SECTION IV – EVIDENCE FOR MEETING STANDARDS

Assessment 6:
Professional Knowledge and Skills

(1)
a. Description of the assessment and its use in the program

This assessment of professional scientific knowledge and skills was created by faculty members from the Biology, Chemistry, and Physics department in Fall 2011 in response to the newly revised version of the NSTA standards (NSTA-2012).

The motivation for 2012 NSTA Standard 6 reads as follows: "Effective teachers of science strive continuously to improve their knowledge and understanding of the ever changing knowledge base of both content, and science pedagogy, including approaches for addressing inequities and inclusion for all students in science. They identify with and conduct themselves as part of the science education community."

Faculty from the three natural science programs agreed that a focus on the dynamic and evolving nature of scientific discovery was a crucial perspective that our teacher candidates need to bring into their classrooms and that this emphasis had not been systematically assessed in the past. It was determined that a pre-existing, required, chemistry seminar course and the required biology capstone course were already demanding these skills of teacher candidates. The physics department determined that this emphasis had not been previously required in the curriculum, and a new course was created, PHY299: "Research Fundamentals Seminar," in order to ensure that all teachers had engaged in learning about new discoveries in physics and to explore how such discoveries come about.

b. A description of how this assessment specifically aligns with the elements and standards it is cited for in Section III. Cite SPA standards by number, title, and/or standard wording.

This assessment aligns with 2012 NSTA Standards 6a. and 6b.:

6a) Engage in professional development opportunities in their content field such as talks, symposiums, research opportunities, or projects within their community.

6b) Engage in professional development opportunities such as conferences, research opportunities, or projects within their community.

c. Data findings:

Biology
From Fall 2016-Spring 2019, eight Biology students were evaluated (note that when there was no opportunity to observe a particular outcome, data from fewer than eight students is presented for any particular rubric element). One student was identified as needing improvement in each of two elements: participation in community events (scientific seminars), and scientific writing. All other students were rated as either proficient, or exceptional. Collectively, students demonstrated their strongest performance in their ability to access and use primary scientific literature (75%, or 6/8 students).

Chemistry
Only one Chemistry student was evaluated, and was scored as proficient or exceptional in all assessment elements.

Physics
From Fall 2016-Spring 2019, seven Physics students were evaluated, and 100% demonstrated either proficiency or excellence in each assessment element. The Physics students were rated consistently exceptional (6/7 students) in oral and written communication, and in their understanding of the role of research in the scientific enterprise.

d. Interpretation of how data provides evidence for meeting standards:

All but one student across the three programs evaluated on this assessment met proficiency expectations and a significant portion excelled in meeting some elements of the assessment. The administration of this assessment is somewhat complex in that it is completed by multiple faculty members across many sections of several different courses. For this reason, it is not surprising that several of the assessment elements may not apply to the material covered by different instructors in different courses. Nevertheless, science faculty have provided positive feedback on the assessment and we are confident that it is now being administered appropriately in well-aligned courses. These faculty are becoming more familiar with the rubric, and have consistent guidance from the three program coordinators.

More data is needed to reinforce this conclusion, but particularly in Physics and Biology (data from only one chemistry student was available), students are clearly meeting NSTA standards 6a. and 6b.

2) Assessment Documentation

NCATE/NSTA Assessment 6: Professional Knowledge

Motivation:
This assessment is designed to address revised assessment requirements as contained in the newly adopted (fall 2011) NSTA Standards for Science Teacher Preparation.

Assessment Distribution Needs:

- Courses:

  - **Biology: BIO498** (Senior Seminar), **BIO493** (Independent Research II), and **BIO494** (Honors Independent Research II); one course is required to meet the capstone requirement
  - **Chemistry: CHE317** (final course in the 3-year seminar sequence)
  - **Physics: PHY299** (Research Fundamentals Seminar)

Science (Natural Science) Professional Knowledge Fall 2014

by COE Administrator

Natural Science Professional Knowledge Fall 2014

Standards

NSTA-2012.6 Professional Knowledge and Skills: Effective teachers of science strive continuously to improve their knowledge and understanding of the ever changing knowledge base of both content, and science pedagogy, including approaches for addressing inequities and inclusion for all students in science. They identify with and conduct themselves as part of the science education community.

NSTA-2012.6a Engage in professional development opportunities in their content field such as talks, symposiums, research opportunities, or projects within their community.

NSTA-2012.6b Engage in professional development opportunities such as conferences, research opportunities, or projects within their community.

Natural Science Professional Knowledge Fall 2014

	Exceptional (Target) (3.000 pts)	**Proficient (Acceptable)** (3.000 pts)	**Needs Improvement (Unacceptable)** (1.000 pt)	**NA** (0.000 pt)
• The student's participation and reaction statements regarding research seminars in the content area show that the student was engaged in the research community. Attendance at seminars and reaction statements showed strong engagement. (1.000, 16.7%)				
• The student's presentation(s) show that s/he is capable of successfully presenting data/research interpretations to a scientific audience. • Student's oral communication effectively conveyed scientific ideas. (1.000, 16.7%)				
• The student's written work demonstrates that s/he is capable of successfully presenting data/research interpretations to a scientific audience. • Student's written communication effectively conveyed scientific ideas. (1.000, 16.7%)				
• The student's work shows that s/he understands the role of research and discovery in the scientific enterprise. • The student shows evidence of learning about diverse career paths and opportunities within their discipline. (1.000, 16.7%)				

• The student's performance in this course indicates that s/he mastered the library/online skills needed to research, retrieve and evaluate current primary literature in the content area. • The student shows an ability to distinguish important and reliable scientific sources from nonscientific or unreliable sources. (1.000, 16.7%)				
• The student demonstrates an understanding of ethics related to the collection and publication of scientific data • The student shows an understanding of intellectual property and copyright as they apply to the collection and use of scientific data and results. (1.000, 16.7%)				

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My Reports - Assessment Report

General Information

Title	Bio 498 Livetext Data 16-17 --> 18-19
Institution	NJ: The College of New Jersey
Course Section	2017 Fall - BIO498 - B 2018 Fall - BIO498 - B 2018 Spring - BIO498 - B 2019 Spring - BIO498 - A 2019 Spring - BIO498 - B
Assessment Rubric	SoS Professional Knowledge - Rubric (COE Administrator)
Assessment Type	Summative
Scoring Type	Final
Inter-Rater Summary	N

Rubric: Rubric

	Exceptional *(3 pts)*	Exceptional *(3 pts)*	Proficient *(2 pts)*	Proficient *(2 pts)*	Needs Improvement *(1 pts)*	Needs Improvement *(1 pts)*	*n*	*Mean*	*Mode*	*Stdev*
Participation in community events relating to science research. The students participation and reaction statements regarding research seminars in the content area show that the student was engaged in the research community. Attendance at seminars and reaction statements showed strong engagement.	1	50.00%	0	0.00%	1	50.00%	2	2.000	1.000	1.000
Oral presentation of scientific content. The students presentation(s) show that s/he is capable of successfully presenting data/research interpretations to a scientific audience. Students oral communication effectively conveyed scientific ideas.	5	62.50%	3	37.50%	0	0.00%	8	2.625	3.000	0.484
Written presentation of scientific content. The students written work demonstrates that s/he is capable of successfully presenting data/research interpretations to a scientific audience. Students written communication effectively conveyed scientific ideas.	4	50.00%	3	37.50%	1	12.50%	8	2.375	3.000	0.696
Career development activities. The students work shows that s/he understands the role of research and discovery in the scientific enterprise. The student shows evidence of learning about diverse career paths and opportunities within their discipline.	1	100.00%	0	0.00%	0	0.00%	1	3.000	3.000	0.000
Ability to access and use primary scientific literature. The students performance in this course indicates that s/he mastered the library/online skills needed to research, retrieve and evaluate current primary literature in the content area. The student shows an ability to distinguish important and reliable scientific sources from nonscientific or unreliable sources.	6	75.00%	2	25.00%	0	0.00%	8	2.750	3.000	0.433
Scientific Ethics and Intellectual Property: The student demonstrates an understanding of ethics related to the collection and publication of scientific data The student shows an understanding of intellectual property and copyright as they apply to the collection and use of scientific data and results.	4	80.00%	1	20.00%	0	0.00%	5	2.800	3.000	0.400

Participation in community events relating to science research. The students participation and reaction statements regarding research seminars in the content area show that the student was engaged in the research community. Attendance at seminars and reaction statements showed strong engagement.

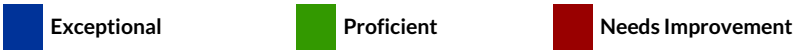
Oral presentation of scientific content. The students presentation(s) show that s/he is capable of successfully presenting data/research interpretations to a scientific audience. Students oral communication effectively conveyed scientific ideas.

Written presentation of scientific content. The students written work demonstrates that s/he is capable of successfully presenting data/research interpretations to a scientific audience. Students written communication effectively conveyed scientific ideas.

Career development activities. The students work shows that s/he understands the role of research and discovery in the scientific enterprise. The student shows evidence of learning about diverse career paths and opportunities within their discipline.

Ability to access and use primary scientific literature. The students performance in this course indicates that s/he mastered the library/online skills needed to research, retrieve and evaluate current primary literature in the content area. The student shows an ability to distinguish important and reliable scientific sources from nonscientific or unreliable sources.

Scientific Ethics and Intellectual Property: The student demonstrates an understanding of ethics related to the collection and publication of scientific data The student shows an understanding of intellectual property and copyright as they apply to the collection and use of scientific data and results.



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My Reports - Assessment Report

General Information

Title	Bio 490 Livetext Data 16-17 --> 18-19
Institution	NJ: The College of New Jersey
Course Section	2017 Fall - CHE317 - 1 2018 Spring - CHE317 - 1
Assessment Rubric	SoS Professional Knowledge - Rubric (COE Administrator)
Assessment Type	Summative
Scoring Type	Final
Inter-Rater Summary	N

Rubric: Rubric

	Exceptional *(3 pts)*	Exceptional *(3 pts)*	Proficient *(2 pts)*	Proficient *(2 pts)*	Needs Improvement *(1 pts)*	Needs Improvement *(1 pts)*	*n*	*Mean*	*Mode*	*Stdev*
Participation in community events relating to science research. The students participation and reaction statements regarding research seminars in the content area show that the student was engaged in the research community. Attendance at seminars and reaction statements showed strong engagement.	1	100.00%	0	0.00%	0	0.00%	1	3.000	3.000	0.000
Oral presentation of scientific content. The students presentation(s) show that s/he is capable of successfully presenting data/research interpretations to a scientific audience. Students oral communication effectively conveyed scientific ideas.	1	100.00%	0	0.00%	0	0.00%	1	3.000	3.000	0.000
Written presentation of scientific content. The students written work demonstrates that s/he is capable of successfully presenting data/research interpretations to a scientific audience. Students written communication effectively conveyed scientific ideas.	0	0.00%	0	0.00%	0	0.00%				
Career development activities. The students work shows that s/he understands the role of research and discovery in the scientific enterprise. The student shows evidence of learning about diverse career paths and opportunities within their discipline.	0	0.00%	1	100.00%	0	0.00%	1	2.000	2.000	0.000
Ability to access and use primary scientific literature. The students performance in this course indicates that s/he mastered the library/online skills needed to research, retrieve and evaluate current primary literature in the content area. The student shows an ability to distinguish important and reliable scientific sources from nonscientific or unreliable sources.	0	0.00%	1	100.00%	0	0.00%	1	2.000	2.000	0.000
Scientific Ethics and Intellectual Property: The student demonstrates an understanding of ethics related to the collection and publication of scientific data The student shows an understanding of intellectual property and copyright as they apply to the collection and use of scientific data and results.	0	0.00%	1	100.00%	0	0.00%	1	2.000	2.000	0.000

Participation in community events relating to science research. The students participation and reaction statements regarding research seminars in the content area show that the student was engaged in the research community. Attendance at seminars and reaction statements showed strong engagement.

Oral presentation of scientific content. The students presentation(s) show that s/he is capable of successfully presenting data/research interpretations to a scientific audience. Students oral communication effectively conveyed scientific ideas.

Written presentation of scientific content. The students written work demonstrates that s/he is capable of successfully presenting data/research interpretations to a scientific audience. Students written communication effectively conveyed scientific ideas.

Career development activities. The students work shows that s/he understands the role of research and discovery in the scientific enterprise. The student shows evidence of learning about diverse career paths and opportunities within their discipline.

Ability to access and use primary scientific literature. The students performance in this course indicates that s/he mastered the library/online skills needed to research, retrieve and evaluate current primary literature in the content area. The student shows an ability to distinguish important and reliable scientific sources from nonscientific or unreliable sources.

Scientific Ethics and Intellectual Property: The student demonstrates an understanding of ethics related to the collection and publication of scientific data The student shows an understanding of intellectual property and copyright as they apply to the collection and use of scientific data and results.

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My Reports - Assessment Report

General Information

Title	Bio 490 Livetext Data 16-17 --> 18-19
Institution	NJ: The College of New Jersey
Course Section	2018 Fall - PHY299 - 1 2019 Spring - PHY299 - 1
Assessment Rubric	Science (Natural Science) Professional Knowledge Fall 2014 - Natural Science Professional Knowledge Fall 2014 (COE Administrator)
Assessment Type	Summative
Scoring Type	Final
Inter-Rater Summary	N

Rubric: Natural Science Professional Knowledge Fall 2014

	Exceptional (Target) *(3 pts)*		Exceptional (Target) *(3 pts)*		Proficient (Acceptable) *(3 pts)*	Proficient (Acceptable) *(3 pts)*	Needs Improvement (Unacceptable) *(1 pts)*	Needs Improvement (Unacceptable) *(1 pts)*	*n*	*Mean*	*Mode*	*Stdev*
The students participation and reaction statements regarding research seminars in the content area show that the student was engaged in the research community. Attendance at seminars and reaction statements showed strong engagement.	3	42.86%	4	57.14%	0	0.00%	7	3.000	3.000	0.000
The students presentation(s) show that s/he is capable of successfully presenting data/research interpretations to a scientific audience. Students oral communication effectively conveyed scientific ideas.	6	85.71%	1	14.29%	0	0.00%	7	3.000	3.000	0.000
The students written work demonstrates that s/he is capable of successfully presenting data/research interpretations to a scientific audience. Students written communication effectively conveyed scientific ideas.	6	85.71%	1	14.29%	0	0.00%	7	3.000	3.000	0.000
The students work shows that s/he understands the role of research and discovery in the scientific enterprise. The student shows evidence of learning about diverse career paths and opportunities within their discipline.	6	85.71%	1	14.29%	0	0.00%	7	3.000	3.000	0.000
The students performance in this course indicates that s/he mastered the library/online skills needed to research, retrieve and evaluate current primary literature in the content area. The student shows an ability to distinguish important and reliable scientific sources from nonscientific or unreliable sources.	5	71.43%	2	28.57%	0	0.00%	7	3.000	3.000	0.000
The student demonstrates an understanding of ethics related to the collection and publication of scientific data The student shows an understanding of intellectual property and copyright as they apply to the collection and use of scientific data and results.	1	14.29%	6	85.71%	0	0.00%	7	3.000	3.000	0.000