps: “good constructive response for mathematics”
- Again, their year is about to start. As I know most science teachers start the year with lab safety and nature of science, I focused on adaptations and discussions on how they could easily fit these lessons in to hit those standards we all need to do. They loved that and the timing of doing the workshop the week before they start school made this a perfect match that several of them commented on in their post-evals. “A day in the life...” where they watch the video and take counts was perfect for this—they talked about how they could use still images, compare that to video, try different types of counting (one person per organism type, etc.) and then discuss the reliability of the data. They talked about using it as a warm up/engagement activity or an exit ticket at the end of that lesson, for example.
- They loved wet maps and the oceanography teacher plans to do it just as written.
- Teachers were asked to write down (for themselves) the one activity they would promise to try before the next workshop as well as how they would use the website with their students. We agreed that this would be our starting point for discussion at the beginning of the next workshop. Several indicated that they really liked the digital atlas, while for others, student online access is still an issue.
- One teacher just completed a unit on hydrothermal vents. She loved the Oceanographic Yo-yo and will use it next year as an introductory inquiry activity.
- Exploring Strange New Worlds: I will develop a class in introduction to fractal geometry to discuss and explore scales of magnitude. I hope to be able to create performance task-type activities useful for math and science. Students will think it is cool. I will use this as the “hook” into lesson about where we explore. As a 3<sup>rd</sup> grade teacher, I could definitely use the “consider complexity” chart. My students could help to see their place in California, for example, and also create their own.
- Wet Maps: I can do this graphing and sonar pinging activity in class. I am looking for a hands-on activity to address their Earth Science curriculum. Oceanographic Yo-yo: Can be another graphing activity, like sonar.

Students extend to temperature, pH and graphing data. Easy to do in class, low cost. The mapping activity is perfect for our summer camp museum programming. Good for many age groups with minor modifications or extensions.

- “I would use these images and websites for a scavenger hunt on Nearpod.”
- A chemistry teacher from New Orleans loved how Wet Maps was like the “Black Box” experiment in chemistry. Another teacher said Wet Maps “gives me the perspective of the scientific method and measurement which are the first topics in my chemistry class.”

**Item 3. If you had returning participants (who had taken either WDWE or HDWE), please note if they have implemented any of the materials from their first workshop. N = 9**

- Only one returning participant. They said they had yet to utilize much of the activities.
- Not too many said they had implemented full lessons, most said they had used the videos, Learning Cubes (adapted to other topics, some with climate change), and ROV diversity and specs.
- One of the teachers used the web quest for ocean careers from Why do We Explore and shared this with the other participants.
- There were many returning participants, but few shared anything specific about what they had done. One woman had made the photo cubes with students at the end of a unit. They each made their own and selected their own photos based on a specific area of content within a unit. She said they were great and the students loved making them.
- The Americorps gang from NE Sailing Center did a few lessons, including Wet Maps, a bit with OceanAGE careers, and I Robot with their after school group and loved it. Another teacher did a medicine in the ocean unit, used the MDM, our Watch the Screen and then did a matching where the students matched medicines to what animal they came from in the sea... then “Ocean Doctor” where she named a disease/illness and they had to pick the medicine from the ocean they would use to treat it. So cool!
- We all continue to struggle with having an Ocean Explorer page and an Okeanos page that look so similar yet have different tabs/information. Why can’t we just have ONE site now with all the tabs the same? IT is so confusing to have different info under Education on one site than the other. ☹
- There were several returning participants, but few shared anything specific about what they had done since October. A few had been on the website with students, one had done a career piece with a class, but they were not very chatty as a group (small groups they were, but not large group sharing).
- Christina Brown attended previous workshops, but came to this one also as her colleague was unable to attend at the last minute. She indicated that she had her students view live feed during the Hawaii mission in class and that they loved it.
- Yes, one teacher used the Wet Maps activity. Two other teachers wanted to wait to take HOW before incorporating lessons into their curriculum.
- Yes, I did have 5 teachers who attended WDWE in December. One teacher said she hadn’t implemented any activities as it was difficult for her to do midyear, but she feels ready for next year. I also had two teachers who attended the NOAA OE workshop at NSTA conference last year and so wanted to attend a PD workshop this year.
- The marine science teacher from Columbia used the bromothymol activity with salt versus freshwater and I Robot Can do That.
- None are using the materials yet, but many plan to do so. People with MATE ROV teams were particularly interested in the ROV lessons.
- None

Of the nine facilitators who responded to this question, several stated they had no or few returning participants. The others were able to offer multiple activities they have used from the last workshop.

**Item 4. Please make note of any special considerations regarding the meeting room, the technology, our on-site colleagues, topics of special interest for the next workshop, etc.**

Most of the facilitators provided feedback to this item. Their responses are provided below:

- None 2
- Room worked well. Smaller group allowed them to really spread out and make piles of all their items while building and learning. Teachers are messy!
- Always bring speakers and be sure to communicate to the contact person the need to set-up on Friday.
- The site is lovely. Teresa and Angela are wonderful and were very accommodating, helpful, and anxious to make sure I was comfortable and had everything I needed. They were available all day for me. The internet was not strong enough for the room full of participants. Mine worked fine for me, and I love the smart board, etc., but it didn't work for the participants to explore the site.
- No problems. As before, I adjusted the agenda slightly so we could break for lunch before the rush and that seems to work well.
- The new folks at NEAq were wonderful. Christine and Corrine were great. Christine was my primary contact this time. She is flexible, easy-going, but also very prepared and willing to do whatever I needed to make it work.
- This group also had many people ask for a third installment. They want "What do we explore?" focused on biology, and I agree that this seems to be the biggest draw for many folks and the easiest for many folks to implement in their classes. I explained there was a thought about "What do we expect to find?" and they said if we do that, the next should be "What DID we find?" 😊 They were really enthusiastic.
- All went well. IT is hard to get set up in the morning when we come in and the sleep-overs are still going on, and I think it might be easier to start later (easier on all of us), and this group is really ready for a third installment of "what did we find" or something like that. 😊
- We still have issues with wifi access, but now have a plan to remedy that problem. The DHP computer lab is a wonderful tool that allows us to explore the website as a group and as individuals during the workshop. Our thoughts are that if they explore it and can ask questions during the workshop, they will be more apt to use it in their classroom. We had a number of folks involved in DISL's ROV programs and this interest diffused throughout the room as we went through the day. I think the ROV aspects of HDWE will be very well received for this reason.
- We had some trouble logging on the Guest access portal to the Internet. One teacher, Geo, wasn't able to get on at all (PC laptop). I asked Audrey for an Aquarium laptop for him, and we tried that but even that one didn't work. Supposedly it was a new laptop and had been having problems too. Others in the group could get on. I didn't have a problem (MAC laptop). Geo shared with another teacher.
- AOP WiFi doesn't begin until 9 am. Because of this I moved the "icebreaker" with the Ocean Challenge Puzzle to immediately after lunch. I had each table open the challenge puzzle and play together as I team. They had to answer 10 "tiles" as quickly as possible. I recorded which team finished first, and how many questions they answered correctly. Getting the correct answers was more important than finishing first, if there was a tie.
- Both the classroom and the executive boardroom are great for this workshop.

For the most part, facilitators reported everything going well during the workshop. However, there are still WiFi issues at several sites and other technical issues that must be overcome.

Overall, the PDO's were implemented as planned and participants reflected frequently on important aspects of the PDO and lessons. Facilitator responses regarding participant reflections indicate that frequent discussion of lesson utility in the participants institutions occurred. Participants reflected on how aspects of the PDO and activities could be adapted for use with their students, would introduce students to scientists and exploration related careers, and were correlated to local and national standards. Participants also reflected on the value of the OLEP&FCs and how they were motivated to increase the amount of ocean science they taught to their students. Some areas for improvement still exist, but these can be ameliorated with attention to details at the sites and streamlined technology requirements.

### **iii. Why Do We Explore?/How Do We Explore? Summary Form Comparisons**

Overall, the PDO's were implemented as planned (27; 96.4%) and participants reflected frequently on important aspects of the PDO and lessons. When an aspect of a PDO was not completed as planned (1; 3.6%), it was a result of the facilitator forgetting to introduce the activity. Facilitator responses regarding participant reflections indicate that frequent discussion of lesson utility in the participants institutions occurred. Participants reflected on how aspects of the PDO and activities could be adapted for use with their students, would introduce students to scientists and exploration related careers, and were correlated to local and national standards. Participants also reflected on the value of the OLEP&FCs and how they were motivated to increase the amount of ocean science they taught to their students.

### III. How Well OER Education is Meeting Established Performance Measures

Data (Section II) relevant to accomplishing each Performance Measure (PM) for each objective is provided following each PM. For PMs where items were common to both the pre and post assessments, scores on these items could range from 1-6 with 1 being Strongly Disagree and 6 being Strongly Agree. For this analysis, Strongly Disagree = 1.00-1.50, Disagree = 1.51-2.50, Slightly Disagree = 2.51- 3.50, Slightly Agree = 3.51-4.50, Agree = 4.51-5.50, and Strongly Agree = 5.51-6.00. The source of the data is identified for each PM. An asterisk (\*) indicates any PMs that **were not met**.

**Goal:** The goal of OE Professional Development Opportunities is to increase professional educator understanding of, and appreciation for, deep-sea exploration and NOAA's discoveries, and improve participating educator's instruction about ocean science, exploration and discoveries.

**Objective 1:** By supporting PDOs, OER will provide effective professional development to educators to encourage use of ocean exploration-based education materials and connections to authentic ocean science, technology and engineering in classrooms throughout the country.

- **PM 1.1:** Each alliance partner will host at least 1 PDO annually; the majority will host 2 PDOs.
  - **Data:** During Fall 2015 - Summer 2016, 14 Alliance Partners (100.0%) hosted at least one PDO during this timeframe for a total of 28 hosted PDOs. One Alliance Partner (3.6%) hosted three PDOs during this timeframe, 12 (85.7%) hosted two PDOs, and one (3.6%) hosted one PDO for a mean of 2.0 PDOs per host. This PM predicts 2.0 PDOs during this timeframe; this PM was accomplished. (Summary Forms; NOAA Ocean Explorer Website)
- **PM 1.2:** NOAA OER Education will host one online PDO every 2-3 years. \*
  - No online PDOs were hosted between June 2015 and September 2016. (NOAA Ocean Explorer Website).
- **PM1.3:** 100% of the workshop presentation content is consistent with Professional Development Best Practices (as defined by our evaluator).
  - 100% of PDO content is consistent with the following Professional Development Best Practices (PDO agenda, PDO PowerPoint presentations, and Summary Forms).
    - Teachers learn best how to teach by inquiry by having a chance to learn by inquiry.
    - Teachers engage in demonstration lessons in order to learn how to best adapt those lessons to their students' needs.
    - The more a teacher can "do the discipline" the better able they will be to pass their understanding on to their students.
    - Engaging in reading, researching, and reflecting about new content and instructional approaches reinforces and magnifies teachers' ability to provide meaningful instruction to students.
    - Successful teachers benefit from connecting their disciplines to the world beyond school.
- **PM 1.4:** During each PDO, participants were shown how the OE lessons are correlated to the OLEP and FCs, and how they support current education standards.
  - Prior to beginning the WDWE PDO, participants indicated they "slightly disagree" (3.04) with the statement "I am familiar with Ocean Literacy Essential Principles and Fundamental Concepts" After the PDO, participants' mean ratings increased by 2.28 points to 5.32 (the "agree" range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large. (WDWE pre/post survey, item f)
  - Prior to beginning the HDWE PDO, participants indicated they "slightly agree" (4.19) with the statement "I am familiar with Ocean Literacy Essential Principles and Fundamental Concepts" After the PDO, participants' mean ratings increased by 1.30 points to 5.49 (the "agree" range). This increase was

significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item e)

- Participants in all (50; 100%) PDOs discussed and indicated an understanding of how the presented lessons correlate to the OLEPs and NGSS. Examples of these discussions occurred in each PDO. Additionally, Common Core and NGSS were discussed in most PDOs. (WDWE and HDWE PDO agenda and Summary Forms)
- **PM 1.5:** During each PDO, participants were introduced to and practiced ocean science and technology activities.
  - Participants were introduced to a minimum of seven ocean science activities during each PDO. All of these activities modeled technologies used to explore the deep ocean. (WDWE and HDWE PDO agendas and Summary Forms)
- **PM 1.6:** Most (>75%) survey respondents indicated that the PDO met their professional development goals.
  - 98.0% (336 of 343) of PDO participants stated that the WDWE PDO furthered their own PD goals (WDWE Post-Survey).
  - 98.8% (257 of 260) of PDO participants stated that the HDWE PDO furthered their own PD goals (HDWE Post-Survey).
- **PM 1.7:** Most (>75%) survey respondents indicated that the PDO provided familiarity with how to follow along with OE expeditions and access OE web resources.
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (2.56) with the statement “I know about the OceanAGE Careers page on the Ocean Explorer website”. After the PDO, participants’ mean ratings increased by 2.83 points to 5.39 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item b).
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (3.19) with the statement “I know how to access NOAA Ship *Okeanos Explorer* education resources on the Ocean Explorer Website”. After the PDO, participants’ mean ratings increased by 2.47 points to 5.66 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item h).
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (2.89) with the statement “I know how I can use the OceanAGE Careers web pages with my students”. After the PDO, participants’ mean ratings increased by 2.33 points to 5.22 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item k).
  - At the beginning of the WDWE PDO, participants indicated they “slightly agree” (3.33) with the statement “I know how to access information about the NOAA Ship *Okeanos Explorer*”. After the PDO, participants’ mean ratings increased by 2.33 points to 5.66 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item o).
  - At the beginning of the HDWE PDO, participants indicated they “agree” (4.09) with the statement “I know about the OceanAGE Careers page on the Ocean Explorer website”. After the PDO, participants’ mean ratings increased by 1.46 points to 5.55 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item b).
  - At the beginning of the HDWE PDO, participants indicated they “agree” (4.52) with the statement “I know how to access NOAA Ship *Okeanos Explorer* education resources on the Ocean Explorer Website”. After the PDO, participants’ mean ratings increased by 1.16 points to 5.68 (the “strongly agree” range).

This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item h).

- At the beginning of the HDWE PDO, participants indicated they “slightly agree” (3.89) with the statement “I know how I can use the OceanAGE Careers web pages with my students”. After the PDO, participants’ mean ratings increased by 1.54 points to 5.43 (the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item k).
- At the beginning of the HDWE PDO, participants indicated they “agree” (4.64) with the statement “I know how to access information about the NOAA Ship *Okeanos Explorer*”. After the PDO, participants’ mean ratings increased by 1.06 points to 5.70 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item o).

**Objective 2:** As a result of participating in OER PDOs, participants will be introduced to cutting-edge exploration expeditions carried out by expert ocean explorers and technology that will engage them in creative and exciting ways to incorporate the science and technology associated with exploring the world’s ocean in their classrooms.

- **PM 2.1:** All workshop participants are introduced to ocean science and technology content during the PDO.
  - The agenda for WDWE and HDWE workshops outlines the content and activities covered during every HDWE workshop. (WDWE and HDWE PDO agenda)
  - Of the 28 WDWE and HDWE PDOs that were conducted in 2015-2016, 27 (96.4%) workshops were completed in their entirety. The aspect of the (4%) workshop that was not completed was the buoyancy activity. The reason for not completing this element of the workshop was the facilitator forgot to initiate the activity. (Facilitator Summary Form)
  - At the beginning of the WDWE PDO, participants indicated they “slightly agree” (4.06) with the statement “I know enough about the NOAA Ship *Okeanos Explorer* to teach my students about her mission, capabilities, and assets”. After the PDO, participants’ mean ratings increased by 1.39 points to 5.45 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item p).
  - At the beginning of the HDWE PDO, participants indicated they “slightly agree” (4.06) with the statement “I know enough about the NOAA Ship *Okeanos Explorer* to teach my students about her mission, capabilities, and assets”. After the PDO, participants’ mean ratings increased by 1.39 points to 5.45 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item p).
  - At the beginning of the HDWE PDO, participants indicated they “agree” (4.54) with the statement “I have a good understanding of how the sciences, advanced technologies, mathematics, and engineering are integrated to support ocean exploration”. After the PDO, participants’ mean ratings increased by 0.95 points to 5.49 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item t).
  - At the beginning of the HDWE PDO, participants indicated they “slightly agree” (4.05) with the statement “I am confident in my understanding of the strategies used in ocean exploration.” After the PDO, participants’ mean ratings increased by 1.38 points to 5.43 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item u).
- **PM 2.2:** Most (>75%) survey respondents indicated that the PDO increased their awareness of technologies required to explore the deep ocean.
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (2.92) with the statement “I know how the capabilities and assets of the NOAA Ship *Okeanos Explorer* are used in ocean exploration”. After the PDO, participants’ mean ratings increased by 2.43 points to 5.35 (within the

“agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item g).

- At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (2.75) with the statement “I know enough about the NOAA Ship *Okeanos Explorer* to teach my students about her mission, capabilities, and assets”. After the PDO, participants’ mean ratings increased by 2.51 points to 5.26 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item p).
- At the beginning of the HDWE PDO, participants indicated they “slightly agree” (4.17) with the statement “I know how the capabilities and assets of the NOAA Ship *Okeanos Explorer* are used in ocean exploration”. After the PDO, participants’ mean ratings increased by 1.36 points to 5.53 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item g).
- At the beginning of the HDWE PDO, participants indicated they “slightly agree” (4.06) with the statement “I know enough about the NOAA Ship *Okeanos Explorer* to teach my students about her mission, capabilities, and assets”. After the PDO, participants’ mean ratings increased by 1.39 points to 5.45 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item p).
- At the beginning of the HDWE PDO, participants indicated they “slightly agree” (4.27) with the statement “I am aware of how underwater robots are used on board the *Okeanos Explorer*”. After the PDO, participants’ mean ratings increased by 1.26 points to 5.53 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item s).
- **PM 2.3:** All (100%) of participants are introduced to ways to connect with premier ocean scientists and explorers and their scientific endeavors through the website.
  - The agenda for WDWE and HDWE workshops outlines the content and activities covered during every HDWE workshop. The agenda identifies the time dedicated to exploring the website. (WDWE and HDWE PDO agenda)
  - Of the 28 WDWE and HDWE PDOs that were conducted in 2015-2016, 27 (96.4%) workshops were completed in their entirety. The aspect of the (4%) workshop that was not completed was not related to ways to connect with premier ocean scientists and explorers and their scientific endeavors through the website. (Facilitator Summary Form)
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (2.56) with the statement “I know about the OceanAGE Careers page on the Ocean Explorer website”. After the PDO, participants’ mean ratings increased by 2.83 points to 5.39 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item b).
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (2.89) with the statement “I know how I can use the OceanAGE Careers web pages with my students”. After the PDO, participants’ mean ratings increased by 2.33 points to 5.22 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item k).
  - At the beginning of the HDWE PDO, participants indicated they “slightly agree” (4.09) with the statement “I know about the OceanAGE Careers page on the Ocean Explorer website”. After the PDO, participants’ mean ratings increased by 1.46 points to 5.55 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item b).
  - At the beginning of the HDWE PDO, participants indicated they “slightly agree” (3.89) with the statement “I know how I can use the OceanAGE Careers web pages with my students”. After the PDO, participants’ mean ratings increased by 1.54 points to 5.43 (within the “agree” range). This increase was

significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item k).

**Objective 3:** As a result of participating in OER PDOs, participants will have increased awareness of the importance of, NOAA's role in, and capabilities and assets to conduct, ocean exploration.

- **PM 3.1:** Most (>75%) survey respondents indicated that the PDO increased their awareness of the value of ocean exploration.
  - At the beginning of the WDWE PDO, participants indicated they “slightly agree” (4.34) with the statement “I am confident in my understanding about the value of exploring the ocean”. After the PDO, participants’ mean ratings increased by 1.24 points to 5.58 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item f).
  - At the beginning of the WDWE PDO, participants indicated they “agree” (5.32) with the statement “I am aware of the importance of ocean exploration”. After the PDO, participants’ mean ratings increased by 0.49 points to 5.81 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was medium (WDWE pre/post survey, item i).
  - At the beginning of the HDWE PDO, participants indicated they “agree” (4.92) with the statement “I am confident in my understanding about the value of exploring the ocean”. After the PDO, participants’ mean ratings increased by 0.68 points to 5.60 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item f).
  - At the beginning of the HDWE PDO, participants indicated they “agree” (5.40) with the statement “I am aware of the importance of ocean exploration”. After the PDO, participants’ mean ratings increased by 0.41 points to 5.81 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was medium (HDWE pre/post survey, item i).
- **PM 3.2:** Most (>75%) survey respondents indicated that the PDO increased their awareness of NOAA's role in ocean exploration.
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (3.34) with the statement “I have a clear idea of what the NOAA Ocean Exploration Program does”. After the PDO, participants’ mean ratings increased by 2.12 points to 5.46 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item j).
  - At the beginning of the WDWE PDO, participants indicated they “slightly agree” (3.88) with the statement “I have a good understanding of NOAA's role in ocean exploration”. After the PDO, participants’ mean ratings increased by 1.71 points to 5.59 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item n).
  - At the beginning of the HDWE PDO, participants indicated they “slightly agree” (4.47) with the statement “I have a clear idea of what the NOAA Ocean Exploration Program does”. After the PDO, participants’ mean ratings increased by 1.13 points to 5.60 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item j).
  - At the beginning of the HDWE PDO, participants indicated they “agree” (4.73) with the statement “I have a good understanding of NOAA's role in ocean exploration”. After the PDO, participants’ mean ratings increased by 0.91 points to 5.64 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was medium (HDWE pre/post survey, item n).

- **PM 3.3:** Most (>75%) survey respondents indicated that the PDO provided them with awareness and knowledge of the *Okeanos Explorer's* assets, capabilities and technologies.
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (2.92) with the statement “I know how the capabilities and assets of the NOAA Ship *Okeanos Explorer* are used in ocean exploration”. After the PDO, participants’ mean ratings increased by 2.43 points to 5.35 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item g).
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (2.75) with the statement “I know enough about the NOAA Ship *Okeanos Explorer* to teach my students about her mission, capabilities, and assets”. After the PDO, participants’ mean ratings increased by 2.51 points to 5.26 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item p).
  - At the beginning of the HDWE PDO, participants indicated they “slightly agree” (4.17) with the statement “I know how the capabilities and assets of the NOAA Ship *Okeanos Explorer* are used in ocean exploration”. After the PDO, participants’ mean ratings increased by 1.36 points to 5.53 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item g).
  - At the beginning of the HDWE PDO, participants indicated they “slightly agree” (4.06) with the statement “I know enough about the NOAA Ship *Okeanos Explorer* to teach my students about her mission, capabilities, and assets”. After the PDO, participants’ mean ratings increased by 1.39 points to 5.45 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item p).

**Objective 4:** As a result of participating in OER PDOs, participants will have greater confidence in their ability to teach ocean science and deep ocean exploration content to their students.

- **PM 4.1:** Most (>50%) survey respondents indicated that the PDO instilled a greater confidence in their ability to teach ocean science content.
  - At the beginning of the WDWE PDO, participants indicated they “slightly agree” (4.16) with the statement “I am confident in my ability to teach ocean science to my students”. After the PDO, participants’ mean ratings increased by 1.14 points to 5.30 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item l).
  - At the beginning of the WDWE PDO, participants indicated they “slightly agree” (3.66) with the statement “I am confident in my ability to teach deep ocean exploration content to my students”. After the PDO, participants’ mean ratings increased by 1.49 points to 5.15 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item q).
  - At the beginning of the WDWE PDO, participants indicated they “slightly agree” (4.04) with the statement “I am confident in my ability to teach the modern reasons for ocean exploration to my students”. After the PDO, participants’ mean ratings increased by 1.47 points to 5.51 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item r).
  - At the beginning of the HDWE PDO, participants indicated they “agree” (4.55) with the statement “I am confident in my ability to teach ocean science to my students”. After the PDO, participants’ mean ratings increased by 0.83 points to 5.38 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item l).
  - At the beginning of the HDWE PDO, participants indicated they “slightly agree” (4.36) with the statement “I am confident in my ability to teach deep ocean exploration content to my students”. After the PDO, participants’ mean ratings increased by 1.18 points to 5.54 (within the “strongly agree” range).

This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item q).

**Objective 5:** As a result of participating in OER PDOs, participants will become aware of the resources available on the Ocean Explorer Website.

- **PM 5.1:** Most (>75%) survey respondents indicated that the PDO provided them with skills and knowledge needed to access the resources available on the Ocean Explorer Website.
  - Facilitators of all (28; 100%) of the PDOs reported participants were able to connect students to the work and lives of ocean scientists, including those working with the *Okeanos Explorer*, using the OE Web site. Most PDO participants identified the OceanAGE website as an important source of career information. (WDWE and HDWE Summary Forms)
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (2.56) with the statement “I know about the OceanAGE Careers page on the Ocean Explorer website”. After the PDO, participants’ mean ratings increased by 2.83 points to 5.39 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item b).
  - At the beginning of the WDWE PDO, participants indicated they “slightly agree” (3.68) with the statement “I have quick access to a wide range of resources that support my teaching of the importance of ocean exploration.” After the PDO, participants’ mean ratings increased by 1.96 points to 5.64 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item d).
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (3.19) with the statement “I know how to access NOAA Ship *Okeanos Explorer* education resources on the Ocean Explorer Web site”. After the PDO, participants’ mean ratings increased by 2.47 points to 5.66 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item h).
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (3.33) with the statement “I know enough about the NOAA Ship *Okeanos Explorer* to teach my students about her mission, capabilities, and assets”. After the PDO, participants’ mean ratings increased by 2.33 points to 5.66 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item o).
  - At the beginning of the HDWE PDO, participants indicated they “slightly disagree” (4.09) with the statement “I know about the OceanAGE Careers page on the Ocean Explorer website”. After the PDO, participants’ mean ratings increased by 1.46 points to 5.55 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item b).
  - At the beginning of the HDWE PDO, participants indicated they “agree” (4.51) with the statement “I have quick access to a wide range of resources that support my teaching of the importance of ocean exploration.” After the PDO, participants’ mean ratings increased by 1.15 points to 5.66 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item d).
  - At the beginning of the HDWE PDO, participants indicated they “agree” (4.52) with the statement “I know how to access information about the NOAA Ship *Okeanos Explorer*”. After the PDO, participants’ mean ratings increased by 1.16 points to 5.68 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item h).
  - At the beginning of the HDWE PDO, participants indicated they “agree” (4.64) with the statement “I know enough about the NOAA Ship *Okeanos Explorer* to teach my students about her mission, capabilities, and assets”. After the PDO, participants’ mean ratings increased by 2.58 points to 5.70

(within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item o).

**Objective 6:** As a result of participating in OER PDOs, participants will be able to effectively use the OER professional development curricula/lessons, the OE Web site and other supporting resources in their instruction.

- **PM 6.1:** During each PDO, participants described ways they would modify and/or plan to incorporate content, lessons and website resources in their instruction.
  - The agenda for WDWE and HDWE workshops identifies the OER professional development curricula/lessons, the OE Web site and other supporting resources introduced during the workshop. (WDWE and HDWE PDO agenda)
  - Of the 28 WDWE and HDWE PDOs that were conducted in 2015-2016, 27 (96.4%) workshops were completed in their entirety. The aspect of the (4%) workshop that was not completed only impacted one activity. The summary forms indicated that participants practiced and discussed ways to integrate content, lessons, the website, and supporting materials into their instruction. (Facilitator Summary Form)
  
- **PM 6.2:** Most (>75%) survey respondents indicated that, after participating in the NOAA OER PDO, they intended to integrate OE lessons and/or the OE website in their classroom.
  - WDWE: Of the 353 responses, 269 teachers (76.2%) plan to integrate material received during the workshop, 80 (22.7%) want to learn more before they integrate material, 2 (0.6%) do not plan to integrate materials, and 24 (6.8%) are not sure. Some participants selected more than one response. (WDWE Post-Survey; Item 2)
  - WDWE: Of the 352 participants who responded to this item, 297 (84.4%) intend to use lessons from WDWE, 274 (77.8%) intend to use the website, 172 (48.9%) intend to use the OceanAGE page, and 163 (46.3%) intend to use the *Okeanos Explorer* Atlas. Most participants selected more than one response. (WDWE Post-Survey; Item 3)
  - HDWE: Of the 270 responses, 220 participants (81.5%) plan to integrate material received during the HDWE workshop, 51 participants (18.9%) want to learn more before they integrate material, 1 participant (0.4%) does not plan to integrate materials, and 8 participants (3.0%) are not sure. Some participants selected more than one response. (HDWE Post-Survey; Item 2)
  - HDWE: Of the 263 participants who responded to this item, 62 participants (23.6%) have integrated material from the WDWE workshop, 7 participants (2.7%) want to learn more before they integrate material, 7 participants (2.7%) have not yet integrated the material, 95 participants (36.1%) have not yet integrated the material but plan to, 3 participants (1.1%) are not sure if they will integrate material, and 89 participants (33.8%) indicated this item does not apply to them. (HDWE Post-Survey; Item 3)
  - Both PDOs: Of the 623 respondents, 489 teachers (78.5%) plan to integrate material received during either workshop. (WDWE & HDWE Post-Survey; Item 2)
  - In all (28; 100%) of the workshops facilitators reported participants identified how they will use OE resources with their students. Facilitators stated that teachers from the WDWE PDOs most frequently mentioned the live feeds and videos, Methane Hydrate Model, and the digital atlas and that teachers from HDWE most frequently mentioned live feeds and videos, Wet Maps, Oceanographic Yo-Yo, Digital Atlas, and Invent A Robot, as activities they intend to implement with their students. Various components of the website were appealing to PDO participants. The general consensus was these lessons and the website have many uses for participants and their students. (WDWE and HDWE Summary Forms)
  
- **PM 6.3:** Most (>75%) survey respondents indicated that the PDO motivated them to incorporate more ocean science into their classroom teaching.

- In all (14; 100.0%) of the PDOs, facilitators reported participants were motivated to incorporate more ocean science into their classroom teaching. (WDWE Facilitator Summary Form; Item 2)
- In all (14; 100.0%) of the PDOs, facilitators reported participants were motivated to incorporate more ocean science into their classroom teaching. (HDWE Facilitator Summary Form; Item 2)
- **PM 6.4:** Most (>75%) survey respondents indicated that the PDO prepared or enabled them to enhance their teaching about ocean science.
  - At the beginning of the WDWE PDO, participants indicated they “slightly agree” (4.36) with the statement “I know engaging instructional strategies to help my students understand the importance of ocean exploration”. After the PDO, participants’ mean ratings increased by 1.19 points to 5.55 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item a).
  - At the beginning of the WDWE PDO, participants indicated they “slightly agree” (3.68) with the statement “I have quick access to a wide range of resources that support my teaching of the importance of ocean exploration.” After the PDO, participants’ mean ratings increased by 1.96 points to 5.64 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item d).
  - At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (3.01) with the statement “I am familiar with Ocean Literacy Essential Principles and Fundamental Concepts”. After the PDO, participants’ mean ratings increased by 2.30 points to 5.31 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item e).
  - At the beginning of the HDWE PDO, participants indicated they “agree” (4.68) with the statement “I know engaging instructional strategies to help my students understand the importance of ocean exploration”. After the PDO, participants’ mean ratings increased by 0.93 points to 5.61 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item a).
  - At the beginning of the HDWE PDO, participants indicated they “agree” (4.51) with the statement “I have quick access to a wide range of resources that support my teaching of the importance of ocean exploration.” After the PDO, participants’ mean ratings increased by 1.15 points to 5.66 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item d).
  - At the beginning of the HDWE PDO, participants indicated they “slightly agree” (4.12) with the statement “I am familiar with Ocean Literacy Essential Principles and Fundamental Concepts”. After the PDO, participants’ mean ratings increased by 1.28 points to 5.40 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item e).
- **PM 6.5:** Most (>75%) survey respondents indicated that the PDO provided them with adequate knowledge to teach ocean science content.
  - At the beginning of the WDWE PDO, participants indicated they “slightly agree” (4.36) with the statement “I know engaging instructional strategies to help my students understand the importance of ocean exploration”. After the PDO, participants’ mean ratings increased by 1.19 points to 5.55 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item a).
  - At the beginning of the WDWE PDO, participants indicated they “slightly agree” (4.34) with the statement “I am confident in my understanding about the value of exploring the ocean”. After the PDO, participants’ mean ratings increased by 1.24 points to 5.58 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item f).

- At the beginning of the WDWE PDO, participants indicated they “slightly disagree” (2.92) with the statement “I know how the capabilities and assets of the NOAA Ship *Okeanos Explorer* that are used in ocean exploration.” After the PDO, participants’ mean ratings increased by 2.43 points to 5.35 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item g).
- At the beginning of the WDWE PDO, participants indicated they “slightly agree” (4.04) with the statement “I am confident in my understanding of modern reasons for ocean exploration”. After the PDO, participants’ mean ratings increased by 1.47 points to 5.51 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (WDWE pre/post survey, item r).
- At the beginning of the HDWE PDO, participants indicated they “agree” (4.68) with the statement “I know engaging instructional strategies to help my students understand the importance of ocean exploration”. After the PDO, participants’ mean ratings increased by 0.93 points to 5.61 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item a).
- At the beginning of the HDWE PDO, participants indicated they “agree” (4.92) with the statement “I am confident in my understanding about the value of exploring the ocean”. After the PDO, participants’ mean ratings increased by 0.68 points to 5.60 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item f).
- At the beginning of the HDWE PDO, participants indicated they “slightly agree” (4.17) with the statement “I know how the capabilities and assets of the NOAA Ship *Okeanos Explorer* that are used in ocean exploration.” After the PDO, participants’ mean ratings increased by 1.36 points to 5.53 (within the “strongly agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item g).
- At the beginning of the HDWE PDO, participants indicated they “agree” (4.54) with the statement “I have a good understanding of how the sciences, advanced technologies, mathematics, and engineering are integrated to support ocean exploration”. After the PDO, participants’ mean ratings increased by 0.95 points to 5.49 (within the “agree” range). This increase was significant at the  $p < .0001$  level and the effect size of this increase was large (HDWE pre/post survey, item t).

### **Summary**

Overall, the 2015-2016 WDWE and HDWE PDOs were very successful at accomplishing the performance measures (PM) identified for all of the objectives. Performance Measures for each Objective were supported with at least one data source indicating that all six of OERs objectives were adequately met. Twenty PMs are aligned with one of the six Objectives; 19 of the 20 (95.0%) PMs were met during the 2015-2016 PDOs. The only PM that was not accomplished was:

- Objective 1: NOAA OER Education will host one online PDO every 2-3 years.

This PM was not met during the 2015-2016 academic year because no online PDOs were conducted.

#### IV. Status of Short-Term and Intermediate Outcomes

The following table provides the status of each short-term and intermediate outcome based on the data and findings presented in Section II. The status of each outcome is indicated as accomplished (+), not accomplished (-), or not applicable (NA) during the 2013-2015 program years.

<b>Outcomes</b>	
<b>Short-term (KASA)</b>	<b>Status</b>
<b>Knowledge:</b> PDO participants are introduced to new ocean science content knowledge.	+
PDO participants are introduced to the OLEP and FCs and, in particular, the knowledge that the ocean is largely unexplored (OLEP 7).	+
PDO participants increase their awareness of Ocean Explorer tools and resources ( <i>Okeanos Explorer</i> , OE Curricula, OE Web Site, Digital Atlas, RSS feeds, Tweets, OceanAGE Careers).	+
PDO participants increase their awareness of the value of ocean exploration.	+
PDO participants increase their awareness of NOAA's role in ocean exploration.	+
PDO participants are introduced (by OE) to premier ocean scientists and explorers and their scientific endeavors.	+
<b>Attitudes:</b> PDO participants indicate greater confidence in their ability to teach ocean science content to their students using OE education resources ( <i>Okeanos Explorer</i> , OE Curricula, OE Website, RSS feeds, Tweets, OceanAGE Careers).	+
PDO participants indicate having acquired adequate knowledge to teach ocean science content to their students using OE education resources (OE Curricula, OE Website, RSS feeds, Tweets).	+
PDO participants indicate the PDOs met their professional development goals.	+
<b>Skills:</b> PDO participants report that they use (intend to use) OE education tools and resources ( <i>Okeanos Explorer</i> lessons, OE Website, OceanAGE Careers) in their classrooms.	+
<b>Aspirations:</b> PDO participants are motivated to continue professional development through OE PD offerings (workshops, online courses).	+
PDO participants are motivated to incorporate more ocean science and technology into their classroom teaching.	+
<b>Intermediate (Practice)</b>	
Workshop participants incorporate materials into classroom instruction.	+

During OE PDOs participants discuss and reflect about how presented content and materials can be adapted to fit the specific needs of their students.	+
Once OE PDOs have concluded, OER staff facilitate development of, and sustain, effective interactions between educators and ocean explorers (via listserv notice re: expeditions, PDs, Ask an Explorer, Daily Logs, etc.)	+
After using OE materials, resources, and tools, PDO participants report student excitement about and interest in OE science, discoveries, technologies, tools, and careers.	--
Educators implement LOSTOE, EX or other OE lessons with their students.	+
Educators use OE resources to support and enhance student understanding of ocean science, exploration and technology and related careers.	+
PDO participants continue professional development through additional OE PD offerings.	+
PDO participants intend to share their OE PDO experiences with colleagues.	+
PDO participants indicate the PDOs enabled them to enhance their students' learning about ocean science.	+
PDO participants indicate they plan to integrate workshop materials into their instruction.	+

Short- and intermediate-term outcomes were assessed to determine whether they had been accomplished (+), not accomplished (-), or the outcome was not applicable (NA) during the 2015-2016 program year. Short-term outcomes were comprised of six knowledge, three attitude, one skill and two aspiration outcomes. Of these short-term outcomes, all (100.0%) of the knowledge, attitude, and aspiration, and skill outcomes were accomplished. Of the 10 intermediate (practice) outcomes, nine (90.0%) were accomplished, and one (10.0%) was not accomplished during this PDO. This outcome was not accomplished because the timing between subsequent PDOs does not allow enough time for participants to incorporate a component of a previous PDO into their instruction and gauge students' responses and reactions to the OER material. As such, this outcome is not measured as part of the PDOs evaluated here.

## V. Observations and Recommendations

1. The relationship between NOAA OER and the informal science centers that host PDOs is an excellent example for a federal/local partnership. There are few issues with host sites and based on facilitator comments, the division of labor seems to work well. The OER model is a good example for other agencies to follow when considering partnerships with local entities.
2. WDWE and HDWE PDOs are running well. This approach and format should continue to be implemented for any future PDOs.
3. This PDO model reaches teachers and educators near the host sites across the U.S. Ocean Exploration should continue to reach out to regional educators and expand opportunities to reach educators across the U.S. as resources allow.
4. These PDOs are excellent at introducing NOAA science to teachers and educators, and therefore, to students nationwide.
5. Ways to eliminate issues with technology and other site related problems should continually be pursued in order to minimize these issues.
6. Whether these PDOs are continued, modified, or new PDOs are offered in the future, objectives and PMs should be revised frequently to reflect the content and realistic outcomes of the PDOs being offered.

**APPENDIX A: NOAA Office of Ocean Exploration and Research, *Why Do We Explore?* Professional Development 2015-2016 Pre-Survey**



**NOAA Office of Ocean Exploration and Research  
*Why Do We Explore?* Professional Development 2015-2016  
 Pre-Survey**

**Part 1:** Please provide your responses to the following.

1. a. Have you attended a NOAA OER **in-person** Professional Development (PD) in the past? \_\_\_ Yes \_\_\_ No  
 b. If yes, please indicate which one(s).  
    \_\_\_ Introductory *Learning Ocean Science Through Ocean Exploration* PD  
    \_\_\_ Follow-up *Learning Ocean Science Through Ocean Exploration* PD  
    \_\_\_ NOAA Ship *Okeanos Explorer* Education Materials Collection, Vol.2 *How Do We Explorer?*
2. a. Have you participated in a NOAA OER **online** PD in the past? \_\_\_ Yes \_\_\_ No  
 b. If yes, please indicate which one(s).  
    \_\_\_ Deep-sea Discoveries in the Atlantic: Advancing Transatlantic Ocean Science Literacy (March 2014)  
    \_\_\_ NOAA Ship *Okeanos Explorer* Education Materials Coll. Vol. 2, *How Do We Explore?* (June 2011)  
    \_\_\_ Gulf of Mexico: Deep-Sea Ecosystems (October 2010)  
    \_\_\_ NOAA Ship *Okeanos Explorer* Education Materials Coll. Vol. 1, *Why Do We Explore?* (June 2010)  
    \_\_\_ NOAA Ship *Okeanos Explorer* Education Materials Coll. Vol. 1, *Why Do We Explore?* (Oct. 2009)  
    \_\_\_ Classroom Exploration of Oceans: The NOAA Ship *Okeanos Explorer* (2008)  
    \_\_\_ Oceans for Life: From Sea to Shining Sea (2006)  
    \_\_\_ Classroom Exploration of Oceans - Highlights from NOAA Ocean Exploration Expeditions (2005)  
    \_\_\_ Ocean Exploration Then, Now and in the Future (The H.M.S.*Challenger*) (2004)  
    \_\_\_ Classroom Exploration of Oceans - Highlights from NOAA Ocean Exploration Expeditions (2003)

**Part 2:** 3. Place a check mark in the column that most closely represents your perspective on each statement.

	<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
I know engaging instructional strategies to help my students understand the importance of ocean exploration.						
I know about the OceanAGE Careers page on the Ocean Explorer website.						
I think it is important that students understand why NOAA is exploring the ocean.						
I am familiar with the <i>Okeanos Atlas</i> , which tracks the path of the <i>Okeanos Explorer</i> .						
I have quick access to a wide range of resources that support my teaching of the importance of ocean exploration.						
I am familiar with Ocean Literacy Essential Principles and Fundamental Concepts.						
I am confident in my understanding about the value of exploring the ocean.						
I know how the capabilities and assets of the NOAA Ship <i>Okeanos Explorer</i> are used in ocean exploration.						

	Strongly Agree	Agree	Slightly Agree	Slightly Disagree	Disagree	Strongly Disagree
I know how to access NOAA Ship <i>Okeanos Explorer</i> education resources on the Ocean Explorer Website.						
I am aware of the importance of ocean exploration.						
I have a clear idea of what the NOAA Ocean Exploration Program does.						
I know how I can use the OceanAGE Careers web pages with my students.						
I am confident in my ability to teach ocean science to my students.						
I think it is important that students understand the direct connection between ocean exploration and their daily lives.						
I have a good understanding of NOAA's role in ocean exploration.						
I know how to access information about the NOAA Ship <i>Okeanos Explorer</i> .						
I know enough about the NOAA Ship <i>Okeanos Explorer</i> to teach my students about her mission, capabilities, and assets.						
I am confident in my ability to teach deep ocean exploration content to my students.						
I am confident in my understanding of modern reasons for ocean exploration.						

**Part 3:** Demographic information (please check the appropriate box for each item):

4. Your current teaching position: \_\_\_ Preservice \_\_\_ Inservice \_\_\_ Informal \_\_\_ Administrator \_\_\_ Other

5. Subjects taught: \_\_\_ Math **and** Science \_\_\_ Science \_\_\_ Math \_\_\_ Other: \_\_\_\_\_

6. Participant focus grade level \_\_\_ K-5 \_\_\_ 6-8 \_\_\_ 9-12 \_\_\_ Community College

7. Number of years teaching: \_\_\_\_\_ yrs.

8. In what state do you teach? \_\_\_\_\_

9. Which best describes you?

- American Indian or Alaska Native     Asian or Pacific Islander  
 Black, non-Hispanic                       Hispanic  
 White, non-Hispanic                       Other \_\_\_\_\_

10. What percent of the students you will teach OER content to are the following? (total should equal 100%)

- \_\_\_ American Indian or Alaska Native                      \_\_\_ Asian or Pacific Islander  
\_\_\_ Black, non-Hispanic    \_\_\_ Hispanic  
\_\_\_ White, non-Hispanic    \_\_\_ Other

11. What percentage of the students at your school receives free or reduced lunch? \_\_\_\_\_

**THANK YOU FOR YOUR TIME AND THOUGHTFULNESS COMPLETING THIS SURVEY**

**APPENDIX B: NOAA Office of Ocean Exploration and Research, *Why Do We Explore?* Professional Development 2015-2016 Post-Survey**



**NOAA Office of Ocean Exploration and Research  
*Why Do We Explore?* Professional Development 2015-2016  
 Post-Survey**

**Part 1:** 1. Please place a check mark in **the** column that most closely represents your perspective on each statement.

	Strongly Agree	Agree	Slightly Agree	Slightly Disagree	Disagree	Strongly Disagree
I know engaging instructional strategies to help my students understand the importance of ocean exploration.						
I know about the OceanAGE Careers page on the Ocean Explorer website.						
I think it is important that students understand why NOAA is exploring the ocean.						
I have quick access to a wide range of resources that support my teaching of the importance of ocean exploration.						
I am familiar with the Ocean Literacy Essential Principles and Fundamental Concepts.						
I am confident in my understanding about the value of exploring the ocean.						
I know how the capabilities and assets of the NOAA Ship <i>Okeanos Explorer</i> are used in ocean exploration.						
I know how to access NOAA Ship <i>Okeanos Explorer</i> education resources on the Ocean Explorer Web site.						
I am aware of the importance of ocean exploration.						
I have a clear idea of what the NOAA Ocean Exploration Program does.						
I know how I can use the OceanAGE Careers web pages with my students.						
I am confident in my ability to teach ocean science to my students.						
I think it is important that students understand the direct connection between ocean exploration and their daily lives.						
I have a good understanding of NOAA's role in ocean exploration.						
I know how to access information about the NOAA Ship <i>Okeanos Explorer</i> .						
I know enough about the NOAA Ship <i>Okeanos Explorer</i> to teach my students about her mission, capabilities, and assets.						

	Strongly Agree	Agree	Slightly Agree	Slightly Disagree	Disagree	Strongly Disagree
I am confident in my ability to teach deep ocean exploration content to my students.						
I am confident in my understanding of modern reasons for ocean exploration.						

**Part 2:** Please provide your responses to the following.

2. What are your plans for integrating lessons, content, or other activities from this professional development within the next academic year?

- I do not plan to integrate material from this workshop into my instruction.
- I plan to integrate material from this workshop into my instruction.
- I plan to learn more before integrating material from this workshop into my instruction.
- I am not sure yet whether I will integrate material from this workshop into my instruction.

3. Which of the following do you intend to use with your students during the next academic year? (check all that apply)

- Lessons from the *Okeanos Explorer* Education Materials Collection, Volume 1: Why Do We Explore?
- The Ocean Explorer Website
- OceanAGE Careers Web Pages
- Okeanos Explorer* or Digital Atlas

4. How many students do you anticipate reaching with lessons or content from the *Why Do We Explore?* Education Materials Collection and/or content from the Ocean Explorer or *Okeanos Explorer* Website/pages? \_\_\_\_\_

5. Will this professional development experience enable you to enhance student learning at the classroom, school, district or other level(s)?  Yes  No

If yes, please tell us in what way(s).

6. Has your participation in this professional development helped further your professional development goal(s)?  Yes  No

If yes, please tell us in what way(s).

7. Based on your experience today, would you participate in another professional development opportunity offered by NOAA Ocean Exploration and Research?  Yes  No

8. What changes or improvements would you make to this OE Educator Professional Development experience?

9. Additional comments...

**THANK YOU FOR YOUR TIME AND THOUGHTFULNESS COMPLETING THIS SURVEY**

**APPENDIX C: NOAA Office of Ocean Exploration and Research, *How Do We Explore?* Professional Development 2015-2016 Pre-Survey**



**NOAA Office of Ocean Exploration and Research  
*How Do We Explore?* Professional Development 2015-2016  
 Pre-Survey**

**Part 1:** Please provide your responses to the following.

1a. Have you attended a NOAA OER **in-person** Professional Development (PD) in the past? \_\_\_ Yes \_\_\_ No

b. If yes, please indicate which one(s).

- \_\_\_ Introductory Learning Ocean Science Through Ocean Exploration PD
- \_\_\_ Follow-up Learning Ocean Science Through Ocean Exploration PD
- \_\_\_ Okeanos Explorer Education Materials Collection, V1: Why Do We Explorer?

2a. Have you participated in a NOAA OER **online** PDO in the past? \_\_\_ Yes \_\_\_ No

b. If yes, please indicate which one(s).

- \_\_\_ Deep-sea Discoveries in the Atlantic: Advancing Transatlantic Ocean Science Literacy (March 2014)
- \_\_\_ NOAA Ship Okeanos Explorer Education Materials Coll. Vol. 2, *How Do We Explore?* (June 2011)
- \_\_\_ Gulf of Mexico: Deep-Sea Ecosystems (October 2010)
- \_\_\_ NOAA Ship Okeanos Explorer Education Materials Coll. Vol. 1, *Why Do We Explore?* (June 2010)
- \_\_\_ NOAA Ship Okeanos Explorer Education Materials Coll. Vol. 1, *Why Do We Explore?* (Oct. 2009)
- \_\_\_ Classroom Exploration of Oceans: The NOAA Ship Okeanos Explorer (2008)
- \_\_\_ Oceans for Life: From Sea to Shining Sea (2006)
- \_\_\_ Classroom Exploration of Oceans - Highlights from NOAA Ocean Exploration Expeditions (2005)
- \_\_\_ Ocean Exploration Then, Now and in the Future (The H.M.S.Challenger) (2004)
- \_\_\_ Classroom Exploration of Oceans - Highlights from NOAA Ocean Exploration Expeditions (2003)

**Part 2:** 3. Please place a check mark in the single column that most closely represents your perspective on each statement.

	<b>Strongly Agree</b>	<b>Agree</b>	<b>Slightly Agree</b>	<b>Slightly Disagree</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
I know engaging instructional strategies to help my students understand the importance of ocean exploration.						
I know about the OceanAGE Careers page on the Ocean Explorer web site.						
I think it is important that students understand why NOAA is exploring the ocean.						
I have quick access to a wide range of resources that support my teaching of the importance of ocean exploration.						
I am familiar with Ocean Literacy Essential Principles and Fundamental Concepts.						
I am confident in my understanding about the value of exploring the ocean.						
I know how the capabilities and assets of the NOAA Ship Okeanos Explorer are used in ocean exploration.						

	Strongly Agree	Agree	Slightly Agree	Slightly Disagree	Disagree	Strongly Disagree
I know how to access NOAA Ship <i>Okeanos Explorer</i> education resources on the Ocean Explorer Web site.						
I am aware of the importance of ocean exploration.						
I have a clear idea of what the NOAA Ocean Exploration Program does.						
I know how I can use the OceanAGE Careers web pages with my students.						
I am confident in my ability to teach ocean science to my students.						
I think it is important that students understand the direct connection between ocean exploration and their daily lives.						
I have a good understanding of NOAA's role in ocean exploration.						
I know how to access information about the NOAA Ship <i>Okeanos Explorer</i> .						
I know enough about the NOAA Ship <i>Okeanos Explorer</i> to teach my students about her mission, capabilities, and assets.						
I am confident in my ability to teach deep ocean exploration content to my students.						
I am aware of how telepresence communication technologies are used in the explorations of the <i>Okeanos Explorer</i> .						
I am aware of how underwater robots are used on board the <i>Okeanos Explorer</i> .						
I have a good understanding of how the sciences, advanced technologies, mathematics, and engineering are integrated to support ocean exploration.						
I am confident in my understanding of the ocean exploration strategy used in NOAA OER <i>Okeanos Explorer</i> missions.						

**Part 3:** Demographic information (please check the appropriate box for each item):

4. Your current teaching position: \_\_\_ Preservice \_\_\_ Inservice \_\_\_ Informal \_\_\_ Administrator \_\_\_ Other

5. Subjects taught: \_\_\_ Math **and** Science \_\_\_ Science \_\_\_ Math \_\_\_ Other: \_\_\_\_\_

6. Participant focus level \_\_\_ K-5 \_\_\_ 6-8 \_\_\_ 9-12 \_\_\_ College

7. Number of years teaching: \_\_\_\_\_ yrs.

8. In what state do you teach? \_\_\_\_\_

9. Which best describes you?

- |   |  |
|---|--|
| <input type="checkbox"/> American Indian or Alaska Native | <input type="checkbox"/> Asian or Pacific Islander |
| <input type="checkbox"/> Black, non-Hispanic              | <input type="checkbox"/> Hispanic                  |
| <input type="checkbox"/> White, non-Hispanic              | <input type="checkbox"/> Other _____               |

10. What percent of the students you will teach OER content to are the following? (total should equal 100%)

- American Indian or Alaska Native
- Asian or Pacific Islander
- Black, non-Hispanic
- White, non-Hispanic
- Other
- Hispanic

11. What percentage of the students at your school receives free or reduced lunch? \_\_\_\_\_

**THANK YOU FOR YOUR TIME AND THOUGHTFULNESS COMPLETING THIS SURVEY**

**APPENDIX D: NOAA Office of Ocean Exploration and Research, *How Do We Explore?* Professional Development 2015-2016 Post-Survey**



**NOAA Office of Ocean Exploration and Research  
*How Do We Explore?* Professional Development 201-2016  
Post-Survey**

**Part 1:** 1. Please place a check mark in the single column that most closely represents your perspective on each statement.

	Strongly Agree	Agree	Slightly Agree	Slightly Disagree	Disagree	Strongly Disagree
I know engaging instructional strategies to help my students understand the importance of ocean exploration.						
I know about the OceanAGE Careers pages on the Ocean Explorer website.						
I think it is important that students understand why NOAA is exploring the ocean.						
I have quick access to a wide range of resources that support my teaching of the importance of ocean exploration.						
I am familiar with the Ocean Literacy Essential Principles and Fundamental Concepts.						
I am confident in my understanding about the value of exploring the ocean.						
I know how the capabilities and assets of the NOAA Ship <i>Okeanos Explorer</i> are used in ocean exploration.						
I know how to access NOAA Ship <i>Okeanos Explorer</i> education resources on the Ocean Explorer Website.						
I am aware of the importance of ocean exploration.						
I have a clear idea of what the NOAA Ocean Exploration Program does.						
I know how I can use the OceanAGE Careers web pages with my students.						
I am confident in my ability to teach ocean science to my students.						
I think it is important that students understand the direct connection between ocean exploration and their daily lives.						
I have a good understanding of NOAA's role in ocean exploration.						
I know how to access information about the NOAA Ship <i>Okeanos Explorer</i> .						

	Strongly Agree	Agree	Slightly Agree	Slightly Disagree	Disagree	Strongly Disagree
I know enough about the NOAA Ship <i>Okeanos Explorer</i> to teach my students about her mission, capabilities, and assets.						
I am confident in my ability to teach deep ocean exploration content to my students.						
I am aware of how telepresence communication technologies are used in the explorations of the <i>Okeanos Explorer</i> .						
I am aware of how underwater robots are used on board the <i>Okeanos Explorer</i> .						
I have a good understanding of how the sciences, advanced technologies, mathematics, and engineering are integrated to support ocean exploration.						
I am confident in my understanding of the ocean exploration strategy used in NOAA OER <i>Okeanos Explorer</i> missions.						

**Part 2:** Please provide your responses to the following.

2. What are your plans for integrating lessons, content, or other activities from this professional development within the next academic year?

- I do not plan to integrate material from this workshop into my instruction.
- I plan to integrate material from this workshop into my instruction.
- I plan to learn more before integrating material from this workshop into my instruction.
- I am not sure yet whether I will integrate material from this workshop into my instruction.

3. If you previously participated in the Volume 1: Why Do We Explore professional development, have you integrated lessons, content, or other activities into your instruction?

- Not Applicable.
- I have not integrated material from the Why Do We Explore workshop into my instruction.
- I have not yet but I still plan to integrate material from the Why Do We Explore workshop into my instruction.
- I have integrated material from the Why Do We Explore workshop into my instruction.
- I plan to learn more before integrating material from the Why Do We Explore into my instruction.
- I am not sure yet whether I will integrate material from the Why Do We Explore into my instruction.

4. Which of the following do you intend to use with your students during the next academic year? (check all that apply)

- Lessons from the *Okeanos Explorer* Education Materials Collection, Volume 2: **How** Do We Explore?
- Lessons from the *Okeanos Explorer* Education Materials Collection, Volume 1: **Why** Do We Explore?
- Content from the Ocean Explorer Website
- OceanAGE Careers Web Pages

\_\_\_\_\_ *Okeanos Explorer* or Digital Atlas

5. How many students do you anticipate reaching with lessons or content from the *How Do We Explore?* Education Materials Collection and/or content from the Ocean Explorer or Okeanos Explorer Website/pages? \_\_\_\_\_

6. Will this professional development experience enable you to enhance student learning at the classroom, school, district or other level(s)? \_\_\_\_\_ Yes \_\_\_\_\_ No

If yes, please tell us in what way(s).

7. Has your participation in this professional development helped further your professional development goal(s)? \_\_\_\_\_ Yes \_\_\_\_\_ No

If yes, please tell us in what way(s).

8. Based on your experience today, would you participate in another professional development opportunity offered by NOAA Ocean Exploration and Research? \_\_\_\_\_ Yes \_\_\_\_\_ No

9. What changes or improvements would you make to this OE Educator Professional Development experience?

10. Additional comments...

**THANK YOU FOR YOUR TIME AND THOUGHTFULNESS COMPLETING THIS SURVEY**

**APPENDIX E: WORKSHOP SUMMMARY FORM – WDWE**

PDO Site: \_\_\_\_\_ Date: \_\_\_\_\_

Type of PDO: LOSTOE Intro \_\_\_\_ Why Do We Explore? \_\_\_\_ How Do We Explore? \_\_\_\_

Facilitator: \_\_\_\_\_

1. Were you able to accomplish the entire PDO agenda? Yes \_\_\_\_ No \_\_\_\_  
If no, what was omitted?
  
2. During guided reflections, did PDO participants:
  - A. indicate they were motivated to incorporate more ocean science into their classroom teaching?  
\_\_\_\_ YES \_\_\_\_ NO  
Notable Example(s):
  
  - B. identify ways to connect students to the work and lives of ocean scientists, including those working with the *Okeanos Explorer*, using the OE Web site?  
\_\_\_\_ YES \_\_\_\_ NO  
Notable Example(s):
  
  - C. understand how the lessons correlate to the OLEPs, the NSES, and the Framework for K-12 Science Education?  
\_\_\_\_ YES \_\_\_\_ NO  
Notable Example(s):
  
  - D. identify how the lessons, materials and resources presented during the workshop meet their local and national standards?  
\_\_\_\_ YES \_\_\_\_ NO  
Notable Example(s):
  
  - E. discuss and reflect about how presented content and materials can be adapted to fit the specific needs of their students?  
\_\_\_\_ YES \_\_\_\_ NO  
Notable Example(s):
  
  - F. identify how they will use OE resources with their students?  
\_\_\_\_ YES \_\_\_\_ NO  
Notable Example(s):
  
3. Please make note of any special considerations regarding the meeting room, the technology, our on-site colleagues, topics of special interest for the next workshop, etc.

**APPENDIX F: WORKSHOP SUMMMARY FORM – HDWE**

PDO Site: \_\_\_\_\_ Date: \_\_\_\_\_

Type of PDO: LOSTOE Intro \_\_\_\_ Why Do We Explore? \_\_\_\_ How Do We Explore? \_\_\_\_

Facilitator: \_\_\_\_\_

1. Were you able to accomplish the entire PDO agenda? Yes \_\_\_\_ No \_\_\_\_  
If no, what was omitted?
  
2. During guided reflections, did PDO participants:
  - A. indicate they were motivated to incorporate more ocean science into their classroom teaching?  
\_\_\_\_ YES \_\_\_\_ NO  
Notable Example(s):
  
  - B. identify ways to connect students to the work and lives of ocean scientists, including those working with the *Okeanos Explorer*, using the OE Web site?  
\_\_\_\_ YES \_\_\_\_ NO  
Notable Example(s):
  
  - C. understand how the lessons correlate to the OLEPs, the NSES, and the Framework for K-12 Science Education?  
\_\_\_\_ YES \_\_\_\_ NO  
Notable Example(s):
  
  - D. identify how the lessons, materials and resources presented during the workshop meet their local and national standards?  
\_\_\_\_ YES \_\_\_\_ NO  
Notable Example(s):
  
  - E. discuss and reflect about how presented content and materials can be adapted to fit the specific needs of their students?  
\_\_\_\_ YES \_\_\_\_ NO  
Notable Example(s):
  
  - F. identify how they will use OE resources with their students?  
\_\_\_\_ YES \_\_\_\_ NO  
Notable Example(s):
  
3. If you had returning participants (who had taken either WDWE or HDWE), please note if they have implemented any of the materials from their first workshop.
  
4. Please make note of any special considerations regarding the meeting room, the technology, our on-site colleagues, topics of special interest for the next workshop, etc.