Science Collaborative for Innovative and Enhanced Content Excellence: 6-8 (SCIEnCE)
Independent Evaluation
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The Longwood University College of Arts and Sciences and the Institute for Teaching through Technology and Innovative Practices (ITTIP) at Longwood University, in partnership with six local school divisions, developed and implemented the *Science Collaborative for Innovative and Enhanced Content Excellence: 6-8 (SCIEnCE)* in response to a needs assessment that indicated the need for improvement in the following SOL strands: nature of science (NoS), scientific investigation, force, motion, energy, and matter. The *SCIEnCE* program provided sustained professional development to seventeen middle school teachers from eleven schools in Southside and Central Virginia through the 2013-2014 school year. The participating teachers attended a weeklong institute in the summer of 2013 at Longwood University and then received ongoing support from the ITTIP staff through the 2013-2014 school year. The SCIEnCE program sought to accomplish the following goals:

1. Improve the science content knowledge of elementary teachers
2. Enhance teachers' knowledge of the NoS SOL strand
3. Develop instructional practices that require more rigorous science inquiry
4. Incorporate problem-based assessments
5. Provide opportunities for teachers to learn, practice, develop, and implement authentic inquiry-based learning and interdisciplinary activities to enhance science learning experiences.

This report presents findings of an external evaluation of the SCIEnCE professional development grant. The report is based on results of pre and post teacher surveys, a focus group of participating teachers, and data that documents the teachers participation on the National Science Teachers Association (NSTA) online learning center, a key component of this professional development model.

Evaluation Questions and Design

To assess the degree to which the SCIEnCE grant met its stated goals the following evaluation questions were asked:

1. What is the effect of the SCIEnCE 6-8 weeklong professional development on the content knowledge and pedagogical knowledge of participants?

2. What are participants' perceptions of the relevance and effectiveness of the SCIEnCE 6-8 professional development?

3. To what extent are teachers implementing the exemplars and integrating the content and pedagogical practices gleaned from the SCIEnCE 6-8 workshops into their teaching?

4. What evidence is there that the knowledge and skills gained through the SCIEnCE 6-8 professional development is having an impact on student achievement and achievement gaps between student sub-groups?

5. What are participants' perceptions of the effectiveness of the SCIEnCE 6-8 online learning community and classroom observation and feedback for facilitating the application of exemplars, content, and pedagogical knowledge learned through the SCIEnCE 6-8 program into their practice?

Data sources

To answer these questions the following data were collected.

- ***Post-Summer Institute Survey (Appendix A)***. This survey collected demographic data as well as (1) teacher perceptions of program effectiveness, (2) self-reported growth as a result of the program, (3) teacher plans to implement material presented through the program, (4) assessment of the usefulness of various components, (5) questions about teachers' perceptions of the NSTA Learning Center resources; and (6) two open-ended questions that asked participants to identify the best parts of the program as well as give suggestions for program improvement.

- ***End-of-Program Survey (Appendix A).*** The end-of-program survey included most of the same sections as the pre-survey, however it did not include the questions about workshop lesson effectiveness. It also included a question that asked teachers to report the frequency of use of the NSTA Learning Center.

- ***Teacher Interviews (Appendix B)***. Two phone interviews with teacher participants were conducted in June of 2014.

- ***NSTA Learning Center Data.*** Data were collected from the NSTA Learning Center about participants' engagement with the online activities.

Appendix C presents an evaluation matrix that connects evaluation questions with data sources and data collection schedules.

Data Analysis

Quantitative data was analyzed using SPSS 22.0, and included both descriptive and inferential analyses. Focus group data was analyzed using ATLAS.ti, a qualitative data analysis software allowing for thematic analysis. Field notes and unit plan analysis provided additional qualitative insight into the program's progress toward the three program goals.

Professional Development Profile

The SCIEnCE 6-8 program included a five-day intensive summer program, school year follow up activities, and a culminating event in the spring of 2014. Below are the descriptions of these key program components.

Five Day Summer Institute

The weeklong professional development institute integrated each of the project components (science content, NoS, IBL, Understanding by Design (UbD), technology, and performance assessments) throughout the week to model an integrated approach to teaching and learning. Lessons focused on the scientific investigation strand; force, motion, energy, and matter. The NoS Documents provided by VDOE (*2010 Science Standards of Learning, Science Curriculum Framework, Enhanced Scope and Sequence)* were used as the foundation for content during the week. Additionally, teachers were provided with resources related to UbD, performance assessments, the NSTA Learning Center, technology integration, and 5E cycle for inquiry. Teachers actively participated in investigations with science content related to the emphasized strands and content indicated previously.

School Year Activities

There were several components of the program that kept teachers engaged with the science content through the school year. A core school year activity involved the teachers developing and implementing a unit based on the pedagogical strategies covered during the summer workshop. During the school year, teachers were encouraged to regularly log on to the NSTA Learning Center, an online professional learning site that provided targeted learning modules related to course content. In addition program leaders from ITTIP provided individual support

through ongoing electronic communication as well as individual school visits and classroom observations.

Culminating Event

The culminating event occurred in May of 2014 at Longwood University. This event brought together all of the participating teachers. Each teacher presented the unit that was developed through the program and shared the results of integrating the unit into classroom practice.

Participant Profile

Seventeen teachers from eleven schools completed in the program. Table 1 provides a demographic breakdown of teacher participants. Fifteen of the 17 participants responded to the end-of-program survey (a response rate of 88%).

Table 1. Demographics Profile of SCIEnCE Participants

Schools Represented	Participants
Amelia County Middle School	1
Bailey Bridge Middle	3
Buckingham County Middle School	2
Carver Middle School	1
Elizabeth Davis Middle School	1
Falling Creek Middle School	1
Matoaca Middle School	2
Nottoway Middle School	1
Salem Church Middle School	1
Prince Edward Middle	1
Providence Middle	1
Grade Level	
6	8
7	0
8	7
Years of Experience	
1 to 2	0
3 to 5	1
6 to 10	7
11 to 20	6
21 or more	1

Findings

Below is a presentation of the findings from this evaluation effort. The findings have been organized into the following categories:

- Impact on Pedagogical Content Knowledge
- Changes in Practice
- Impact on Students
- Overall Program Perceptions

Impact on Pedagogical Content Knowledge

One of the core goals of the SCIEnCE 6-8 professional development program was to improve the science pedagogical content knowledge of participating teachers. The section below discussed the observed impact on both the scientific content knowledge as well as on teachers' growth in the understanding of science pedagogy.

To assess the extent to which the program impacted teachers' science content knowledge participants were asked to indicate the level of agreement with a series of items that related directly to the science standards covered in the summer workshop. These survey items were administered twice: once at the end of the summer 2013 workshop and then again in the spring of 2014, at the end of the program. Table 2 presents the results from the post workshop survey in summer of 2013. Table 3 presents the results of the end-of-program survey administered in May of 2014. Table 4 presents the mean scores for each item at each time point, as well as the change in mean from summer 2013 to spring 2014.

Table 2. Teacher Perceptions of the Effectiveness of the SCIEnCE 6-8 Program on Content Knowledge – Post-Summer Institute. (n=22)

The SCIEnCE program . . .	Strongly Disagree	Disagree	Agree	Strongly Agree
...has given me a better understanding of the empirical nature of scientific knowledge.	0.0% (0)	0.0% (0)	50.0% (11)	50.0% (11)
...has made me more knowledgeable about the production of scientific knowledge through observation and inference.	0.0% (0)	0.0% (0)	68.2% (15)	31.8% (7)
...has made me more aware of the differences between scientific law and scientific theory.	0.0% (0)	0.0% (0)	45.4% (10)	54.6.0% (12)
...has made me more aware of the subjective nature of scientific knowledge.	0.0% (0)	0.0% (0)	63.6% (14)	36.4% (8)
...has helped me to understand ways in which scientists plan and carry out investigations.	0.0% (0)	4.5% (1)	68.2% (15)	27.3% (6)
...has helped me understand the importance of	0.0% (0)	0.0% (0)	50.0% (11)	50.0% (11)

analyzing and interpreting scientific data.

Table 3. Teacher Perceptions of the Effectiveness of the SCIEnCE 6-8 Program on Content Knowledge – Post-Program. (n=15)

The SCIEnCE program . . .	Strongly Disagree	Disagree	Agree	Strongly Agree
...has given me a better understanding of the empirical nature of scientific knowledge.	0.0% (0)	7.1% (1)	57.1% (8)	35.7% (5)
...has made me more knowledgeable about the production of scientific knowledge through observation and inference.	0.0% (0)	7.1% (1)	42.9% (6)	50.0% (7)
...has made me more aware of the differences between scientific law and scientific theory.	0.0% (0)	21.4% (3)	57.1% (8)	21.4% (3)
...has made me more aware of the subjective nature of scientific knowledge.	0.0% (0)	7.1% (1)	64.3% (9)	28.6% (4)
...has helped me to understand ways in which scientists plan and carry out investigations.	0.0% (0)	0.0% (0)	64.3% (9)	35.7% (5)
...has helped me understand the importance of analyzing and interpreting scientific data.	0.0% (0)	0.0% (0)	64.3% (9)	28.6% (4)

Table 4. Teacher Perceptions of the Effectiveness of the SCIEnCE 6-8 Program on Content Knowledge – Mean Change

The SCIEnCE program . . .	Summer 2013 Post-Workshop Mean n=22	Spring 2014 Post-Program Mean n=15	Change in Mean
...has given me a better understanding of the empirical nature of scientific knowledge.	3.50	3.29	-0.21
...has made me more knowledgeable about the production of scientific knowledge through observation and inference.	3.32	3.43	+0.11
...has made me more aware of the differences between scientific law and scientific theory.	3.55	3.00	-0.55
...has made me more aware of the subjective nature of scientific knowledge.	3.36	3.21	-0.15
...has helped me to understand ways in which scientists plan and carry out investigations.	3.23	3.36	+0.13
...has helped me understand the importance of analyzing and interpreting scientific data.	3.50	3.31	-0.19

In addition to the questions directly related to the science content standards, the post-workshop survey also contained several items that asked participants to report knowledge growth on pedagogical approaches including inquiry-based learning, Understanding by Design, and use of technology. The results from these questions are reported in table 5.

Table 5. Teacher Perceptions of growth in Pedagogical Content Knowledge

The SCIEnCE program . . .	Strongly Disagree	Disagree	Agree	Strongly Agree
...has increased my understanding of inquiry-based learning.	0.0% (0)	5.0% (1)	20.0% (4)	75.0% (15)
…has increased my understanding of Understanding by Design.	0.0% (0)	0.0% (0)	35.0% (7)	65.0% (13)
…has increased my understanding of technology and sensors.	0.0% (0)	0.0% (0)	25.0% (5)	75.0% (15)

Overall, the survey items from the two time points indicate a general agreement among participants that the program improved their knowledge of the majority of targeted science content. However, it is worth noting that on some items there was also a slight drop off on the level of agreement across the two time periods. For example, there was a .55 point drop in agreement on the item "has made me more aware of the differences between scientific law and scientific theory." This suggests that teachers' perceptions of knowledge growth was highest for some items directly after the workshop, and that their sense of knowledge growth faded somewhat through the school year.

Data from the open-ended responses on the surveys and from the teacher interviews suggest that the hands-on nature of the courses helped participants to better understand these content areas. One teacher indicated in an interview that they "really liked using the Probe-ware that they gave us," and that "We actually implemented it this year in our classes." Another teacher responded on the survey to say "this professional development was extremely helpful to me in preparation for implementing PBLs this year." Along the same lines another teacher stated, "I learned about inquiry, as well as PBL. I now feel more confident to implement the above in my teaching." One of the interviewed teachers suggested that the main thing learned from the program about the teaching of science was that "there are so many more different ways to incorporate things, especially for special education students." Teachers also suggested that the pedagogical strategies used would have a lasting impact on their practice. For example, one teacher stated, "I have tried my best to incorporate a lot of what I learned. There are still a few items that I was not able to integrate this year, but am excited to continue learning and using in following years."

NSTA Learning Center Data

A key component of the SCIEnCE professional development model was the use of the NSTA Learning Center to support the ongoing growth of teachers through the school year. The Learning Center allowed teachers to engage in a wide range of personal learning activities, as well as opportunities to find and share resources. When teachers engaged with the site, they were awarded activity points and, at certain times, badges for the completion of particular activities. Overall the participating teachers involved in the SCIEnCE program earned 36,325 points. The average number of points earned per teacher was 2018, with a maximum of 5080 and a minimum of 880. The teachers also earned a total of 94 badges. The average per teacher was 5.2, with a max of 9 and a minimum of 3.

Changes in Practice

Another goal of the SCIEnCE program was to impact the pedagogical practice of the teacher participants. To assess change in practice, a retrospective self-report pretest/posttests (Lam & Bengo, 2003) was used. This instrument asked teachers to indicate the likelihood of engaging in particular pedagogical strategies both "prior to" and "after" participation in the SCIEnCE professional development. The strategies asked about included Inquiry-based Learning, Understanding by Design, Nature of Science, the 5e instructional model, and technology integration. Table 6 presents the frequencies of responses, the pre and post means, and the results of paired sample t-tests for statistical significance for these items.

Table 6. Teacher Reported Change in Practice Related to the SCIEnCE Program – End of Year.

	Not at all likely	Somewhat likely	Likely	Very likely	M	$t(14)$	p
What is the likelihood that you would develop lessons that use inquiry-based learning?							
PRIOR TO your participation in the SCIEnCE program.	7.1% (1)	35.7% (5)	50.0% (7)	7.1% (1)	2.6	-5.70	.000*
AFTER your participation in the SCIEnCE program.	0.0% (0)	14.3% (2)	42.9% (6)	42.9% (6)	3.3		
What is the likelihood that you would develop lessons using Understanding by Design principles?							
PRIOR TO your participation in the SCIEnCE program.	21.4% (3)	50.0% (7)	21.4% (3)	7.1% (1)	2.1	-4.20	.001*
AFTER your participation in the SCIEnCE program.	0.0% (0)	21.4% (3)	64.3% (9)	14.3% (2)	2.9		

What is the likelihood that you would develop lessons using the Nature of Science?							
PRIOR TO your participation in the SCIEnCE program.	7.1% (1)	42.9% (6)	42.9% (6)	7.1% (1)	2.6	-3.31	.006*
AFTER your participation in the SCIEnCE program.	0.0% (0)	14.3% (2)	57.1% (8)	28.6% (4)	3.1		
What is the likelihood that you would develop lessons using the 5e instructional model?							
PRIOR TO your participation in the SCIEnCE program.	28.6% (4)	42.9% (6)	21.4% (3)	7.1% (1)	2.2	-3.33	.006*
AFTER your participation in the SCIEnCE program.	0.0% (0)	30.8% (4)	46.1% (6)	23.1% (3)	2.9		
What is the likelihood that you would develop lessons that integrate technology?							
PRIOR TO your participation in the SCIEnCE program.	0.0% (0)	14.3% (2)	28.6% (4)	57.1% (8)	3.4	-2.48	.028*
AFTER your participation in the SCIEnCE program.	0.0% (0)	0.0% (0)	14.3% (2)	85.7% (12)	3.9		

* significant at the <.05 level.

This data suggest that teacher participants were much more likely to incorporate the targeted instructional strategies after their participation in the SCIEnCE professional development program. The largest growth was with teachers' predicted use of the Understanding by Design principles (+0.8) and the 5e Instructional Model (+0.7).   Results of paired *t*-tests indicate that the change in teacher behavior is statistically significant for all pedagogical methods.

These findings are supported by the qualitative data collected through the interviews and open-ended survey questions. Teachers suggested that the program was helpful in terms of their practice. For example, during an interview one teacher stated, "being new to teaching science, this course was extremely helpful in helping me find a good balance between giving information and allowing students to discover information."

Impact on Students

Although student level data was not collected, teachers were asked during the interviews to report on their perceptions of the impact of the targeted pedagogical practices on student motivation, engagement, and achievement. Teachers indicated that overall their students "really liked" these strategies. One teacher stated, that her students, "liked the activity as a whole because they got to do stuff and use the technology." One teacher mentioned that the individual students interacted with the material differently. For example, "some kids readily do it and some kids come need to come around to it." In regards to achievement, both teachers interviewed

suggested that SCIEnCE practices would have a positive impact on students' achievement. One teacher said that the impact of the program might impact even more than achievement:

> I think it goes back to imagination, I think when we are able to critically think and use creativity in our thinking and not be afraid to be wrong, but to use inquiry and to investigate, to not always worry about getting the right answer, is how I think we get some of the best people.

The interview data suggest that students were interacting well with SCIEnCE techniques, and if the teachers' beliefs are correct, there will be a positive impact on academic achievement.

Overall Program Perceptions

A number of questions on the teacher surveys and the interviews were used to gauge participants' perceptions of the overall relevance and effectiveness of the SCIEnCE 6-8 professional development program. This section is broken out to present the findings related to the various program components.

Effectiveness of Summer Institute

On the post-summer institute survey, teachers were asked to rate the effectiveness of each lesson presented from "ineffective" to "very effective." A summary of participant responses is reported in Table 7.

Table 7. Perceived Effectiveness of SCIEnCE 6-8 Program Lessons – Post Summer Institute.

	Ineffective	Somewhat ineffective	Effective	Very effective
The lesson on Technology?	0.0% (0)	5.0% (1)	35.0% (7)	60.0% (12)
The lesson on 5E Lesson Design?	0.0% (0)	5.0% (1)	45.0% (9)	50.0% (10)
The lesson on the Nature of Science?	0.0% (0)	0.0% (0)	40.0% (8)	60.0% (12)
The lesson on Modifying Labs?	0.0% (0)	15.0% (3)	50.0% (10)	35.0% (7)
The lesson on NSTA Learning Center?	0.0% (0)	0.0% (0)	20.0% (4)	80.0% (16)
The lesson on Theory vs. Law?	0.0% (0)	0.0% (0)	60.0% (12)	40.0% (8)
The lesson on Problem Based Assessment?	0.0% (0)	5.0% (1)	35.0% (7)	60.0% (12)
The lesson on Modeling?	0.0% (0)	0.0% (0)	60.0% (12)	40.0% (8)
The lesson on NGSS?	5.0% (1)	25.0% (5)	40.0% (8)	30.0% (6)
The lesson on Understanding by Design?	0.0% (0)	0.0% (0)	60.0% (12)	40.0% (8)
The lesson on Unit Plan Development?	0.0% (0)	0.0% (0)	45.0% (9)	55.0% (11)

Whereas most lessons were rated as "effective" by a majority of the participants, five were rated "very effective" by a majority of teachers: the lesson on technology, the lesson on the nature of science, the lesson on the NSTA Learning Center, the lesson on problem based assessment, and the lesson on unit plan development. Conversely, the lesson on the NGSS was rated as "ineffective" or "somewhat ineffective" by 30% of the participants.

Through the interviews and open-ended survey items, the lessons that were most specifically called out were those on technology and on problem-based assessment. In reference to problem-based assessment, one interviewed teacher stated, "I had heard of it and done a little bit, but this gave me more to go on as far as designing stuff that will meet all of our students' needs." At the same time, several participants used the open response question on the survey to highlight the value of the technology training: "I felt that every activity was great for showing me that I have largely been using only what my teachers used on me, effectively limiting my teaching." The only concern raised in relation to these lessons was the time allotted: on the end-of-program survey four participants suggested a reevaluation of workshop timing so that more attention or examples could be given, particularly in relation to problem-based assessment.

Perception of the NSTA Learning Center

The NSTA Learning Center is a key component to the continuing impact of the SCIEnCE 6-8 program on participating teachers' content knowledge and instruction. For this reason, three survey questions focused explicitly on the NSTA Learning Center. While 95% of participants responded on the post workshop survey that they would "likely" or "very likely" use the NSTA resources during the year, by the end-of program survey almost 65% indicated that they only used it "a few times", and only a single individual used the Learning Center "weekly." That being said, all participants indicated some level of use. Participants indicated a positive perception of the NSTA Learning Center as a professional learning tool, with only one participant saying that the tool was "somewhat ineffective." Almost half (42.9%) suggested that the web site was "somewhat difficult" to navigate.

Qualitative data through the interviews and open-ended survey items suggest both positive and negative teacher reactions to the NSTA Learning Center. One interviewed teacher used the resources for more than what was required over the course of the program: "I started an outdoor classroom initiative at our school this year, so I used NSTA to pull down resources for that as well." Another teacher stated, that "the tools and resources are nicely consolidated on the

NSTA website." However other perspectives suggest that while the NSTA resources contained some useful information, they were difficult to navigate and use. For example, one teacher stated, "when I used the NSTA website, I did find it to be quite frustrating at times." Another teacher stated, "not being able to locate exactly what I wanted kind of discouraged me."

Overall Program Perceptions

Teacher perceptions of the SCIEnCE program were positive. All participants indicated that the program "met" (54%) or "exceeded" (46%) their expectations. When asked if they would recommend the program to their colleagues, 50% said they would "highly recommend it", 43% said the would "recommend it," and only 7% (1 participant) said the would "recommend the program with reservations." When asked about the best components of the program on the en-of-program survey a number of ideas were presented:

- *Hands-on learning*. Almost all of the participants recognized the "hands-on portions" of the program" and the "face-to-face interactive learning" as one of its best aspects. For example on teacher stated that she appreciated, "the demonstrations of lessons with time to digest it. Often at these classes, information is just constantly thrown at you, you'll get an idea and forget it before you have time to write it down or explore it. This program had great examples with that really important time associated with it as well.

- *Opportunities for collaboration*. Several teachers indicated that the opportunity to interact with other teachers while learning the content was very valuable. For example oone teacher stated that she appreciated the "interaction with the other teachers and getting their perspective on several concepts."

- *Access to new technology resources*. Teachers also suggested that the resources obtained through the program were useful when brought back to their classrooms. One teacher wrote, "I love getting tools that I can use in my classroom and then integrating it into instruction."

- *Skilled instructors and presenters*. One teacher stated, "the faculty were phenomenal and helpful to me in my first year of teaching science." Along these lines another teacher, writing about the workshop presenters, stated, "Having people who can speak with enthusiasm and intelligence goes a long way."

- *NSTA Learning Center.* Despite frustration among some teachers with the site, others recognized it is a very valuable resource. One teacher stated, "I used the NSTA site often which otherwise I would not have."

Suggestions for Improvement

Teacher participants were also asked on the end-of-program survey for suggestions for improvement. Several key themes emerged:

- *Making more of the summer workshop*. Some teachers pointed out that it was difficult to continue the high level of engagement with the course once the school year hit. For this reason, one participant suggested, "pushing participants to work on their lessons and the other requirements during the summer."

- *More time for unit development.* One teacher wrote, "I would have liked more time to actually work on creating my PBL unit."

- *Providing more structure during the school year.* Some teachers suggested enhancing the school year follow up to encourage teachers to engage with the material while teaching. For example one teacher wrote, "create a class in Moodle that requires the teachers to login to the NSTA learning center a few times each nine week grading period to create a lesson that utilizes a NSTA resource. This would have helped me greatly and kept me more on task on using the NSTA resources more effectively."

Conclusions and Recommendations

The findings from this evaluation suggest that the SCIEnCE 6-8 professional development program is having a positive impact on teacher pedagogical content knowledge and teacher practice. There is also some anecdotal evidence that these strategies are having a positive effect on student engagement and achievement. Overall, the participating teachers rated the program as a very effective and relevant professional development experience.

The findings from the evaluation also lead to several recommendations for future program development and evaluative work.

- *Review of the effectiveness of the NSTA Learning Center.* The data from the evaluation suggested that teachers had mixed reactions to the NSTA Learning Center. While there seem to be some teachers that embraced the resources, many seemed frustrated in

attempts to use it. This suggests that if the NSTA Learning Center is used again, more time should be spent establishing the value of the resource and helping teachers navigate it.

- ***School year follow-up to ensure retention of pedagogical content knowledge.*** The number of participants "strongly agreeing" with statements related to course impact decreased between pre and post survey. Some of the data on teacher pedagogical content knowledge showed a drop of in self-reported knowledge gain between the end of the summer institute and the end of the program. This suggests that the program leaders may want to assess school year activities to ensure that they are reinforcing program content.

- ***Determining ways to assess impact on students.*** Ultimately the goal of any teacher professional development is improved student outcomes. However, determining the impact on students in programs like this is difficult because of the range of grade levels and participating schools and school divisions. Developing a common assessment that is valid and reliable across this range of settings and populations is challenging. Nonetheless, it is important to develop program and evaluation strategies that allow for a deeper understanding of student impact. Future work should go into assessing the impact of these strategies across a broad spectrum of contexts.

Appendices

Appendix A: SCIEnCE 6-8 Professional Development Survey (*Post-Workshop and Post-Program*)

Post-Workshop Survey Introduction: This survey is part of an external evaluation of the SCIEnCE professional development to help measure the extent to which the program meets its stated goals. The focus of this survey is the summer 2013 workshop. Additional information will be collected through the 2013-2014 school year as you participate in additional program activities and apply the knowledge gained to your classroom practice. The survey results will be kept anonymous and used only for the purposes of program evaluation. Your feedback on the form and quality of this professional development is very important. If at any time you feel that you cannot or do not want to answer the question being asked then you may skip that question. The survey should take approximately 10 minutes to complete. Thank you in advance for your participation!

Post-Program Survey Introduction: This survey is part of an external evaluation of the SCIEnCE professional development program to help measure the extent to which the program has met its stated goals. The survey results will be kept anonymous and used only for the purposes of program evaluation. Your feedback on the form and quality of this professional development is very important. If at any time you cannot or do not feel like answering a question you may skip it and move to the next one. The survey should take approximately 10 minutes to complete. Thank you in advance for your participation!

What is the name of your school?

What grade level do you teach?
6
7
8
Other

How many years have you been teaching?
1 to 2
3 to 5
6 to 10
11 to 20
21or more

Content Knowledge
Indicate the degree to which you AGREE or DISAGREE with the following statements about what you have learned in the SCIEnCE program.
Scale: 1 = Disagree strongly, 2 = Disagree; 3 = Agree; 4 = Agree Strongly.
The SCIEnCE program . . .
- ...has given me a better understanding of the empirical nature of scientific knowledge.

- ...has made me more knowledgeable about the production of scientific knowledge through observation and inference.
- ...has made me more aware of the differences between scientific law and scientific theory.
- ...has made me more aware of the subjective nature of scientific knowledge.
- ...has helped me to understand ways in which scientists plan and carry out investigations.
- ...has helped me understand the importance of analyzing and interpreting scientific data.
- ...has increased my understanding of inquiry-based learning. *(Post-workshop only)*
- …has increased my understanding of Understanding by Design. *(Post-workshop only)*
- …has increased my understanding of technology & sensors. *(Post-workshop only)*

Change in Practice
Post-Workshop Survey Prompt: The following questions assess potential changes in your professional practice. Consider the likelihood that you would engage in the following professional activities both PRIOR TO and AFTER your participation in the SCIEnCE week-long summer program.
Post-Program Survey Prompt: The following questions assess potential changes in your professional practice. Consider the likelihood that you would engage in the following professional activities both PRIOR TO and AFTER your participation in the SCIEnCE professional development program.
Scale: 1 = Not at all likely; 2 = Somewhat likely; 3 = Likely; 4 = Very likely

- What is the likelihood that you would develop lessons that use inquiry-based learning?
  PRIOR TO your participation in the SCIEnCE program.
  AFTER your participation in the SCIEnCE program.
- What is the likelihood that you would develop lessons using Understanding by Design principles?
  PRIOR TO your participation in the SCIEnCE program.
  AFTER your participation in the SCIEnCE program.
- What is the likelihood that you would develop lessons using the Nature of Science?
  PRIOR TO your participation in the SCIEnCE program.
  AFTER your participation in the SCIEnCE program.
- What is the likelihood that you would develop lessons using the 5e instructional model?
  PRIOR TO your participation in the SCIEnCE program.
  AFTER your participation in the SCIEnCE program.
- What is the likelihood that you would develop lessons that integrate technology?
  PRIOR TO your participation in the SCIEnCE program.
  AFTER your participation in the SCIEnCE program.

Lesson Effectiveness (*Post Workshop Only*)
The following questions are designed to assess your perception of the relevance and effectiveness of the SCIEnCE week-long summer program for your understanding and practice. How EFFECTIVE or INEFFECTIVE were the following elements of the program?
Scale: 1 = Ineffective; 2 = Somewhat effective; 3 = Effective; 4 = Very effective
- The lesson on technology
- The lesson on 5E Lesson Design

- The lesson on the Nature of Science
- The lesson on modifying labs
- The lesson on NSTA Learning Center
- The lesson on theory vs. law
- The lesson on Problem Based Assessment?
- The lesson on Modeling?
- The lesson on NGSS?
- The lesson on Understanding by Design?
- The lesson on Unit Plan Development?

How likely are you to use the NSTA Learning Center throughout the next school year? (*Post-Workshop Survey Only*)
Very unlikely
Somewhat likely
Likely
Very likely

How often did you use the NSTA Learning Center throughout the school year? (*Post-Program Only*)
Never
Only a few times
At least once a month
Every week
Every day

How effective do you think the NSTA Learning Center is as a professional learning tool?
Ineffective
Somewhat effective
Effective
Very effective

Choose the sentence that best describes your experience of navigating through the NSTA web site:
Navigating through the NSTA web site was very difficult.
Navigating through the NSTA web site was somewhat difficult.
Navigating through the NSTA web site was somewhat easy.
Navigating through the NSTA web site was very easy.

To what extent did this program meet your expectations?
This program did not meet my expectations
This program met my expectations
This program exceeded my expectations

Would you recommend the SCIEnCE program to other teachers that you know?
I would not recommend this program
I would recommend this program with reservations

I would recommend this program
I would highly recommend this program

What were the best parts of the SCIEnCE program?

How would you suggest improving the program?

Appendix B: Teacher Focus Group Interview Protocol

1. **Introductions**
   a. District, school
   b. Grade level

2. **Activities**
   a. Last summer's workshop - What do you remember doing?
   b. NSTA learning Center – Did you use it? Was it helpful?
   c. What other school year follow up has there been as a part of this program?
      i. Observations / visits / online?

3. **What were the main things you learned in this class?**
   a. Content – Science, Nature of Science, Scientific Investigation
   b. Pedagogical – Instructional Practices, Problem-based, IBL, Interdisciplinary, UbD, Technology

4. **Since you have taken the class, have you had opportunities to integrate the knowledge you have gained into your practice?**
   a. Examples?

5. **What products were expected?**

6. **Do you feel like this has made you a more effective teacher?**

7. **How have the students responded to the strategies you learned through this program?**
   a. Is it helping them grasp the concepts?
   b. Are they interested? Are they motivated?
   c. Do you think the strategies you learned through this training are going to have an impact on student math achievement?

8. **Has your participation in the program led you to collaborate with teachers inside and outside of your school and division?**

9. **How do you feel about the platform for professional development? Face-to-face class and follow up? NSTA tool?**

10. **What do you see as the strengths of this course?**

11. **How do you think it could have been improved?**

Appendix C: Evaluation Matrix

GOAL 1: Develop and implement high-quality professional development activities through integration of UbD, IBL, Problem-Based Assessments and 5e instructional models to improve teacher's knowledge of physical science concepts and the NoS.			
Evaluation Questions	**Data Collection Activities**	**Data Collection Instruments**	**Data Collection Schedule**
What is effect of the SCIEnCE 6-8 weeklong professional development on the content knowledge and pedagogical knowledge of participants? What is the effect of the individualized National Science Teachers Association Learning Center courses on the content knowledge and self-efficacy for science pedagogy of participants? What are participants' perceptions of the relevance and effectiveness of the SCIEnCE 6-8 professional development?	• Administer PD pre and post assessments • Administer PD inquiry assessment • Administer pre and post PD impact assessment • Administer program post assessment • Conduct focus group • Administer end of program post assessment • Conduct focus group	• NSTA content and pedagogical skill assessment • Concord Inquiry Assessment • Locally developed teacher self-report program-impact assessment • NSTA content and teacher efficacy assessment • Focus group protocol • Locally-developed teacher self-report program satisfaction • Focus group protocol	• Summer 2013 • Summer 2013 • Summer 2013 • Fall 2013 • Spring 2014 • Spring 2014 • Spring 2014

GOAL 2: Develop and model exemplars integrating IBL, UbD, and NoS for improving physical science achievement and reducing achievement gaps in subgroups of students with disabilities.			
Evaluation Questions	**Data Collection Activities**	**Data Collection Instruments**	**Data Collection Schedule**
To what extent are teachers implementing	• Administer end of program post	• Locally-developed post test of teacher	• Spring 2014

the exemplars and integrating the content and pedagogical practices gleaned from the SCIEnCE 6-8 workshops into their teaching?	assessment • Conduct classroom observations • Unit plan analysis • Conduct focus group	self-report of integration • Trainer-developed classroom observation instrument • Unit plan rubric • Focus group protocol	• Fall/Spring 2013-2014 • Spring 2014 • Spring 2014 • Spring 2014
What evidence is there that the knowledge and skills gained through the SCIEnCE 6-8 professional development is having an impact on student achievement and achievement gaps between student sub-groups?	• Administer end of program post assessment • Conduct focus group • Collect school level standardized achievement data	• Locally-developed teacher self-report on student impact • Focus group protocol • State tests	• Spring 2014 • Summer 2014

GOAL 3: Facilitate collaborative online learning community of teachers to develop, share, and implement units of instruction and support the teachers through classroom observation and feedback.			
Evaluation Questions	**Data Collection Activities**	**Data Collection Instruments**	**Data Collection Schedule**
What are participants' perceptions of the effectiveness of the SCIEnCE 6-8 online learning community and classroom observation and feedback for facilitating the application of exemplars, content, and pedagogical knowledge learned through the SCIEnCE 6-8 program?	• Administer end of program post assessment • Conduct focus group	• Locally-developed post-test of teacher program satisfaction • Focus group protocol	• Summer 2013/Spring 2014 • Spring 2014