Reviewer Rubrics

INTRODUCTION

As part of the process of standards revision, the Council for the Accreditation of Educator Preparation (CAEP) requires all specialty organizations to construct rubrics that are linked to the standards. The rubrics submitted here reflect the 20102 NSTA Preservice Standards and Elements, and the current Specialized Professional Association (SPA) requirements. They were refined from feedback on past rubrics from programs, reviewers, standards writing team members and the audit co-directors.

Preponderance of the evidence policy

NSTA applies the SASB policy and a legal interpretation that program review decisions be based on the "preponderance of evidence" at the standards level. The rubrics were created to reflect the directions and criteria for creating a Program Report, define the "preponderance of evidence" for each Standard holistically, and delineate descriptors for all elements. "Preponderance of evidence" as defined by the SASB "means an overall confirmation that candidates meet standards in the strength, weight, or quality of evidence." "Preponderance of evidence" as defined by the legal system is more than fifty percent and defined as superiority in weight, force, and importance of convincing evidence. Taking both of these interpretations into account, the application of "preponderance of evidence" is explained for each standard to be an interpretation by the reviewer between the standard and the evidence supplied by the institution.

Programs will meet the standards and their key elements in ways designed to support the program's unique mission, candidate characteristics, unit and institutional goals, and state context.

- SPA program reviewer decisions that standards are met will be based on the *preponderance of evidence at the standard level, NSTA decisions will not require that every element be met*.

- Decisions on national recognition will be based on the *preponderance of evidence that all standards are met; recognition will not require that every aspect of every standard be met*.

Considering the preponderance of the evidence is more complex than simply determining if "the majority of elements are met?" or "how many elements can be met with conditions?" Reviewers are asked to make professional judgments, considering the following questions as they review each standard. Data for assessments and rubrics should be reported at the element level within each standard to give reviewers the confidence that the broader standard is being met.

Do the program descriptions, assessment tools and performance data provide sufficient evidence that:

- Candidates are mastering the related knowledge base at the beginner level with the breadth and depth indicated in the supporting explanation?

- Candidates have demonstrated ability to apply that knowledge base in the secondary (6-12) classroom?
- Candidates are developing professionalism in their area of licensure and expertise?
- Candidates are prepared for work with diverse students and are developing cultural competence?

Data Expectations

NSTA reviews for compliance with CAEP data requirements. According to CAEP policy, data needs to be disaggregated by standard. In addition, NSTA requires data to be disaggregated by elements. In order to meet all standards, programs are expected to submit data from two applications of the assessments.

When data indicate less than satisfactory candidate performance on a standard, programs are expected to analyze and respond. NSTA does not set a threshold level of performance for assessments or threshold percentage of candidates who should perform at a particular level on an assessment. It is the responsibility of the program to set these thresholds in ways that are responsive to their mission, candidates, institution and state.

Rubric Terminology

Rubrics are intentionally drawn from the key elements and supporting explanations of each standard. Reviewers make a global judgment based upon the "preponderance of evidence" about whether data show that each standard is met as a whole.

Recognition of Reports

NSTA uses the following terminology to differentiate the recognition of reports:

> DOES NOT MEET EXPECTATIONS: Program evidence is minimal, limited, cursory, inconsistent, and/or ambiguous, and essential areas for improvement are identified.
>
> MET WITH CONDITIONS: Program evidence shows that, in general, candidates' performance meets the expectations described for the standard. The evidence is appropriate and relevant, and is accurate but the number of administrations of the instruments is lacking and/or data are not completely disaggregated by element and aggregated by standard.
>
> MEETS EXPECTATIONS: Program evidence is clear and shows that, in general, candidates' performance meets the expectations described for all the standards at the appropriate level. Evidence is detailed and consistent.

Standard 1: Content Knowledge

Standard 1: Effective teachers of science understand and articulate the knowledge and practices of contemporary science. They interrelate and interpret important concepts, ideas, and applications in their fields of licensure. **Programs demonstrate Standard 1, Elements a, b, and c by…**			
Requirements	-providing three or more years of candidate data for state-required science content license tests (or equivalent standardized science content test) including the mean and score range with an 80% or better pass rate. OR –providing three years or more of aggregated and disaggregated data by subject/licensure area from a comprehensive examination of the required curriculum. Data include sub-scores with mean and range with an 80% or better pass rate. AND -providing science GPA values or comprehensive exam scores for all candidates. AND -including an alignment of program content requirements using the NSTA Content Analysis Form, that exceeds the 90% minimum coverage/alignment as specified in each area: core, advanced, and supporting competencies.		
Preponderance of Evidence	- Programs shall, at a minimum, meet element 1a of this standard and at least one other element at the *Acceptable* level in order to meet the standard. If only 1a is met, then the preponderance of evidence will indicate that this standard is *Met with Conditions*.		
NSTA Element	**Target**	**Acceptable**	**Unacceptable**
Element 1a Understand the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association.	- providing conclusive and convincing evidence that candidates understand how major concepts, principles, theories, and laws relate to one another. - providing conclusive and convincing evidence that candidates understand how principles and theories have developed in their science fields. - providing conclusive and convincing evidence that candidates understand how science concepts and laws and inquiry skills explain scientific phenomena in their science fields.	- providing clear and consistent evidence that candidates understand how major concepts, principles, theories, and laws relate to one another. - providing clear and consistent evidence that candidates understand how principles and theories have developed in their science fields.	- providing insufficient evidence that candidates understand how major concepts, principles, theories, and laws relate to one another in their science fields.

Element 1b Understand the central concepts of the supporting disciplines and the supporting role of science-specific technology.	- completing the NSTA Content Analysis Form with greater than 90% alignment. - providing GPAs or content exams showing understanding of supporting science concepts that are consistently above required minimums.	- completing the NSTA Content Analysis Form with greater than 80% alignment. - providing GPAs or content exams showing understanding of supporting science concepts.	- completing the NSTA Content Analysis Form with less than 80% alignment. OR - not providing a Content Analysis Form.
Element 1c Show an understanding of state and national curriculum standards and their impact on the content knowledge necessary for teaching P-12 students.	- providing conclusive and convincing evidence that candidates understand state and national curriculum standards and how the standards impact candidate content knowledge for all students.	- providing clear evidence that candidates understand state and national curriculum standards and how the standards impact candidate content knowledge for all students.	- providing insufficient evidence that candidates understand state and national curriculum standards and how the standards impact candidate content knowledge for students.

Standard 2: Content Pedagogy

Standard 2: Effective teachers of science understand how students learn and develop scientific knowledge. Preservice teachers use scientific inquiry to develop this knowledge for all students. **Programs demonstrate Standard 2, Elements 2a, b, and c by…**			
Standard 2	- Assessments have operational terms and discernable levels of performance that clearly address applicable standard or elements with minimum levels of performance. - Aggregated data are presented with mean and range scores for each element. - Data are used for affirmation and/or improving the program. - Analysis includes goals and future plans. - Analysis of data addresses elements of the standard.		
Preponderance of Evidence	- Programs shall meet two of the three elements of this standard at an *Acceptable* level in order to meet the Standard. If one of the three elements is met at an *Acceptable* level and the preponderance of evidence is convincing, then this standard is *Met with Conditions*.		
NSTA Element	**Target**	**Acceptable**	**Unacceptable**
Element 2a Plan multiple lessons using a variety of inquiry approaches that demonstrate their knowledge and understanding of how all students learn science.	- providing innovative and detailed lesson plans and a variety of assessments using multiple inquiry approaches. - including creative and detailed methods for addressing students' diverse backgrounds and how they learn.	- providing clear and consistent evidence that multiple lesson plans and a variety of assessments use multiple inquiry approaches. - including clear and consistent methods for addressing students' diverse backgrounds and how they learn.	- providing insufficient lesson plans and assessments using multiple inquiry approaches.
Element 2b Include active inquiry lessons where students collect and interpret data in order to develop and communicate concepts and understand	- including many creative and detailed lessons, activities, and laboratory investigations where students understand how to collect, interpret, and communicate data. - showing how students creatively use	- documenting many clear and consistent lessons, activities, and laboratory investigations where students understand how to collect, interpret, and communicate data. - showing how students consistently	- documenting few or no lessons, activities, and laboratory investigations where students collect, interpret, and communicate data. - providing insufficient science-specific technology applications.

scientific processes, relationships and natural patterns from empirical experiences. Applications of science-specific technology are included in the lessons when appropriate.	their own data to analyze observations and phenomena, and how the analysis leads to understanding natural patterns and relationships within scientific fields. - consistently including science-specific technology into many lessons.	use data to analyze observations and phenomena, and how the analysis leads to understanding natural patterns and relationships within scientific fields. - including some science-specific technology into some lessons.	
Element 2c Design instruction and assessment strategies that confront and address naïve concepts/preconceptions.	- designing innovative and detailed lesson plans and assessments that explicitly take into account students' prior knowledge and naïve conceptions. - designing creative lesson plans that help students address naïve conceptions/preconceptions.	- designing clear and consistent lesson plans and assessments that take into account students' prior knowledge and naïve conceptions. - designing clear and consistent lesson plans that help students address naïve conceptions/preconceptions.	- designing insufficient lesson plans and assessments that take into account students' prior knowledge.

Standard 3: Learning Environments

Standard 3: Effective teachers of science are able to plan for engaging all students in science learning by setting appropriate goals that are consistent with knowledge of how students learn science and are aligned with state and national standards. The plans reflect the nature and social context of science, inquiry, and appropriate safety considerations. Candidates design and select learning activities, instructional settings, and resources--including science-specific technology, to achieve those goals; and they plan fair and equitable assessment strategies to evaluate if the learning goals are met. **Programs demonstrate Standard 3, Elements 3a, b, c and d by…**			
Standard 3	- Assessments have operational terms and discernable levels of performance that clearly address applicable standard or elements with minimum levels of performance. - Aggregated data are presented with mean and range scores for each element. - Data are used for affirmation and/or improving the program. - Analysis includes goals and future plans. - Analysis of data addresses each element of this standard.		
Preponderance of Evidence	- Programs shall meet three of four elements of this standard at an *Acceptable* level in order to meet the standard. If two of the four elements are met at an *Acceptable* level and the preponderance of evidence is convincing, then this standard is *Met with Conditions*.		
NSTA Element	**Target**	**Acceptable**	**Unacceptable**
Element 3a Use a variety of strategies that demonstrate the candidates' knowledge and understanding of how to select the appropriate teaching and learning activities – including laboratory or field settings and applicable instruments and/or technology- to allow access so that all students learn. These strategies are inclusive and motivating for all students.	- providing a consistent sequence of study that shows a detailed progression of learning over time toward a more expert level of understanding that is consistent with state and/or national science education standards. - providing conclusive and convincing evidence that candidates effectively integrate into the sequence of study scientific investigations through laboratory or field experiences. - providing abundant experiences that are inclusive and motivating for all students.	- providing a consistent sequence of study that reflects the state or national science education standards. - providing clear and consistent evidence that candidates use laboratory and/or field experiences in the lessons. - providing consistent experiences that are inclusive and motivating for all students.	- providing a sequence of study that fails to sufficiently relate the goals/objectives of state or national science education standards. OR -providing insufficient evidence (absent, minimal or superficial) that candidates use laboratory and/or field experiences. OR - does not provide experiences that motivate and include all students.

Element 3b Develop lesson plans that include active inquiry lessons where students collect and interpret data using applicable science-specific technology in order to develop concepts, understand scientific processes, relationships and natural patterns from empirical experiences. These plans provide for equitable achievement of science literacy for all students.	- providing evidence that candidates plan a variety of innovative and detailed inquiry lessons in which students use prior knowledge and experiences to design experiments. - convincingly documenting that students can collect, analyze, and interpret data. - showing that students' analyses of data allow them to conclusively and convincingly identify relationships and patterns in the science fields. - conclusively showing how science-specific technology is use.	- providing clear and consistent evidence that candidates plan inquiry lessons in which students collect, analyze, and interpret data. - clearly documenting that students can identify relationships and patterns from data they collected. - clearly demonstrating how student literacy for all students is achieved. - clearly showing how science-specific technology is used.	- providing insufficient evidence that candidates plan lessons in which students collect, analyze, and interpret data. -does not provide science-specific technology in lessons.
Element 3c Plan fair and equitable assessment strategies to analyze student learning and to evaluate if the learning goals are met. Assessment strategies are designed to continuously evaluate preconceptions and ideas that students hold and the understandings that students have formulated.	- providing conclusive and convincing evidence that candidates plan a variety of fair and equitable diagnostic, formative, and summative assessment strategies that monitor progress toward, and achievement of, stated learning goals. - providing conclusive and convincing evidence that candidates continuously assess student preconceptions and ideas.	- providing clear and consistent evidence that candidates plan a variety of fair and equitable diagnostic, formative, and summative assessment strategies that monitor progress toward, and achievement of stated learning goals. - providing clear and consistent evidence that candidates continuously assess student preconceptions and ideas.	- providing insufficient evidence that candidates plan a variety of fair and equitable diagnostic, formative, and summative assessment strategies that monitor progress toward, and achievement of, stated learning goals.
Element 3d Plan a learning environment and learning experiences for all students that demonstrate chemical safety, safety procedures, and the ethical treatment of living organisms within their licensure area.	– providing evidence that candidates plan extensive learning experiences that require consideration of chemical safety, safety procedures and the ethical treatment of living organisms as it applies to their particular science field. – providing conclusive and convincing evidence that candidates can create a safe learning environment.	– providing evidence that candidates consistently plan appropriate and detailed learning experiences that require consideration of chemical safety, safety procedures and the ethical treatment of living organisms as it applies to their particular science field. – providing consistent evidence that candidates can create a safe learning environment.	– providing insufficient evidence that candidates can create a safe learning environment.

Standard 4: Establishing a Safe Learning Environment

Standard 4: Effective teachers of science can, in a P-12 classroom setting, demonstrate and maintain chemical safety, safety procedures, and the ethical treatment of living organisms needed in the P-12 science classroom appropriate to their area of licensure. **Programs demonstrate Standard 4, Elements 4a, b, and c by…**			
Standard 4	- Assessments have operational terms and discernable levels of performance that clearly address applicable standard or elements with minimum levels of performance. - Aggregated data are presented with mean and range scores for each element. - Data are used for affirmation and/or improving the program. - Analysis includes goals and future plans. - Analysis of data addresses each element of this standard.		
Preponderance of Evidence	- Programs shall meet two of the three elements of this standard at an *Acceptable* level in order to meet the standard. If one of the three elements is met at an *Acceptable* level and the preponderance of evidence is convincing, then this standard is *Met with Conditions*.		
NSTA Element	**Target**	**Acceptable**	**Unacceptable**
Element 4a Design activities in a P-12 classroom that demonstrate the safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used within their subject area science instruction.	- providing detailed evidence that candidates can consistently design activities, laboratory experiments, and field trips that incorporate safe and proper techniques of materials for their subject matter. - consistently documenting the safe and proper techniques for preparation, storage, dispensing and supervision of materials. – providing detailed evidence that candidates apply safe and proper techniques of materials in planning.	- providing consistent and clear evidence that candidates can design activities, laboratory experiments, and field trips that incorporate safe and proper techniques of materials for their subject matter. - consistently documenting the safe and proper techniques for preparation, storage, dispensing and supervision of materials.	– providing insufficient evidence that candidates appropriately prepare, store, dispense, supervise, and dispose of all materials that may be used within their science license area.

Element 4b Design and demonstrate activities in a P-12 classroom that demonstrate an ability to implement emergency procedures and the maintenance of safety equipment, policies and procedures that comply with established state and/or national guidelines. Candidates ensure safe science activities appropriate for the abilities of all students.	- providing detailed evidence that candidates can consistently design activities that are safe. - providing detailed evidence that candidates can consistently implement emergency procedures, maintain safety equipment, and demonstrate safety policies and procedures that comply with established national and/or state guidelines. - providing detailed evidence that candidates implement developmentally appropriate and innovative activities that are safe for students' abilities.	- providing clear and consistent evidence that candidates can design activities that are safe. - providing clear and consistent evidence that candidates can implement emergency procedures, maintain safety equipment, and demonstrate safety policies and procedures that comply with established national and/or state guidelines. - providing clear and consistent evidence that candidates implement developmentally appropriate activities that are safe for students' abilities.	- providing insufficient evidence of ability to implement emergency procedures as well as maintain safety equipment. OR - providing insufficient evidence that candidates apply knowledge and skills of procedures in planning safe science lessons.
Element 4c Design and demonstrate activities in a P-12 classroom that demonstrate ethical decision-making with respect to the treatment of all living organisms in and out of the classroom. They emphasize safe, humane, and ethical treatment of animals and comply with the legal restrictions on the collection, keeping, and use of living organisms.	- providing detailed evidence that candidates can creatively design activities that demonstrate the safe, humane and ethical decision-making in the treatment of all living organisms. – providing detailed evidence that candidates demonstrate safe, humane and ethical decision-making in the treatment of all living organisms in planning science lessons. This includes evidence that candidates understand and are aware of the legal restrictions on the collection, keeping, and use of living organisms both in and out of the classroom relevant to their science license area.	- providing clear and consistent evidence that candidates can design activities that demonstrate the safe, humane and ethical decision-making in the treatment of all living organisms. – providing clear evidence that candidates demonstrate safe, humane and ethical decision-making in the treatment of all living organisms in planning science lessons.	– providing insufficient evidence that candidates demonstrate safe, humane and ethical decision-making in the treatment of all living organisms in planning science lessons. This includes insufficient evidence that candidates can comply with the legal restrictions on the collection, keeping, and use of living organisms both in and out of the classroom.

Standard 5: Impact on Student Learning

Standard 5: Effective teachers of science provide evidence to show that P-12 students' understanding of major science concepts, principles, theories, and laws have changed as a result of instruction by the candidate and that student knowledge is at a level of understanding beyond memorization. Candidates provide evidence for the diversity of students they teach. **Programs demonstrate Standard 5, Elements 5a, b, and c by…**			
Standard 5	- Assessments have operational terms and discernable levels of performance that clearly address applicable standard or elements with minimum levels of performance. - Aggregated data are presented with mean and range scores for each element. - Data are used for affirmation and/or improving the program. - Analysis includes goals and future plans. - Analysis of data addresses each element of this standard.		
Preponderance of Evidence	- Programs shall meet two of the three elements of this standard at an *Acceptable* level in order to meet the standard. If one of the three elements is met at an *Acceptable* level and the preponderance of evidence is convincing, then this standard is *Met with Conditions*.		
NSTA Element	**Target**	**Acceptable**	**Unacceptable**
Element 5a Collect, organize, analyze, and reflect on diagnostic, formative and summative evidence of a change in mental functioning demonstrating that scientific knowledge is gained and/or corrected.	- providing convincing and conclusive evidence that candidates collect, organize, analyze, and reflect on evidence of change in mental functioning of students. - providing convincing and conclusive evidence that candidates use diagnostic, formative, and summative evidence demonstrating that students have gained scientific knowledge. - providing convincing and conclusive evidence that candidates' instruction has brought about a deep	- providing clear and consistent evidence that candidates collect, organize, analyze, and reflect on evidence of change in mental functioning of students. - providing clear and consistent evidence that candidates use diagnostic, formative, and summative evidence demonstrating that students have gained scientific knowledge. - providing clear and consistent evidence that candidates' instruction	- providing insufficient evidence that candidates use diagnostic, formative, and summative evidence demonstrating that students have gained scientific knowledge.

	understanding of science knowledge through a positive change in student achievement. - providing evidence that candidates' analysis reflects learning patterns for individuals or subgroups in addition to the whole class.	has brought about a deep understanding of science knowledge through a positive change in student achievement.	
Element 5b Provide data to show that P-12 students are able to distinguish science from nonscience, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science.	- providing convincing and conclusive evidence that candidates can help students distinguish science from nonscience, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science. - providing evidence that candidates can evaluate information as originating from scientific explanations or other ways of knowing.	- providing clear and consistent evidence that candidates can help students distinguish science from nonscience, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science.	- providing insufficient evidence that candidates can help students distinguish science from nonscience, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science.
Element 5c Engage students in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner.	- providing convincing and conclusive evidence that candidates can engage students in a variety of inquiry activities where students design their own experiments, collect data, and draw conclusions. - providing convincing and conclusive evidence that candidates can engage students in creatively collecting, analyzing, and interpreting data in order to make inferences.	- providing clear and consistent evidence that candidates can engage students in a variety of inquiry activities where students design their own experiments, collect data, and draw conclusions.	- providing insufficient evidence that candidates can engage students in a variety of inquiry activities where students design their own experiments, collect data, and draw conclusions.

Standard 6: Professional Knowledge and Skills

Standard 6: 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. **Programs demonstrate Standard 6, Elements 6a and b by…**			
Standard 6	- Assessments have operational terms and discernible levels of performance that clearly address applicable standard or elements with minimum levels of performance. - Aggregated data are presented with mean and range scores for each element. - Data are used for affirmation and/or improving the program. - Analysis includes goals and future plans. - Analysis of data addresses each element of this standard.		
Preponderance of Evidence	- Programs shall show a preponderance of evidence for each element in order to meet the standard. If one of the two elements shows a preponderance of evidence, then this standard is *Met with Conditions*. Both elements do not have to meet the *Acceptable* level for this standard to be met.		
NSTA Element	**Target**	**Acceptable**	**Unacceptable**
Element 6a Engage in professional development opportunities in their content field such as talks, symposiums, research opportunities, or projects within their community.	- providing convincing and conclusive evidence that candidates engage in leadership opportunities through professional talks, symposiums, research opportunities, and projects within their science field and community.	- providing clear evidence that candidates attend professional talks, symposiums, research talks, and projects within their science field and community.	- providing insufficient evidence that candidates participate in professional development opportunities in their science field.
Element 6b Engage in professional development opportunities such as conferences, research opportunities, or projects within their community.	- providing convincing and conclusive evidence that candidates engage in leadership opportunities through conferences, research opportunities or projects within the science education community.	- providing clear evidence that candidates attend conferences, research talks, or projects within the science education community.	- providing insufficient evidence candidates participate in professional development opportunities within the science education community.

Description of Terms

Aggregated Data – Combined data from a year of candidate completers, licensure area, or a level of completer (undergraduate, post baccalaureate, or masters)

Clear and Consistent Evidence – Evidence is logically displayed and organized for discernment each year of data collection.

Conclusive and Convincing Evidence – Evidence that is reported yearly and shows a logical progression of patterns that specifically matches individual aspects of the element and standard.

Content Analysis Form – Form that has science content needed for a science teacher as defined by the science content organizations.

Core Competencies - Science concepts that represent introductory knowledge that generally occur in the first or second year in content coursework as defined by the science content organizations.

Creative and Innovative – An ability to design or produce something that does not follow a specific pattern, but allows for novel and new ideas to flourish.

Disaggregated Data – Data that are separately reported by content area, licensure area, and subtopic on state exams.

Discernible Levels of Performance – Levels within the rubric that distinguishes among levels of observable performance.

Insufficient – Not providing enough data or evidence to show an alignment with the objectives and criteria of the standard and elements.

Minimum Levels of Performance – These are the required descriptive levels within the rubric for all candidates.

Naïve Conceptions –A cognitive idea that is different in a significant way from the scientific idea, held by a sizable proportion of the population, and notably resistant to being taught away (Clement, 1982).

Operational Terms – Descriptive words that describe criteria in such a way as to create a high possibility of inter-rater reliability

Supporting Competencies - Science concepts that represent science content knowledge and support the major content core competencies as defined by the science content organizations.