K - 5 Media Science Specialists Professional Learning Community

Computer Science - not computer literacy - underlies most innovation today. Yet, the majority of U.S. schools require only that students use computers. Seldom do schools prepare students to innovate and create the new technologies that drive local and national economies. This ability to innovate with technology is also important for students' future success and ability to make a difference in a global society (National Center for Women Information Technology, 2020).

Recognizing how critical it is to provide equitable access to computer science instruction to Nevada's youth, Senators Woodhouse, Denis, Dondero-Loop, and Parks sponsored Senate Bill 313 in the 80th Legislative Session. The bill was signed into law by Governor Steve Sisolak in June of 2019 and continued 2017's ground-breaking legislation of expanding computer science education to all students in Nevada (Nevada Revised Statutes 389.520, 2017). The passing of Senate Bill 313 allocated funding to support Nevada's school districts in furthering computer science education work and called on the state's three regional professional development programs to assist districts with this charge (Nevada Revised Statutes 391A.125, 2019). While the 81st Legislative Session did not allocate additional funding for computer science education, Nevada's continued commitment to ensuring access to computer science is evident in the Nevada Department of Education's Addendum to the State Plan for the Improvement of Pupils (2021) goal to increase access to STEM learning and the earmarking of Elementary and Secondary School Emergency Relief funds to support STEM learning.

To ensure every student has access to learning about computer science, a district in the region made the decision to create an elementary special targeting the Nevada Academic Content Standards for Computer Science (NVACS-CS). The district called upon the expertise of the Northeastern Nevada Regional Professional Development Program (NNRPDP) to support the district's initiative to institute a Media Science special in the district's 18 elementary, intermediate, rural, and online schools.

Initial Data and Planning

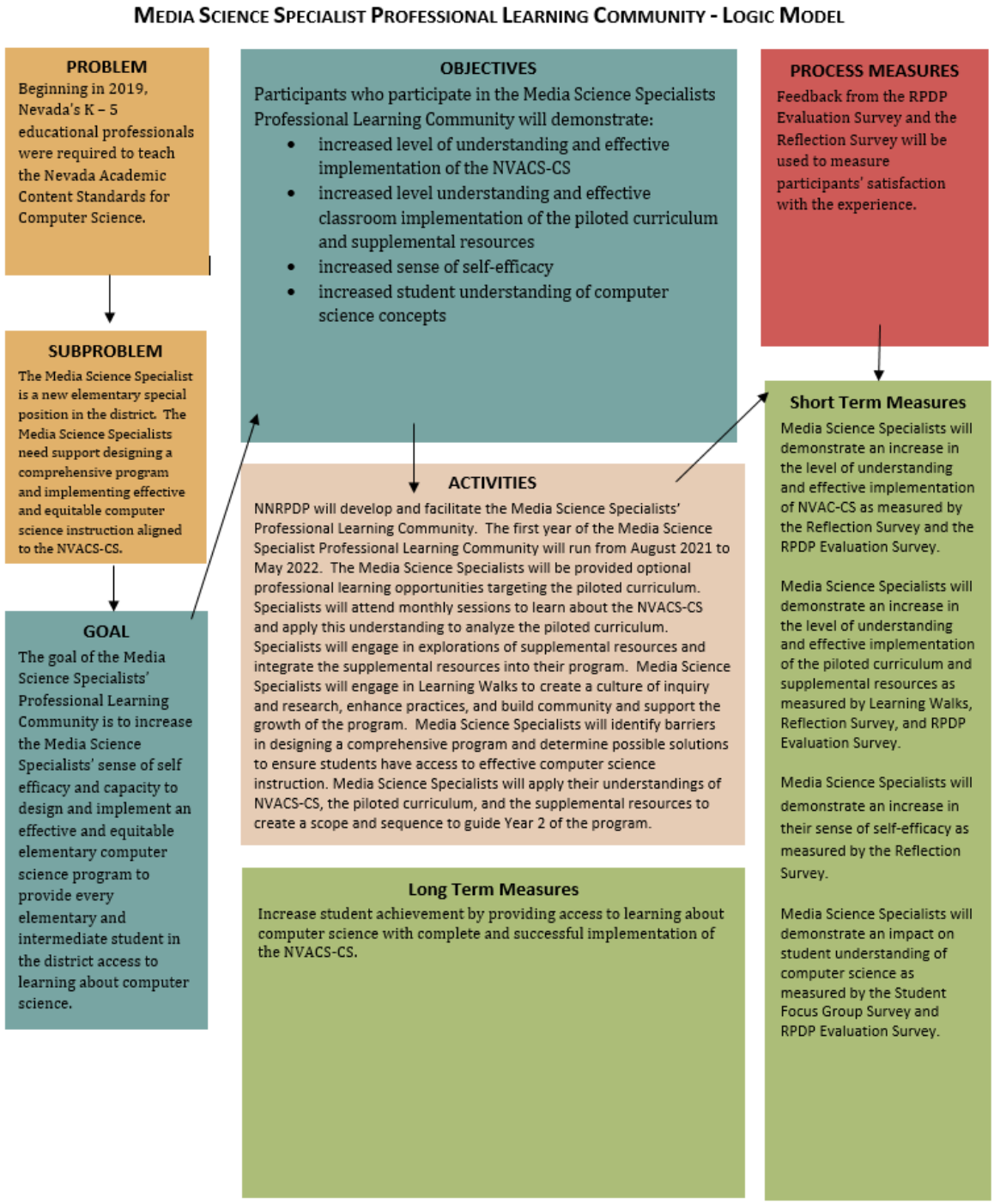
Nevada Department of Education's (2019) mission is to "provide engaging and rigorous computer science and integrated technology education for ALL Nevada students, regardless of their age, race, gender, disability, socioeconomic level, or what school they attend, and to prepare them for a wide variety of postsecondary experiences and careers in the digital age." Achieving this mission requires educators to be equipped with the knowledge and skills to teach computer science concepts. Yet, 63% of surveyed K–12 principals in schools that do not offer computer science instruction said that they lacked qualified teachers (Gallup & Google, 2015). Teacher preparation programs in Nevada did not graduate a single new teacher prepared to teach computer science in 2018 (code.org, 2020). Data collected in the 2019 - 2020 school year indicated 76% of the K - 5 rural educators surveyed in six counties in Nevada were

not even moderately aware of the NVAC-CS, and 86% were not very confident in teaching the NVACS-CS (Thomson, 2020). A large majority of elementary school teachers do not possess the computer science content or pedagogical understandings, resulting in an urgent need to provide educators with professional learning opportunities necessary to effectively address the NVACS-CS.

The NNRPDP has one specialist on staff who possesses the capacity to support educators throughout the region with their learning and teaching of computer science concepts. The Computer Science Specialist (CSS) has a Master of Science in mathematics education and is a National Board Certified Teacher in Adolescent Mathematics. She has also fulfilled the course requirements for Nevada's K - 12 Introductory Computer Science licensure endorsement and serves as a facilitator for Code.org as part of the Regional Professional Development Program's partnership with Code.org. The CSS has participated in work with the NVACS-CS at the local and state level and served on the Nevada Department of Education's Computer Science Curriculum Review Committee. In addition to instituting three years of the Computer Science Ambassador Program, the CSS has also supported learning opportunities across the region, as well as facilitated statewide computer science endorsement courses. The CSS's expertise served to inform the planning of the professional learning structure of the Media Science Specialists (MSS) Professional Learning Community (MSS-PLC).

To ensure students have access to learning about NVACS-CS, the objectives for the MSS-PLC are outlined in the following Logic Model (Figure 3):

Figure 1 *Logic Model*



Method

Learning Design

The NNRPDP is called upon by members in the region and the state as an intervention measure to impact desired outcomes. The effectiveness of the NNRPDP is evidenced in annual reports to stakeholders and outlined in research-based professional learning plans. The learning design of the MSS-PLC was informed by Nevada's Standards for Professional Development (2018), Guskey's Five Levels of Professional Development (2002), the Seven Elements of Effective Professional Development (Darling-Hammond et al., 2017), the U.S. Department of Education's guidance document, Non-Regulatory 2 Guidance: Using Evidence to Strengthen Education Investments (2016), the research of John Murray (2014), as well as other effective teacher professional development research. The content and foci of the MSS-PLC was informed by the NVACS-CS, K–12 Computer Science Framework, Computer Science Teachers Association (CSTA), International Society for Technology in Education (ISTE), Code.org, and research by Jeanette Wing, as well as others in the field. To ensure students have access to effective computer science instruction and to support the district's MSS in their new role, the objectives for the MSS-PLC were informed by the Computer Science Teachers Association Standards for Computer Science Teachers (2020). The CSTA established the standards to provide clear guidance around effective and equitable computer science instruction in support of rigorous computer science education for all K-12 students (2020).

The CSS constructed a Professional Learning Plan (see Appendix R) that provides an overview of the design of the MSS-PLC. The Professional Learning Plan also delineates how the MSS-PLC's learning design aligns with Nevada's Standards for Professional Development (2018) and Learning Forward's Standards for Professional Learning (2011).

In addition to these professional learning standards, the CSS's learning design of the MSS-PLC also incorporated the seven elements of effective professional development identified in a meta-analysis of 35 studies (Darling-Hammond et al., 2017).

Table 1 *NNRPDP's Incorporation of the Seven Elements of Effective Professional Development*

Professional Development Element	Media Science Specialist Professional Learning Community Design: Element Alignment Evidence
Content Focus	The Media Science Specialist Professional Learning Community intentional focus on discipline-specific curriculum development and pedagogies is reflected in a focus on: • Implementation of NVAC-CS • Analyses of pilot curriculum alignment to NVACS-CS
Active Learning	The opportunity for engagement in active learning in the Media Science Specialist Professional Learning Community is reflected in:

Professional Development Element	Media Science Specialist Professional Learning Community Design: Element Alignment Evidence
	• Lessons modeled by NNRPDP Computer Science Specialist • Lessons modeled by the Media Science Specialists • Learning Walks • Using resources that can be implemented in the classroom • Metacognitive routines
Collaboration	The creation of space for sharing ideas and collaboration in the Media Science Specialist Professional Learning Community is reflected in: • Content learning • Model lesson analysis • Learning Walks • Curriculum analysis • Notions
Models of Effective Practice	The modeling of effective practice in the Media Science Specialist Professional Learning Community is reflected in: • Model lessons • Learning Walks • Curriculum analysis • Scope and sequence design
Coaching and Expert Support	The sharing of expertise and best practices targeting individual needs in the Media Science Specialist Professional Learning Community is reflected in: • Individual supports offered outside of the monthly sessions via classroom visits, emails, and/or one-to-one meetings
Feedback and Reflection	The facilitation of reflection and solicitation of feedback in the Media Science Specialist Professional Learning Community is reflected in: • Model lesson analysis • Content focus debrief • Pilot curriculum analysis • Learning Walks • Metacognitive routines • Notions
Sustained Duration	Adequate time to learn, practice, implement, and reflect is evidenced in the Media Science Specialist Professional Learning Community through: • Ongoing over the 2021-2022 school year and continuation in the 2022- 2023 school year • Monthly sessions offered during the school year

As noted by John Murray (2014), “effective teacher professional learning [includes] an emphasis on pedagogical content knowledge, a focus on student learning, implementation over time, alignment with school goals, a connection to teacher needs, and ongoing teacher collaboration” (p. 13.) The MSS-PLC addresses the following key components:

- The learning design is focused on increasing the MSS’ understanding of the NVACS-CS and therefore focuses on content knowledge.
- The learning design includes an element for classroom application, which highlights the focus on student learning.
- The duration of MSS-PLC is ongoing as indicated in Table 2.
- The MSS-PLC is aligned with the NRS (NRS 389.520, 2017 and NRS 391A.370S, 2019), and, thereby, school goals.
- Based on regional, state, and national data, the learning design connects to teachers’ need to increase understandings about computer science.
- The structure of the MSS-PLC provides opportunities for teacher collaboration when synthesizing understandings, analyzing curriculum alignment with NVACS-CS, and supporting the roles and responsibilities of the district’s newly created MSS position.

Participants and Procedure

The MSS-PLC included all 13 of the district's MSS. Twelve of the 13 MSS participated. Three of the 12 participating MSS service students at multiple sites. The MSS-PLC impacted approximately 4,800 elementary and intermediate students.

To achieve the overarching goal of impacting student achievement, the MSS-PLC was designed to support the MSS’ success in the district’s newly developed position by deepening understanding and implementation of the NVACS-CS, the piloted curriculum, and supplemental resources. The MSS-PLC contracted sessions for the 2021 - 2022 academic year started in September 2021 and concluded in May 2022. The MSS met each month with the exception of December 2021 and April 2022. The structure of the monthly, full-day sessions included whole group instruction on a computer science concept, analyses of the piloted curriculum’s alignment to the computer science concept for each grade level K - 5, scaffolding of the grade banded 6 - 8 computer science concept and identification of learning targets for sixth grade intermediate school students, determining whether supplemental resources would be required to meet the standards targeting the concept, curating supplemental resources, exploration of a robotics resource tool purchased by the district , and notions, i.e. discussing logistical and management challenges and solutions, determining structural consistency, etc. Learning Walks were also incorporated into the monthly sessions. The Learning Walk consisted of an informal visit to the hosting MSS’s classroom where the fellow MSS observed the host teacher and offered detailed feedback on an area of focus determined by the hosting MSS. During the September 2021 session, the CSS gauged the MSS’ interest in participating in Learning Walks via an anonymous survey. Given the expressed interest, the intentions, guidelines, and discussion norms for the Learning Walks were established in the October 2021 session (see Appendix D). Learning Walks were scheduled for the subsequent monthly sessions.

Table 2 *K-5 Media Science Specialists Professional Learning Community Structure and Session Overview*

Date	Time	Foci
August 23	9:00 am - 2:00 pm	ECSD Customized Code.org Workshop (attendance optional)
August 24	9:00 am - 2:00 pm	ECSD Customized Code.org Workshop (attendance optional)
September 14	8:30 am - 2:30 pm	NVACS-CS: Computing Systems Curriculum Analysis & Alignment Notions
October 11	8:30 am - 2:30 pm	NVACS-CS: Data & Analysis Curriculum Analysis & Alignment Notions Supplemental resource explorations: Sphero
November 15	8:30 am - 2:30 pm	NVACS-CS: Networks & the Internet Curriculum Analysis & Alignment Notions Learning Walk
January 10	8:30 - 2:30 pm	NVACS-CS: Impacts of Computing Curriculum Analysis & Alignment Notions Learning Walk Supplemental resource explorations: Dash & Dot
February 7	8:30 - 2:30 pm	NVACS-CS: Algorithms & Programming Curriculum Analysis & Alignment Notions Learning Walk (canceled) Supplemental resource explorations: WeDo2.0
March 7	8:30 - 2:30 pm	Supplemental resource explorations: Kibo and Dash & Dot Notions Scope & sequence next steps preview

Date	Time	Foci
		Learning Walk
May 2	8:30 - 2:30 pm	Scope & sequence development
May 3	8:30 - 2:30 pm	Learning Walk Scope & sequence review and presentations

Measurement and Methodology

The purpose of the MSS-PLC is to increase student achievement by providing access to learning about computer science with complete and successful implementation of the NVACS-CS in the district's elementary and intermediate schools. The long-term outcome and overall measure of the MSS-PLC is to:

1. Increase student learning and growth as measured by aggregate assessment scores from participating educators and those same scores analyzed against a comparison group. This was not evaluated in Year 1 of the MSS-PLC.

The goal of the MSS-PLC is to increase the MSS' sense of self-efficacy and capacity to design and implement an effective and equitable elementary computer science program to provide every elementary and intermediate student in the district access to learning about computer science.

The short-term outcomes and measures of the MSS-PLC are as follows:

1. MSS will demonstrate an increase in the level of understanding of NVACS-CS and instructional design as measured by Reflection Survey (see Appendix E) and RPDP Evaluation Survey (see Appendix B).
2. MSS will demonstrate an increase in the level of effective implementation of the NVACS-CS, the piloted curriculum, and supplemental resources as measured by anecdotal notes from Learning Walks, Reflection Survey, and RPDP Evaluation Survey.
3. MSS will demonstrate an increase in their sense of self-efficacy as measured by Reflection Survey.
4. MSS will demonstrate an impact on student understanding of computer science concepts as measured by the Student Focus Group Survey (see Appendix F) and RPDP Evaluation Survey.

Qualitative and quantitative measurements were used to assess the following variables:

- Levels of understanding
- Levels of instructional proficiency

- Levels of self-efficacy
- Student learning

The variables informed the evaluation plan based on Guskey's Five Levels of Professional Development (2002):

Table 3 *Evaluation Plan*

Evaluation Level	What Questions Are Addressed?	How Will Information Be Gathered?	What Is Measured or Assessed?	How Will Information Be Used?
1. Participants' Reactions	Training expectations, presenter skills, increased knowledge, motivation to improve	*RPDP Evaluation Survey* *Reflection Survey*	Initial satisfaction with the experience	To improve program design and delivery
2. Participants' Learning	Did participants acquire the intended knowledge and skills?	*RPDP Evaluation Survey* *Reflection Survey*	*Participants' increased understanding of NVACS-CS, piloted curriculum, and resources*	To improve program content, format, and organization
3. Organization Support & Change	Was implementation advocated, facilitated, and supported? Was the support public and overt? Were problems addressed quickly and efficiently? Were sufficient resources made available?	*Reflection Survey*	The organization's advocacy, support, accommodation, facilitation, and recognition	To document and improve organization support To inform future change efforts

Evaluation Level	What Questions Are Addressed?	How Will Information Be Gathered?	What Is Measured or Assessed?	How Will Information Be Used?
	Were successes recognized and shared? What was the impact on the organization? Did it affect the organization's climate and procedures?			
4. Participants' Use of New Knowledge and Skills	Did participants effectively apply the new knowledge and skills?	*RPDP Evaluation Survey* *Reflection Survey* *Learning Walks*	*Participants' ability to implement NVACS-CS, piloted curriculum, and resources*	To document and improve the implementation of program content
5. Student Learning Outcomes	What was the impact on students? Did it affect student performance or achievement?	*RPDP Evaluation Survey* *Student Focus Group Survey*	Student growth and achievement	To document impact and subsequent student growth and achievement

Note: Italicized text is specific to this intervention.

Results

Process Measures

Twelve of the 13 MSS consistently attended the sessions. One MSS attended 40% of the fourth session. On the RPDP Evaluation Survey, 100% of the MSS indicated the training matched their needs to a great extent, and 100% indicated the presenter's experience and expertise

enhanced the quality of the training to a great extent (n-= 12). Textual analysis of the comments made in the reflections and feedback section of the RPDP Evaluation Survey identified 100% of the comments as positive.

Sample excerpts from the RPDP Evaluation Survey:

This has been so helpful for my first year of media science. I needed help with the standards and this group has been very beneficial.

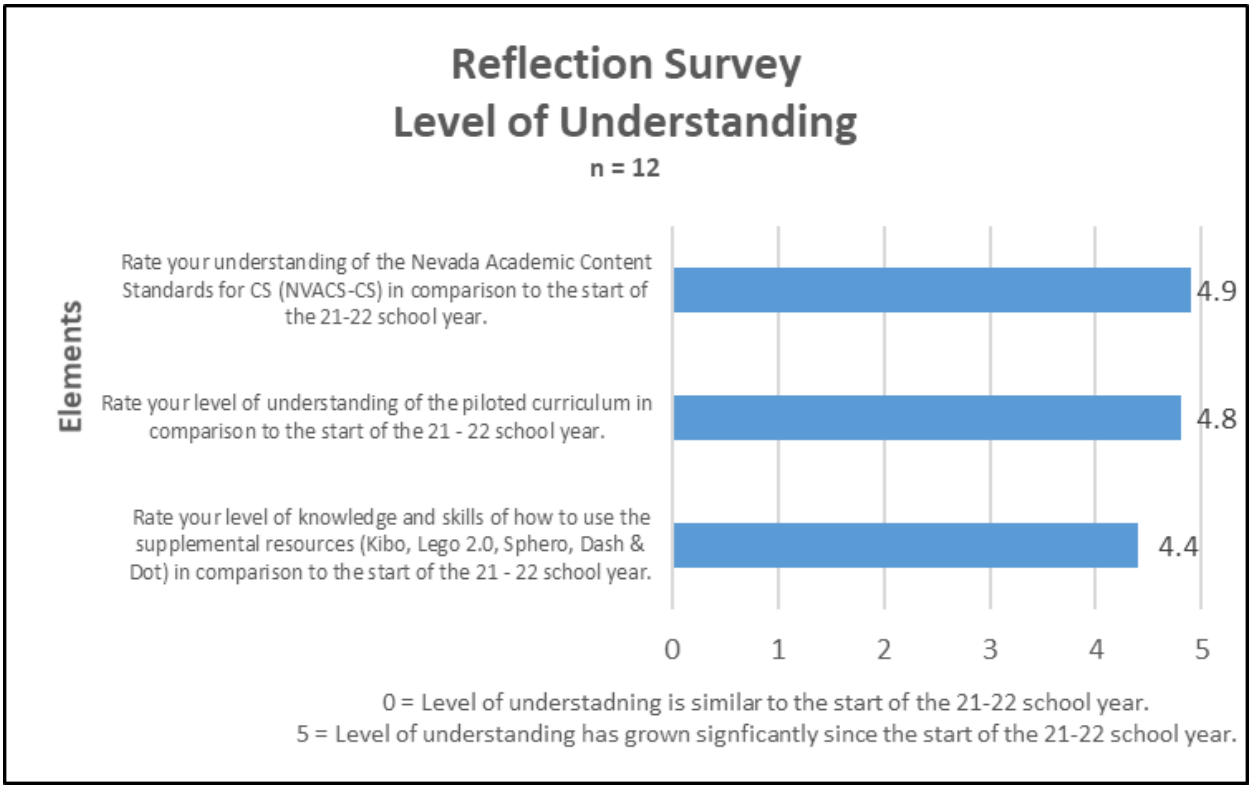
This training was very effective and necessary moving forward in the CS direction.

… I learned a great deal of content AND pedagogy and LOVED the development of our group dynamic along the way. Thank you for this amazing opportunity!

Levels of Understanding

The measures used to assess levels of understanding included the Reflection Survey and RPDP Evaluation Survey. On the RPDP Evaluation Survey, the statement, *this training added to my knowledge of standards and/or my skills in teaching subject matter content*, received a mean rating of 4.9 on a scale of 1 - 5, where a zero-rating indicated *not at all* and rating of a five indicated *to a great extent* (n = 12).

Figure 2 *RPDP Evaluation Survey: Level of Understanding*

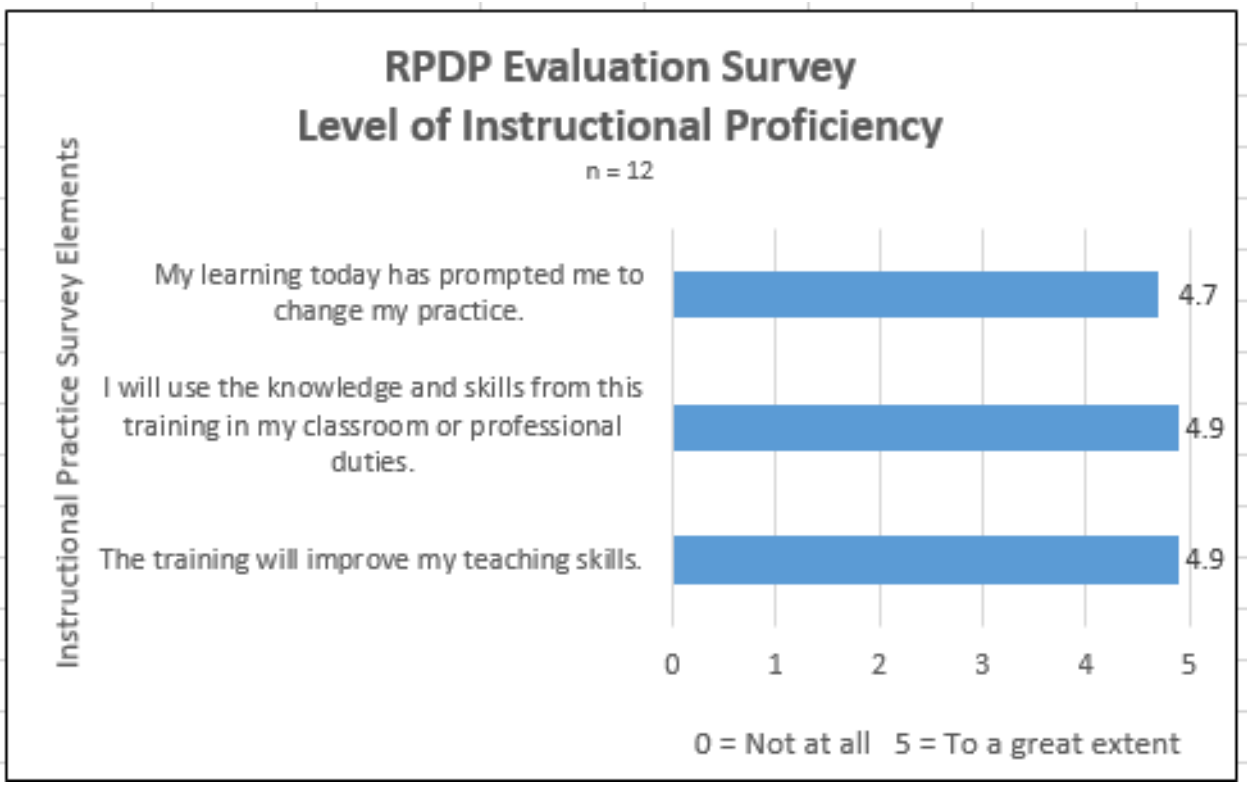


MSS completed a Reflection Survey during the final session in which they were asked to compare their level of understanding and knowledge of skills in August 2021 to their level of understanding and knowledge of skills in May 2022. Responses on the Reflection Survey indicate MSS rated their level of understanding of the NVACS-CS and the piloted curriculum as increasing significantly over the course of the 2021 - 2022 school year.

Level of Instructional Proficiency

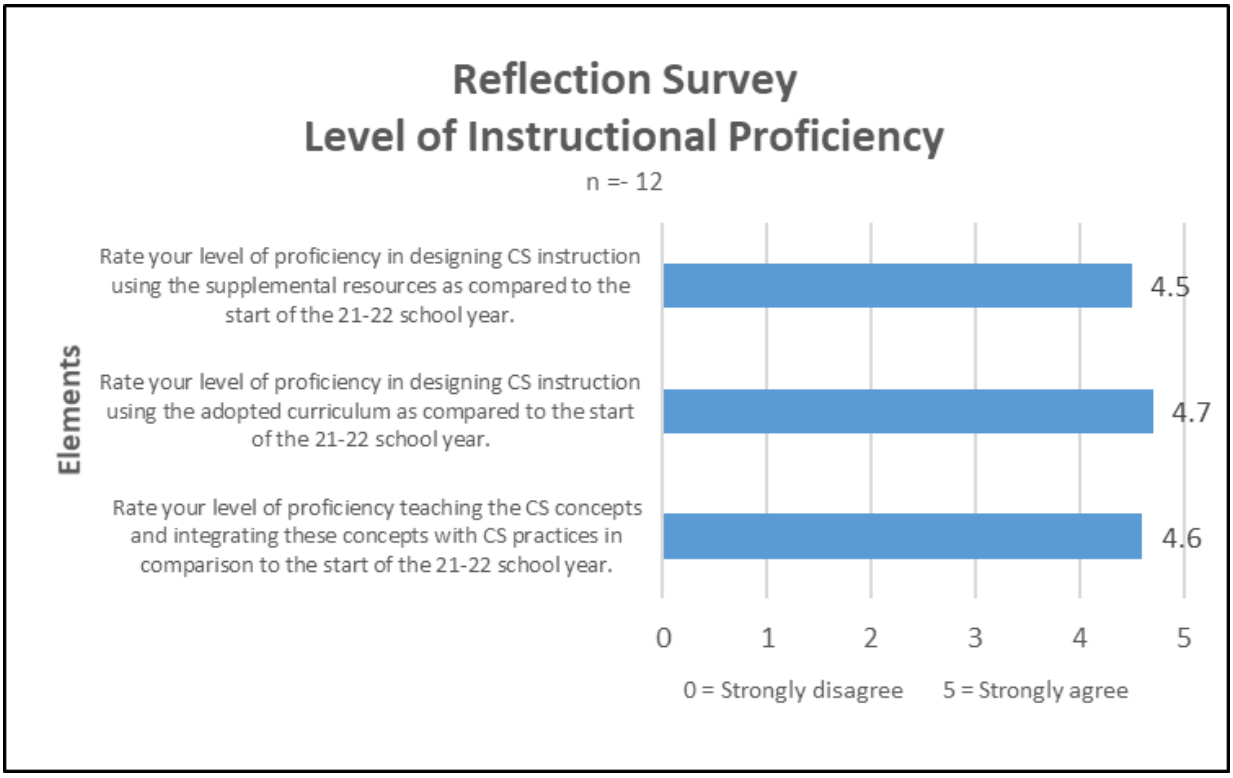
Three measures were used to assess the level of instructional proficiency: (a) Learning Walks, (b) RPDP Evaluation Survey, and (c) Reflection Survey. The RPDP CSS observed Learning Walks for evidence of application of content from the MSS-PLC sessions. One-hundred percent of the Learning Walks suggested MSS were using content from the MSS-PLC sessions during instruction. The feedback provided by MSS to the hosting MSS and the hosting MSS's reflections during the debriefs of the Learning Walks were evaluated and indicated 100% of the Learning Walks reflected application of the new learning and skills.

Figure 3 *RPDP Evaluation Survey: Level of Instructional Proficiency*



The mean ratings of the elements related to instructional proficiency on the RPDP Evaluation Survey indicate the MSS' instructional proficiency was impacted to a great extent as a result of participating in the MSS-PLC.

Figure 4 *Reflection Survey: Level of Instructional Proficiency*

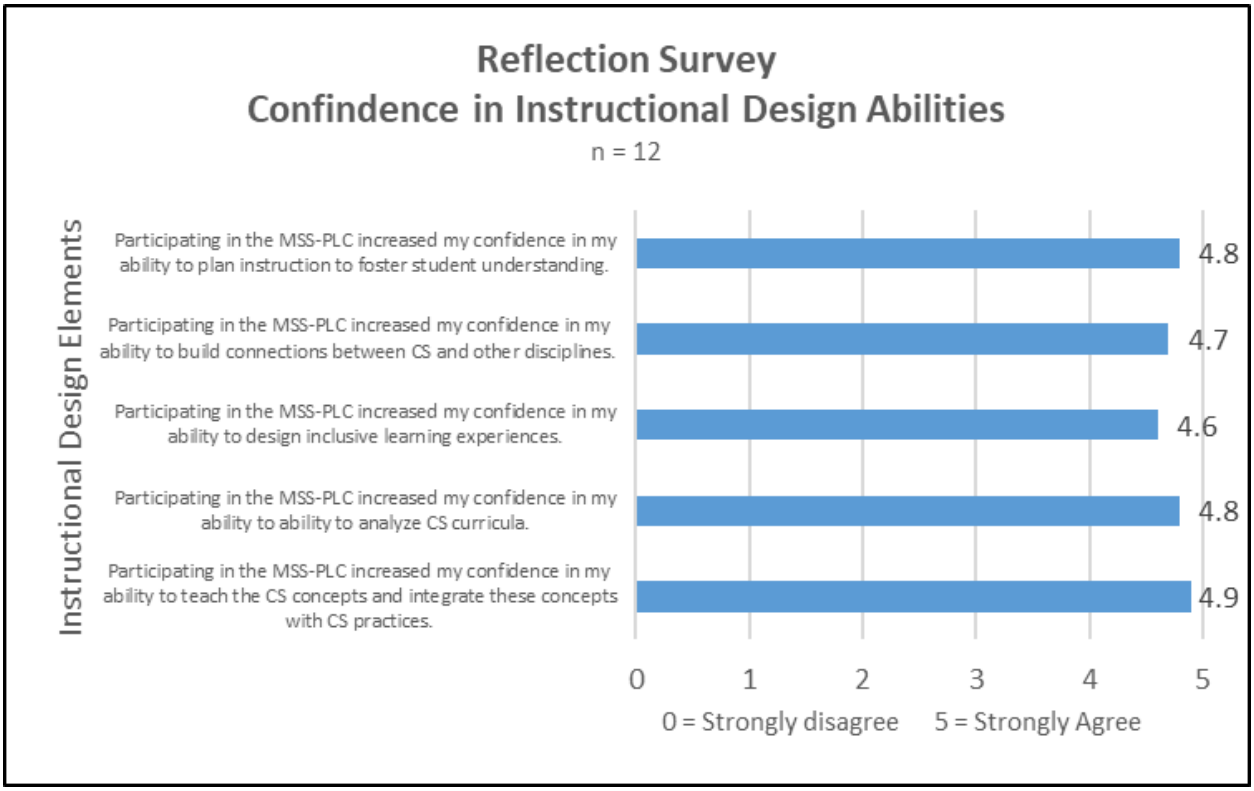


Responses on the Reflection Survey indicate MSS' rated their level of proficiency teaching the NVACS-CS, the piloted curriculum, and the supplemental resources within the range of *increasing significantly* on the linear scale when comparing their level of proficiency at the start of the 2021-2022 school year to the end of the 2021-2022 school year.

Level of Self-efficacy

Self-assessments of confidence in the ability to design instruction and perception of organizational support were measured in the Reflection Survey to assess MSS' sense of self-efficacy.

Figure 5 *Reflection Survey: Confidence in Instructional Design Abilities*



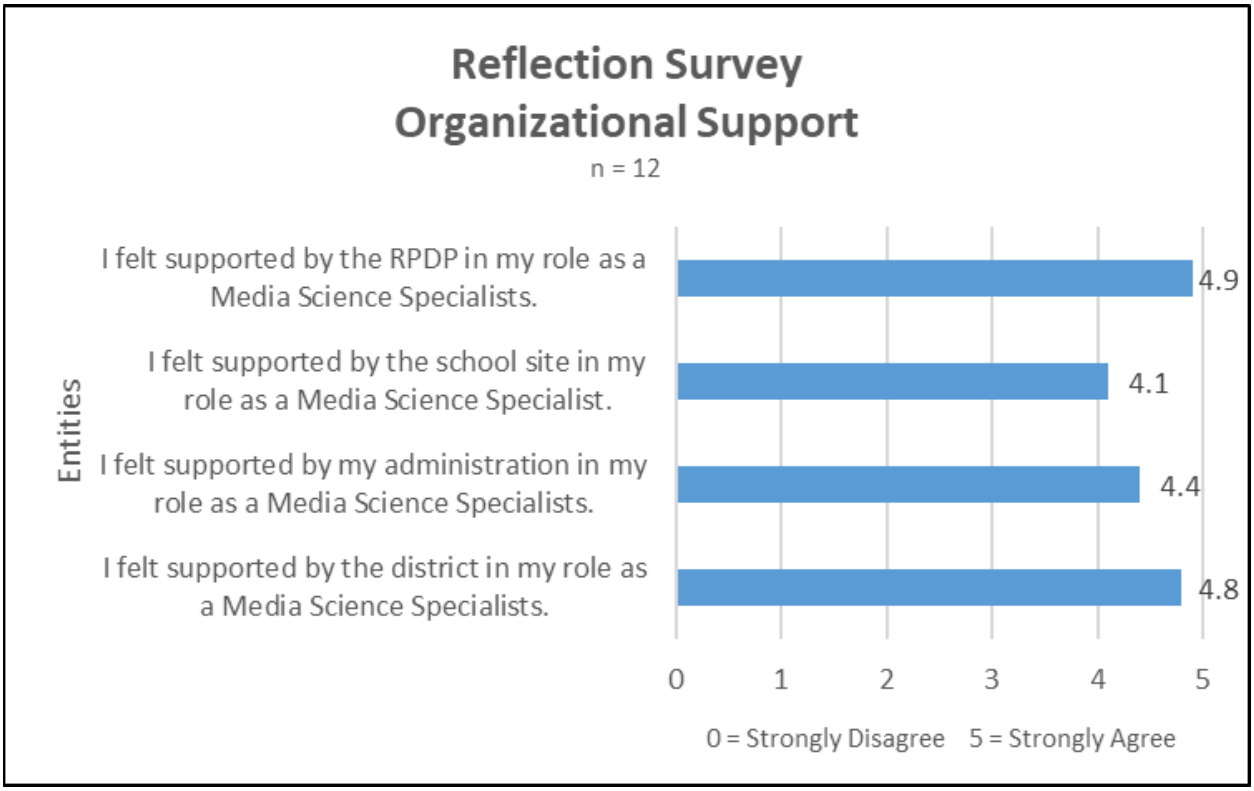
Ratings on the Reflection Survey indicate MSS' confidence in their ability to design computer science instruction increased as a result of participating in the MSS-PLC. A textual analysis of MSS' comments on the Reflection Survey reflected increases in confidence in their level of ability.

Table 4 *Sample excerpts from Reflection Surveys*

Theme	MSS Comments
Self-efficacy	*The MSS-PLC has helped me a lot with my self-efficacy. I feel very confident in my ability to teach the computer science standards and projects to all of my students.*
	The MSS-PLC has had a profound affect [sic] *on my self - efficacy as a Media Science Specialist. When I received the email … that our primary teaching focus was Computer Science, I felt completely unprepared to teach this in a professional way. The activities in the PLC meetings and support . . . helped me to learn how to teach the computer science curriculum.*

Theme	MSS Comments
	At the beginning of this year, I had no idea what I didn't know. I couldn't help myself out of instructional problems and I didn't have the resources I needed either. I feel infinitely more confident in my capacity as a computer science teacher and I have a wealth of resources to pull from and solve instructional problems with now.

Figure 6 *Reflection Survey: Organizational Support*



MSS felt support by organizational entities, with the greatest sense of support coming from entities outside of the school site. In a textual analysis of MSS' comments in the Reflection Survey, nine of the MSS' also referenced feeling supported by the MSS-PLC.

Table 5 *Sample excerpts from Reflection Surveys*

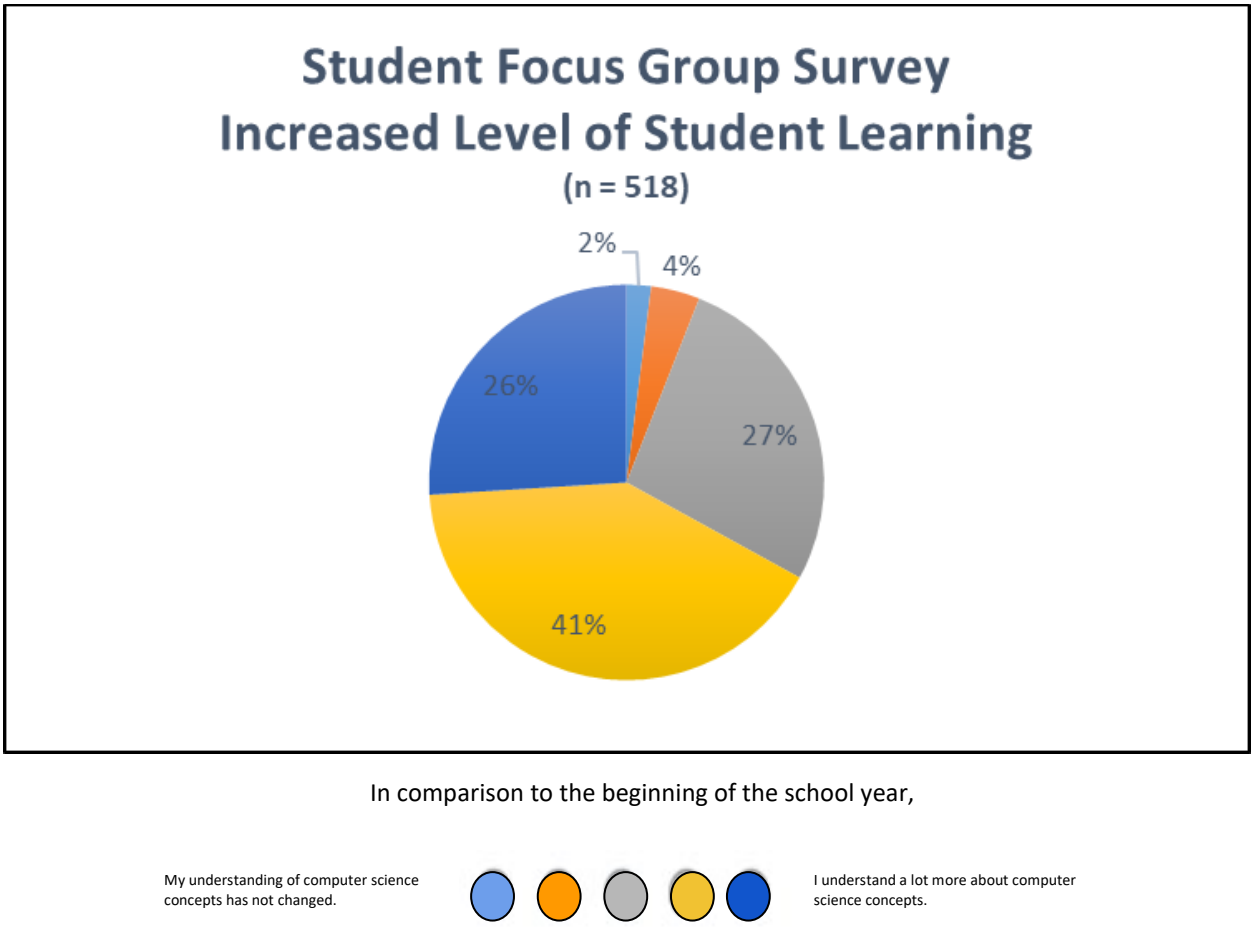
Theme	MSS Comments
Organizational Support	*Thank you so much for getting us together, providing resources (funding for robots from district) and keeping us on track! :) So glad we met this year to commiserate, celebrate, and create content!*
	I don't think I would have been able to be as proficient and positive without this cohort of teachers and the lead of [CSS]. This group has helped in so many ways. We have all learned and shared with each other and have grown in so many ways.
	[The CSS] has been inspirational, she created and facilitated a passionate cohort of Media Science Specialist. She fostered an environment where we could all collaborate and feel safe, valued, and understood. This has been a meaningful year-long learning experience, it made a world of difference to me while I struggled with my new responsibilities and curriculum. This training helped me struggle less.
Professional Learning Community Support	*I came into this year with two, one-day, professional development sessions around coding and a hopeful, but generally clueless attitude. This PLC has challenged me in the best way possible to deeply develop my own learning around computer science and my capacity to teach my students and facilitate their learning when their level of knowledge exceeds my own. I have developed meaningful relationships with my colleagues and my practice has improved immensely as a result of the collaborative activities we've engaged in and the learning walks and subsequent discussions that have taken place this year.*
	The most valuable aspect of the MSS-PLC this year was the collaboration that resulted from our meetings. The collaboration made for meaningful work, and gave us all a sounding board for our successes, frustrations, and questions.

Student Learning

Two measures were used to assess student learning: (a) the RPDP Evaluation Survey and (b) the Student Focus Group Survey. On the RPDP Evaluation Survey, the MSS' mean rating of

the statement, *my learning today will affect students' learning,* was 4.9 on a scale where one indicates *not at all* and a five indicates *to a great extent* (n = 12).

Figure 7 *Student Survey: Level of Student Understanding*



MSS administered the Student Focus Group Survey to a group of fourth and fifth grade students. Out of the 518 students surveyed, 35 students indicated, on a linear scale, that their level of understanding about computer science had either not increased or increased very little. A textual analysis of students' comments indicated 93% of the students were able to identify something that they had learned about computer science concepts that they did not know at the beginning of the 2021-2022 school year (n = 518).

Table 6 *Sample excerpts from the Student Survey*

Computer Science Concept		**Student Comment**
Algorithms & Programming		*I did not know that you need 1010101010 for coding.*

	I did not now [sic] *that you can animate things on coding.*
	One thing new about computer science I learned was nested looping. I was never familiar with the concept until this year. Now I am more familiar with nested looping
	I did not know how to use block code … I hope to learn java script very soon because you can basically [sic] *do anything* [sic]
	I now know that Robots don't have feelings it was programmed that way.

Discussion

Evaluating the effectiveness of the MSS-PLC based on the variables of Guskey's (2002) five critical levels suggests the MSS-PLC provided effective professional development that resulted in an increase in levels of understanding, instructional proficiency, self-efficacy, and student learning.

Levels of Understanding

Meeting on a consistent monthly basis provided the MSS with time to learn, practice, implement, and reflect, which are key elements of effective professional learning (Hammond, et.al, 2017). The monthly sessions were structured to provide opportunity for purposeful application of the whole group learning of the NVACS-CS through the analyses of the piloted curriculum and the curation and integration of supplemental resources. The Council of the Great City Schools (2021) notes that "discipline-specific, content focused professional development supports teaching and learning within the classroom context… as opposed to generic professional development delivered externally or divorced from teachers' school or district contexts" (p.8). Positive results on the questions aligned to the levels of understanding on the RPDP Evaluation Survey and Reflection Survey indicate the MSS-PLC contributed to the MSS' increased levels of understanding in all three areas of foci: (a) NVACS-CS, (b) the adopted curriculum, and (c) supplemental resources. Given these increases in understandings, the MSS-PLC was successful in achieving the attainment of its specific learning goal to impact participants' learning, Guskey's (2002) second level of evaluation of professional development effectiveness.

Levels of Instructional Proficiency

The design of the MSS-PLC provided the structure and fluidity to be responsive to the needs of the MSS in a role new to them, to the school site, and to the district by cultivating a committed learning community, a factor that can be key in increasing educator effectiveness.

Within learning communities, members exchange feedback about their practice with one another, visit each other's classrooms, and share resources…They develop norms of collaboration and relational trust and employ processes and structures that unleash expertise and strengthen capacity to analyze, plan, implement, support, and evaluate their practice. (Learning Forward, 2011)

One important element of learning communities described by Learning Forward is visiting colleagues' classrooms, an element that is often not a component of learning communities due to the logistical challenges it presents. Learning Walks have also been found to be transformative by moving professional development into professional practice (Fisher & Frey, 2014). Therefore, the incorporation of the Learning Walks into the design of the MSS-PLC may have contributed to the impact on the levels of instructional proficiency. The CSS's observations of the Learning Walks, including the host teachers' lessons, student discourse, and the feedback offered during the debriefs, provided evidence the MSS were translating their learning to practice. Data from the RPDP Evaluation Survey and Reflection Survey also suggest the MSS-PLC increased the MSS' levels of instructional proficiency in all three areas of foci: (a) NVACS-CS, (b) the adopted curriculum, and (c) supplemental resources. Thus, the MSS-PLC addressed Guskey's (2002) fourth level of evaluation of professional development effectiveness: participants' use of new knowledge and skills.

Levels of Self-efficacy

"Teachers' self-efficacy…plays a key role in influencing important academic outcomes (e.g., students' achievement and motivation) and well-being in the working environment" (Barni et al., 2019). As evidenced in comments, the MSS' confidence in the skills and knowledge required in their new role was not strong at the beginning of the school year. Results from the Reflection Survey indicate the MSS' sense of self-efficacy increased in five key components of the Instructional Design standard of the CSTA Standards for Computer Science Teachers (2020): (a) analysis of curricula, (b) developing standards-aligned learning experiences, (c) designing inclusive learning experiences, (d) building connections between CS and other disciplines, and (e) planning instruction to foster student understanding.

"As Speritzer (1995) noted, the way staff members view their own abilities in the workplace is a result of [perceived organizational support]; the [perceived organizational support] also impacts the level of competence employees feel in shaping their behaviors at work" (Rockow et al., 2016, p 1). The results indicate the MSS felt supported by the NNRPDP, the district, the administration, and the school site, with the NNRPDP receiving the strongest mean agreement rating. By securing organizational support, Level 3 of Guskey's (2002) five critical elements of evaluating the effectiveness of professional development, the design of MSS-PLC generated confidence, resulting in an increase in MSS' sense of self-efficacy.

Student Learning

In the initial design, data from the MSS' student learning goals were going to be evaluated to assess Guskey's (2002) fifth level of evaluation of professional development effectiveness, student learning outcomes. However, requirements for student learning goals were adjusted by administration due to recommendations provided to districts from the Nevada Department of Education. Thus, these data were not available to assess the effectiveness of the MSS-PLC. Results from the Student Focus Group Survey do suggest the MSS-PLC Impacted student learning about computer science in general. Outside of references to the core concept of algorithms and programming, the data do not provide conclusive evidence in terms of student learning that is connected to each of the NVACS-CS five core computer science concepts or the seven practices. Since many typical forms of assessments, such as classroom assessments, present validity challenges, "the best way to counter these threats to the validity of results is to include a comparison group — another similar group of educators or schools not involved in the current activity or perhaps engaged in a different activity (Guskey, 2016, p.36). Identifying a comparison group was not an option given there were too many other variables impacting outcomes, such as the inconsistency in the amount of instructional time devoted to teaching NVACS-CS at elementary school sites in other districts and the absence of an elementary special structured to specifically address NVACS-CS at elementary school sites in other districts. Further explorations will be necessary to identify measurement tools that will provide reliable and valid data regarding increases in student learning specific to the NVACS-CS five core concepts and seven practices.

Conclusion

The MSS position was conceived by the district at the conclusion of the 2020 - 2021 school year and instituted into the elementary system just two months later at the start of the 2021 - 2022 school year. With the advent of the new position, MSS found themselves entering into an unknown construct with limited understandings of the NVACS-CS, the piloted curriculum, and the supplemental resources, or a clear vision of the role of a MSS. Although excited, the MSS were, understandably, apprehensive. The MSS-PLC was designed taking these factors into account and with the intention to provide professional learning that would support high-quality leading, teaching, and learning. The MSS-PLC incorporated three features most prevalent to effective professional development programs, i.e. a focus on content, support for collaboration, and feedback and reflection (Council of the Great City Schools, 2020), and the evidence suggests the MSS-PLC was successful. The MSS-PLC illustrated an impact on student learning. MSS' understanding of the NVACS-CS, the piloted curriculum, and the supplemental resources increased, as did their sense of self-efficacy. As one MSS noted, "[I] definitely feel like the plane is coming together mid-flight now [as] compared to starting . . . I feel significantly better going into this next year because of all the work we did this year."

While the MSS made significant strides as a result of their participation in the MSS-PLC, the work has only just begun. Ongoing support is necessary for MSS to continue to move along the continuum of the robust benchmarks established by the CSTA Standards for Computer Science Teachers (2020). The CSS has received district approval to sustain ongoing professional learning for the MSS in the 2022 - 2023 school year. By continuing to provide high-quality

professional learning, Year 2 of the MSS-PLC will empower MSS to impact students' understanding of the NVACS-CS and equip students with essential problem-solving, critical thinking and complex analytical skills.

References

Barni, D., Danioni, F., & and Benevene, P. (2019). Teachers 'self-efficacy: The role of personal values and motivations for teaching. *Frontiers in Psychology*, 10 (1645). https://doi.org/10.3389/fpsyg.2019.01645

Carey, B. (2015). *How we learn: The surprising truth about when, where and why it happens*. Random House.

Code.org. (2020). Support K - 12 education in Nevada. https://code.org/advocacy/state-facts/NV.pdf

Council of the Great City Schools. (2021). *Advancing instruction and leadership in the nation's great city schools: A framework for developing, implementing, and sustaining high-quality professional development.* https://www.cgcs.org/cms/lib/DC00001581/Centricity/domain/35/publication%20docs/CGCS_PDFrameworkFINAL.pdf

Computer Science Teachers Association (2020). *CSTA standards for computer science teachers*. https://csteachers.org/teacherstandards

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute.

ESSA Advisory Group. (2019, February 26). *ESSA presentation*. http://www.doe.nv.gov/Boards_Commissions_Councils/ESSA_Adv_Group/ESSA_Advisory_Group/

Fisher, D. & Frey, N. (2014). Using teacher learning walks to improve instruction. http://www.scsk12.org/memo/files/files/learning%20walk2.pdf

Gallop and Google. (2015). *Images of Computer Science: Perceptions Among Students, Parents and Educators in the U.S.* Washington, D.C.: The Gallup Organization.

Guskey, T. R. (2002). Does it make a difference? Evaluating professional development. *Educational Leadership, 89*, 45-51.

Guskey, T.R. (2016). Gauge impact with 5 levels of data. *Learning Forward, 37*, 32 – 37.

Hayes, Mizel. (2010). *Why professional development matters*. Learning Forward.

Knowles, M.S. (1984). *The modern practice of adult education: From pedagogy to androgyny*. Wilton, CT: Association Press.

Learning Forward. (2011). *Standards for professional learning*. Learning Forward.

Mahler, D., Grobschedl, J., & Harms, U. (2017). Opportunities to learn for teachers' self-efficacy and enthusiasm. *Education Research International*, 2017. https://doi.org/10.1155/2017/4698371

Murray, John. (2014). Designing and Implementing Effective Professional Learning. Corwin.

National Center for Women Information Technology. (2020). *Moving beyond.* NCWIT. https://www.ncwit.org/resources/moving-beyond-computer-literacy-why-schools-should-teach-computer-science-0

Nevada Department of Education. (March 11, 2021). *Addendum to the state plan for the improvement of pupils.* https://doe.nv.gov/uploadedFiles/ndedoenvgov/content/STIP/2021STIPAddendum.pdf

Nevada Department of Education. (n.d.). *K – 12 computer science*. https://doe.nv.gov/Nevada_Academic_Standards/Computer_Science/

Nevada Department of Education. (2019) *Nevada academic content standards for computer science and integrated science and integrated technology.* https://doe.nv.gov/uploadedFiles/nde.doe.nv.gov/content/Nevada_Academic_Standards/Comp_Tech_Standards/NevadaAcademicContentStandards_forrev.pdf

Nevada Department of Education. (February 1, 2018). *Nevada's standards for professional development*. http://www.doe.nv.gov/uploadedFiles/ndedoenvgov/content/Educator_Licensure/NVStandardsforPD.pdf

Nevada Department of Education. (March 21, 2017). *The new Nevada plan under the every student succeeds plan.* http://www.doe.nv.gov/uploadedFiles/ndedoenvgov/content/Boards_Commissions_Councils/ESSA_Adv_Group/2017/Thenewnevadaplan.pdfinked

Nevada Revised Statutes. (2017). *NRS 389.520*. https://www.leg.state.nv.us/nrs/NRS-389.html#NRS389Sec520

Nevada Revised Statutes. (2019). *NRS 391A.370*. https://www.leg.state.nv.us/NRS/NRS-391A.html#NRS391ASec370

Rockow, S., Kowalski, C., Chen, K., & Smothers, A. (2016). Self-efficacy and perceived organizational support by workers in a youth development setting. *Journal of Youth Development,* 11(1), 1 - 15. https://doi.org/10.5195/jyd.2016.432

Thomson, Connie. (2020). Computer science ambassadors: Year 2.[unpublished manuscript]. Northeastern Nevada Regional Professional Development Program.

U.S. Department of Education. (2016). *Non-regulatory guidance: Using evidence to strengthen education investments.* https://www2.ed.gov/policy/elsec/leg/essa/essassaegrantguid10212016.pdf

Wing, J.M. (2017). Computational thinking's influence on research and education for all. *Italian Journal of Educational Technology*, *25*(2), 7-14. doi: 10.17471/2499-4324/922

U.S. Department of Education. (2016). *Non-regulatory guidance: Using evidence to strengthen education investments.* https://www2.ed.gov/policy/elsec/leg/essa/essassaegrantguid10212016.pdf

Wing, J.M. (2017). Computational thinking's influence on research and education for all. *Italian Journal of Educational Technology*, *25*(2), 7-14. doi: 10.17471/2499-4324/922