Exploring NVACSS

Introduction

The Nevada State Board of Education adopted the Nevada Academic Content Standards for Science (NVACSS) based on the Next Generation Science Standards (NGSS) in 2014. These standards demand significant conceptual shifts as noted in the National Science Teacher Association's NGSS Position statement:
The continuum of teacher development from initial preparation through ongoing development is a critical factor in delivering the quality of instruction called for in the Framework and the NGSS. Teachers need a thorough understanding of the disciplinary core ideas and practices they are expected to teach, how students learn them, and the range of instructional strategies that can support student learning. Implementing the NGSS requires that experienced teachers make a significant shift in the content and manner in which they have been teaching and that beginning teachers make a shift from how they were taught at the university level (p. 5).

Effectuating the realization of these conceptual shifts starts with increasing awareness and understandings of the NVACSS, and, based on informal conversations with various stakeholders throughout the region served by the Northeastern Nevada Regional Professional Development Program (NNRPDP), it was determined a need did exist to further increase awareness and understandings of the standards. Thus, a professional development opportunity, *Exploring the NVACSS based on the NGSS for K – 5*, was developed to achieve this outcome, as well as to ascertain the impacts associated with increasing educators' awareness and understandings of the NVACSS.

Structure

Exploring the NVACSS based on the NGSS for K-5 was a blended learning opportunity offered to kindergarten through fifth grade (K-5) teachers in the six districts served by the NNRPDP. It was comprised of seven on-line modules, one full day on-site session hosted in Elko, Nevada, and follow-up reflections. (See Appendix G.) The evaluation and structure of each of these facets was informed by the Guskey's Five Levels of Professional Development (2002) and the Standards for Professional Learning (Learning Forward, 2011).

Throughout the on-line modules, K-5 participants from across the region delved into *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*, explored the structure and conceptual shifts of the NVACSS, the integration of the three dimensions: disciplinary core ideas (DCIs), science and engineering practices (SEPs), and the crosscutting concepts (CCCs), analyzed case studies, and identified strategies for supporting science learning for all students. The seven online modules preceded the full day on-site sessions.

The full day on-site sessions were held in Elko, Nevada for each of the respective grade levels, K-5. During these sessions, participants explored components of an instructional resource (Full Option Science System [FOSS] kits) through analyzing and reflecting on model lessons

presented by the facilitator. Following the analyses of the model lessons, participants engaged in an investigation of the resources and implementation planning.

The blended learning opportunity culminated with a follow-up reflection, in which participants assessed aspects of the resources and reflected on learning.

Measurement

Several measurements were designed in order to determine the participants' increase in awareness and understandings of the NVACSS and to identify the impacts of these increases in awareness and understandings.

The measurements to determine the participants' increase in awareness and understandings of the NVACSS included pre and post responses to questions requiring the identification of the three dimensions. Pre and post self-assessments using a 5 point Likert scale to rate understandings of the structural components, conceptual shifts, three dimensions, and strategies to support learning for all students were also used to determine increases in awareness and understandings. (See Appendix H.)

To identify the impacts of the increases in awareness and understandings, trend analyses of the interim and follow-up reflections were conducted and the analyses were used to code the reflection responses. Pre and post self-assessments using a 5 point Likert scale to rate understandings of how to integrate the three dimension into instructional design and how to design instruction where students participate in practices used by scientists and engineers in the real world was another data source used to ascertain impacts. Responses to the following five statements, rated using a Likert scale from 1-7, were also used to identify the instructional impacts of the increases in awareness and understandings: 1) This training added to my knowledge of standards and/or my skills in teaching subject matter content, 2) The training will improve my teaching skills, 3) This training will help me meet the needs of diverse student populations, and 5) My learning today will affect students' learning.

Results and Discussion

Data collected from the pre and post self-assessments indicate a substantial increase in participants' awareness and understandings of the structural components, conceptual shifts, three dimensions, and support strategies related to the NVACSS.

I have a better understanding of the three dimensions and how they all intertwine (and should intertwine) throughout a child's many years of education to strengthen student learning about the natural world – Brenna

On the pre self-assessment, 68% of the participants had no or slight understanding of the structural components of the standards, whereas 97% of the participants indicated fair or solid understanding on the post self-assessment. On the pre self-assessment, 71% of the participants had no or slight understanding of the conceptual shifts of the standards. On the post self-assessment, 97% of the participants indicated a fair or solid understanding of the conceptual

shifts. In terms of the three dimensions, 86% had no or slight understanding on the pre self-assessment. On the post self-assessment, 100% of the participants had a fair or solid understanding of the three dimensions. A no or slight understanding of strategies to support science learning for all students was reported by 68% of the participants on the pre self-assessment. On the post self-assessment, 100% of the participants reported a fair or solid understanding of strategies. Identification of the elements of the three dimensions increased from 21% on the pre self-assessment to 100% on the post self-assessment. (See Figures 16 through 19.)

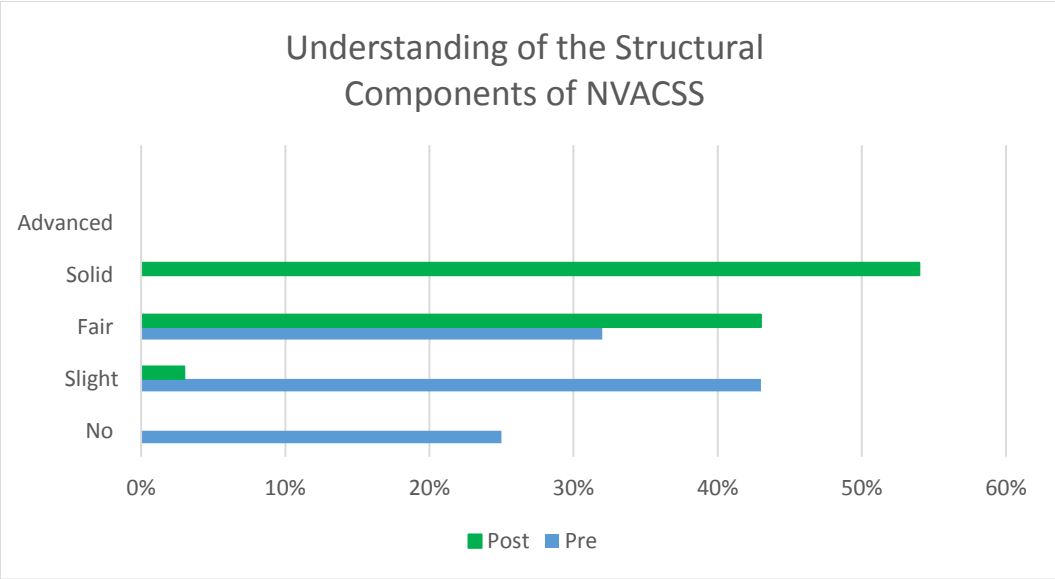

Figure 1: Understanding Structural Components of NVACSS

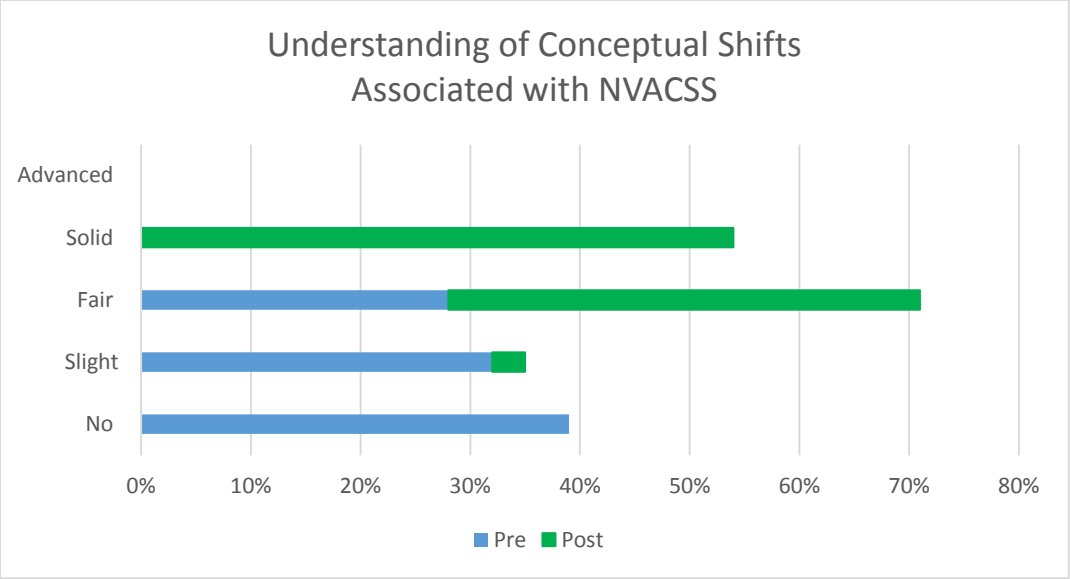

Figure 2: Understanding Conceptual Shifts

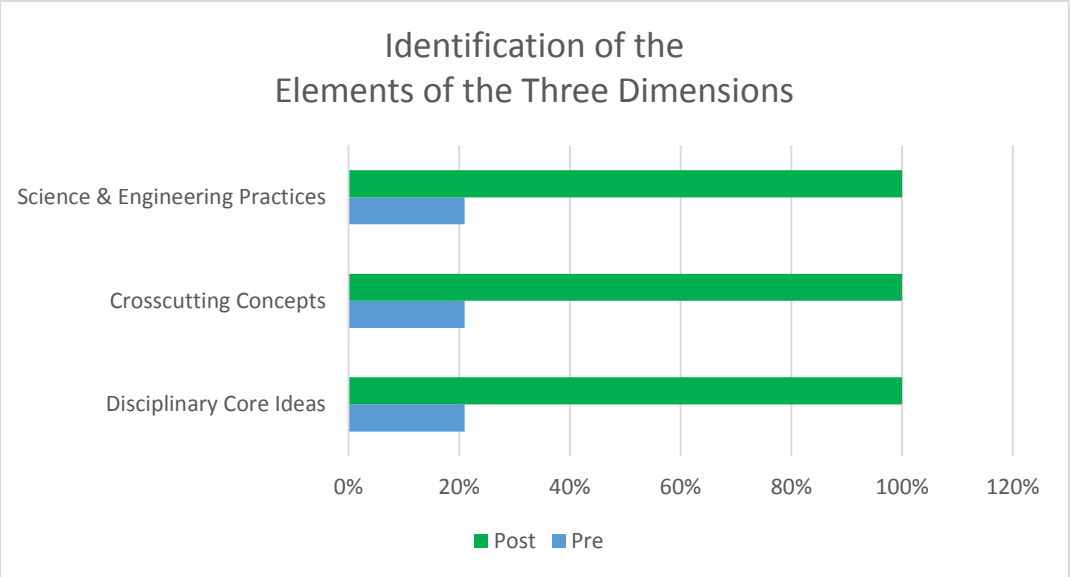

Figure 3: Identifying Elements of Three Dimensions

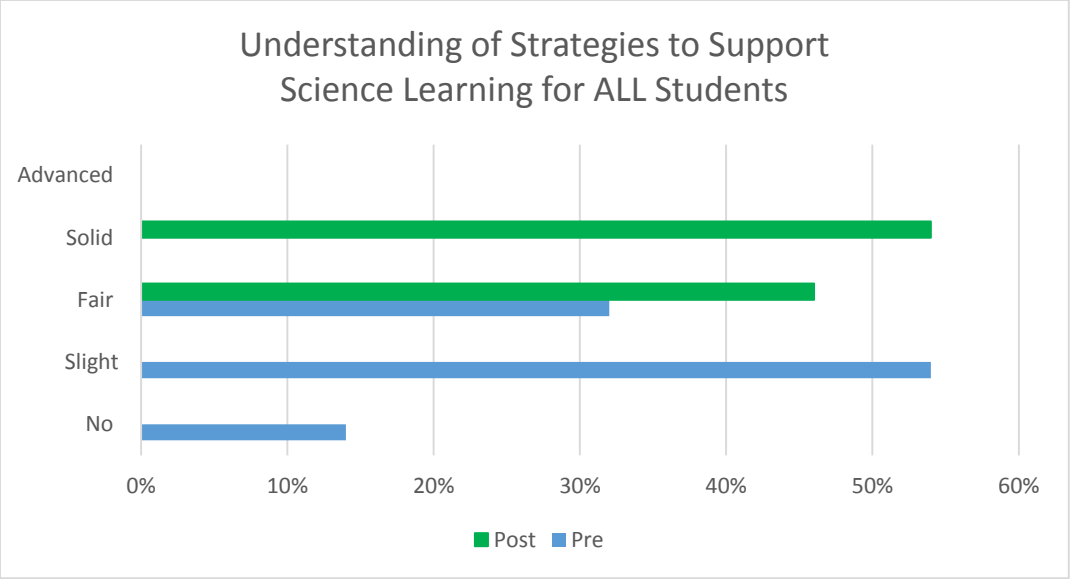

Figure 4: Understanding Strategies Supporting Science Learning

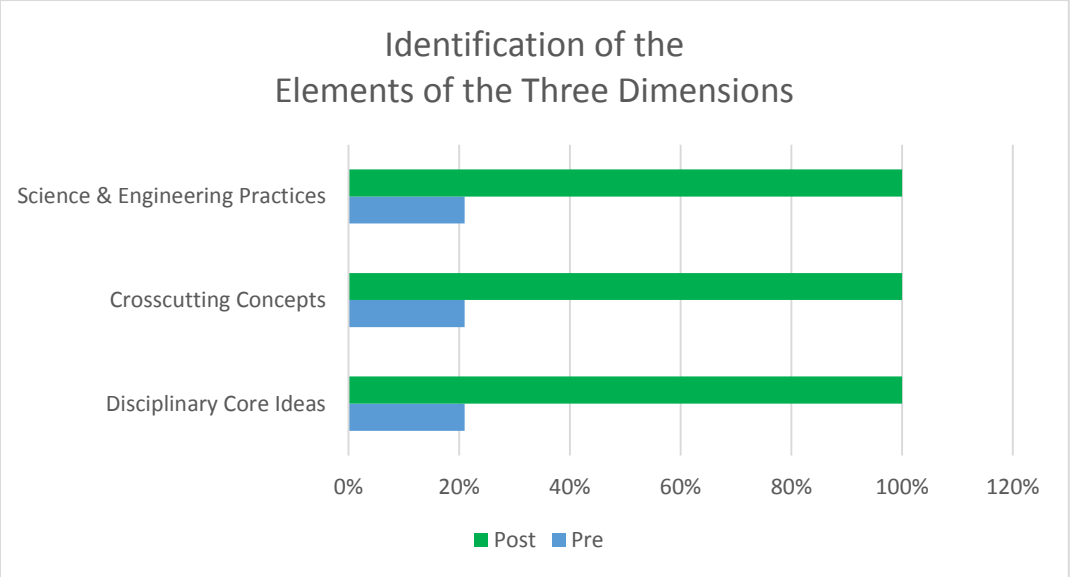

Figure 5: Identifying Elements of Three Dimensions

In order to determine the impacts of these substantial increases in awareness and understandings, data from trend analyses of interim and follow-up reflections, ratings regarding the *how to* of instructional design, and responses to instructional impact statements were evaluated.

I used to think I was wondering aimlessly when it came to teaching science because I was very overwhelmed by all the new legislation and documents that explain the science standards. Now I think that science is something that I can bring into my classroom and embrace as fun and exciting – Christy

A trend analysis of the interim reflection, in which participants responded to the prompt, "I used to think….Now I think…," suggested perceptual shifts in confidence and excitement about teaching the NVACSS, the relevance of purposeful and consistent science instruction, and the importance of an intentional three-dimensional instructional approach. (See Figure 20.)

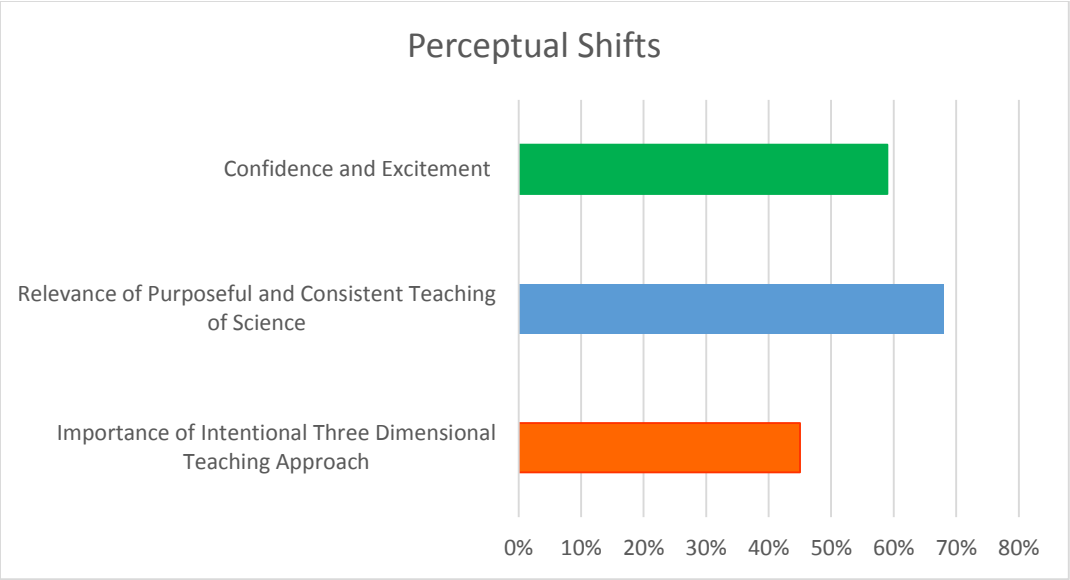

Figure 6: Perpetual Shifts

They [students] started to look forward to science class instead of dreading it and it made a big difference in the information they retained as well – Jennifer

A trend analysis of the follow-up reflection, in which participants analyzed resources and reflected on learning, spotlighted greater student engagement with NVACSS alignment, deeper student understandings as a result of NVACSS implementation, and recognition of the significance of the integration of the three dimensions. (See Figure 21.)

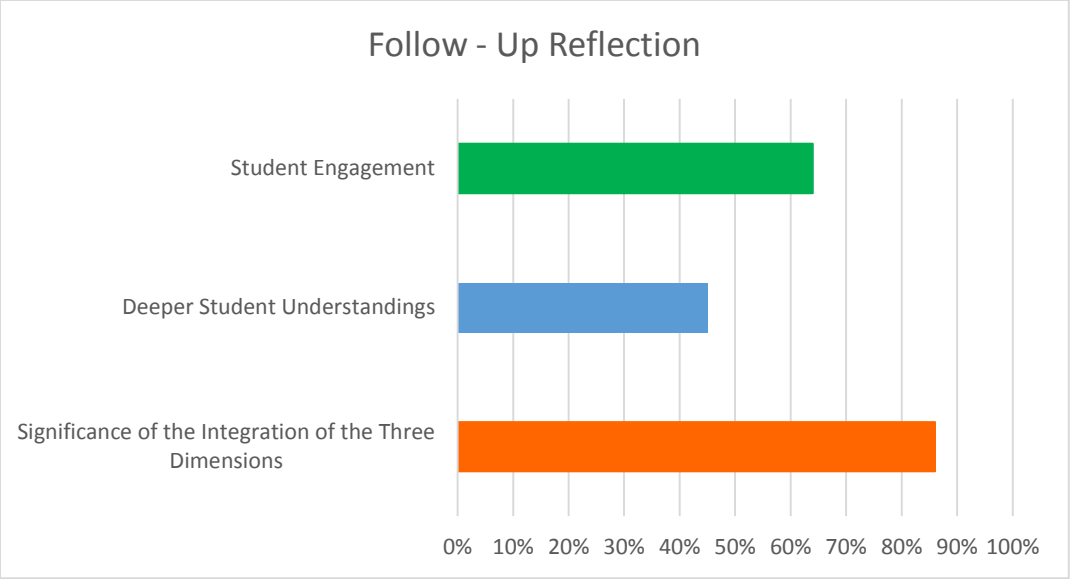

Figure 7: Follow Up Reflection

I feel like I can look at the kindergarten standards now and am confident in bringing them to life in my classroom on a regular basis - Chrissie

In ratings regarding the *how to* of instructional design, participants' understanding of how to integrate the three dimensions into instruction increased from 89% of the participants having no or slight understanding on the pre self-assessment to 97% having fair or solid understanding on the post self-assessment. Participants' understanding of how to design instruction where students participate in practices used by scientists and engineers in the real world increased from 75% of the participants having no or slight understanding on the pre self-assessment to 97% having fair or solid understanding on the post self-assessment. Thus, participants' increase in understandings suggest greater competence in these *how to* facets of instructional design. (See Figures 22 and 23.)

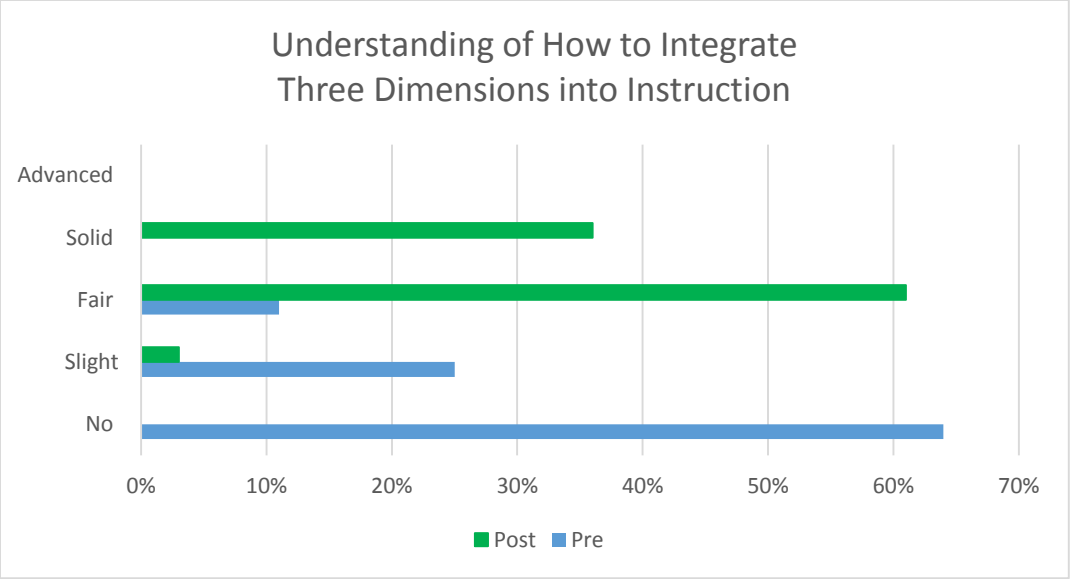

Figure 8: Understanding Integrating 3 Dimensions

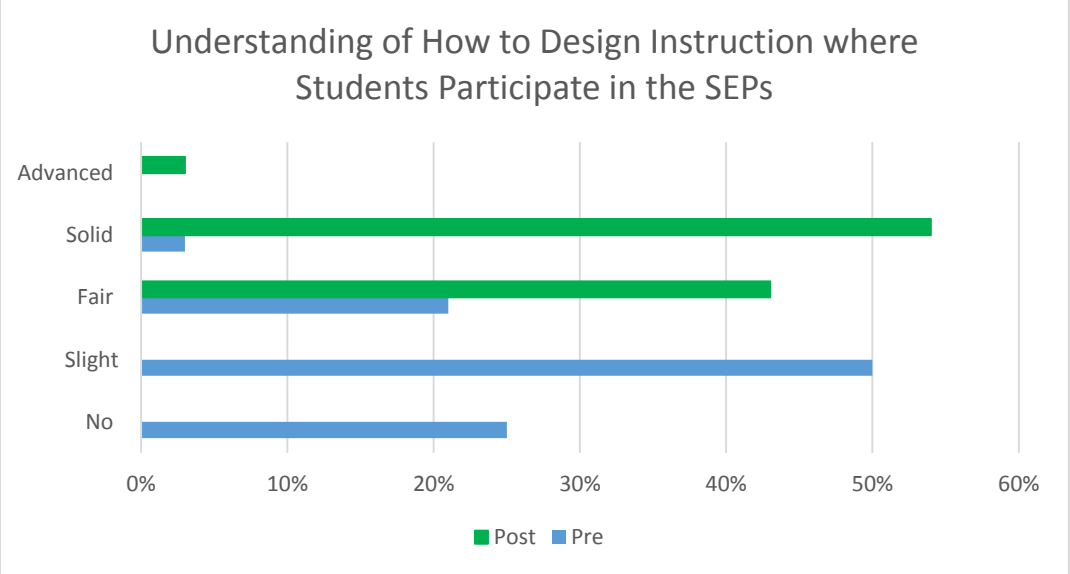

Figure 9: Designing Instruction for Student Participation in SEPs

I am legitimately teaching science and I feel good about it! – Shammy

Three out of the five statements used to further assess the instructional impacts yielded 100% ratings in the 4 to 5 range on a Likert scale with participants noting effects on instructional skills and student learning. The statement, *The learning today has prompted me to change my practice*, received 89% of the ratings in the 4 to 5 range. These ratings indicate a connection between instructional skills, instructional practice, and student learning being impacted by the increase in the participants' awareness and understandings of NVACSS. Interestingly, the statement, *This training will help me meet the needs of diverse student populations*, only garnered 70% of the ratings in the 4 to 5 range as 26% of the participants selected 7 on the Likert

scale indicating the statement was non-applicable. The selection of non-applicable to the statement is notable when considering that 100% of the participants indicated fair or solid understanding of strategies to support all students in learning science in the post self-assessment. The disparity might suggest misinterpretation of the statement. (See Figure 24.)

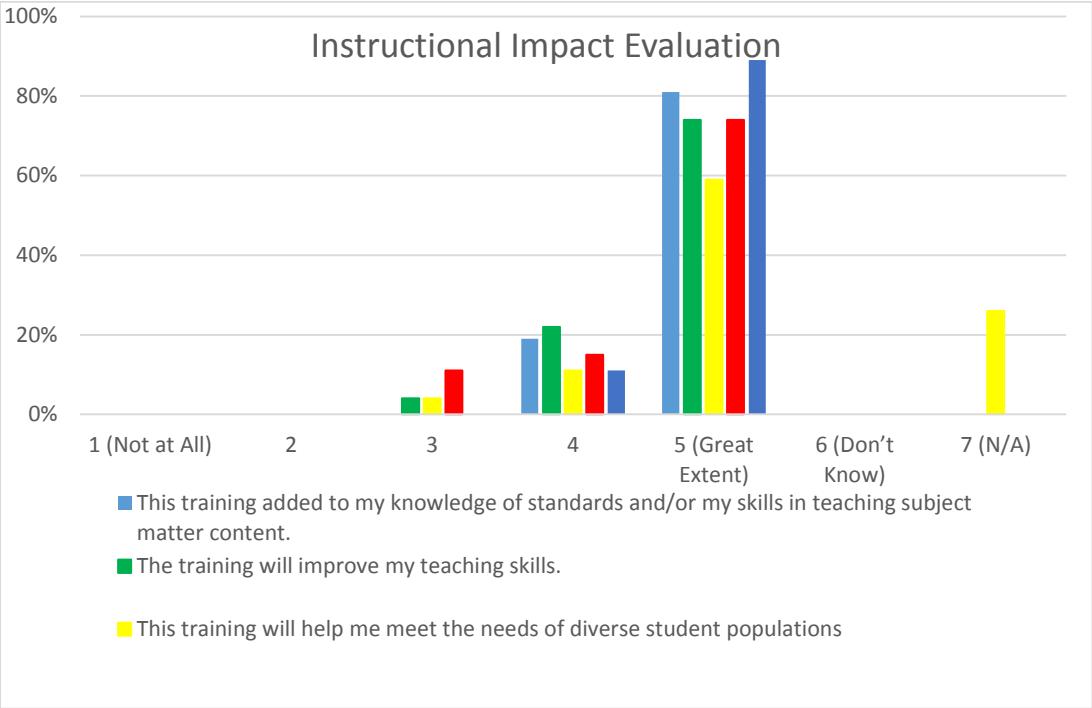

Figure 10: Impact on Instruction

Conclusion

Based on these data, a correlation exists between increasing the participants' awareness and understandings of the NVACSS and the participants' shifts in disposition and instruction. Increasing awareness and understandings of the NVACSS translate into more confident educators who are more apt to shift science instruction in a manner that embraces the vision of NVACSS, integrates the three dimension, and promotes students' engagement and depth of knowledge. This is an impressive first step, but a first step nonetheless. Further professional development is required to continue to advance educators' awareness and robust understanding of the NVACCS in order to support successful implementation of the standards to ensure all of Nevada's students are scientifically literate.

References

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