NSTA/NCATE Science **Section IV**

Assessment #3

Unit Plan and Resource Packet

1. A brief description of the assessment and its use in the program

The assessment is a Unit Plan and Resource Packet Assessment. The assessment is used in the Science Methods classes: ESEC 384 (Middle School Science Methods), ESEC 385 (Secondary Science Methods), ESEC 386 (Field Experience, both Middle and Secondary), and ESEC 450 (Student Teaching seminar). This project is assigned during the Science Methods course (ESEC 384, Middle School and ESEC 385, Secondary). It is also used as one of the assessments for the Portfolio at the completion of Student Teaching (ESEC 450, Student Teaching seminar). The Science educator is the person that evaluates the packet. A conference is held after the evaluation with the candidate.

This project is required of all science teacher candidates in both the Science Methods class and as part of their Student Teaching. Keene State College firmly believes that science teaching candidates must have a firm foundation in preparing units and appropriate lessons for the unit that are in compliance with the National Science Education Standards, the New Hampshire State Frameworks, and the Danielson model (Clinical Observation, Assessment #4).

2. A description of how this assessment specifically aligns with the standards

This assessment aligns with the candidate's ability to write lesson plans in units that address the National Science Education Standards (1b). Units and lessons (and the application of these lessons during the Method's field experience and student teaching in Assessment #4) must be planned to engage student effectively in the studies of history, philosophy, and practice of science; help students distinguish between science and non-science; include students critically analyzing assertions, and appreciate the evolution and practice of science (Nature of Science, 2a, 2b, 2c). The unit includes inquiry activities that engage students in various methods of scientific inquiry (Inquiry, 3a, 3b). The unit includes lessons that require student engagement in analyzing relevant and personal science and technology issues (Issues, 4a, 4b). The unit plan demonstrates candidates' ability to plan an active, coherent, and effective unit based on the goals and recommendation of the NSES. The essential question forces candidates to begin with the end in mind. In the Methods classes, candidates are encouraged to begin with the essential question, the objectives (based on NSES and NH Frameworks), and then the very next step is the last of the 5E lesson plan---developing the Evaluation, the assessment to verify that students have assimilated the information (Curriculum, 6a, 6b). Candidates must identify resources in the community to promote the learning of science and the unit must include student engagement in a community project/issue (7a, 7b). The unit plan must include formal and summative student assessment to gauge student learning and modify lessons if needed (8a, 8b, 8c). Lesson plans must include explicitly stated safety and welfare instruction for the legal and ethical responsibilities to students and the proper treatment of animals, the proper and safe preparation, storage, dispending, supervision, and disposal of all materials in the classroom (9a, 9b).

3. A brief analysis of the data findings

The Methods students were able to plan (and conduct) effective lesson plans to make a coherent unit at the "Developing" level. A comparison of the Methods assessment to the Student Teaching assessment shows an increase in aptitude for writing and conducting lessons.

4. An interpretation of how that data provides evidence for meeting standards

Methods candidates obtained a "Developing" rating and Student Teachers obtained a "Proficient", indicating that they met the NSTA standards mentioned in how the assessment aligns with the standards in #2. As expected, candidate performance increased from the Methods experience to the culminating Student Teaching experience.

5. Assessment Documentation

5A: Assignment[1]

Assignment: Produce a Unit Plan and Resource Packet for a particular unit within your secondary-level certification area. The packet must be organized into the following sections.

Note: The NSTA/NCATE standards are in parenthesis in red. Although candidates have always developed a unit plan, this assessment was developed this past year knowing that KSC was applying for accreditation and specifically focusing on the NSTA standards. The assignment was a collaborative effort developed by the Methods candidates and the Methods science educator. It was used for the first time with the Methods candidates in the Fall 2005 and then was used in their Student Teaching experience Spring 2006.

I. Objectives and Unit Standards

1. List the objectives of the unit, the Essential question(s), with reference to the NH State Frameworks and the National Science Education Standards. (6a)
2. Identify the unifying concepts/themes (Systems, Order, and Organization; Evidence, Models, and Explanation; Change, constancy, and measurement; Evolution and Equilibrium; Form and Function) that are addressed by the unit. (1b)

The unit must include at least one lesson that engages students in each of the following:

3. Historical, cultural development, and the philosophical nature of science in your discipline (2a)
4. Discrepancy event (2c)
5. A guided-inquiry and/or an open-ended inquiry activity/laboratory (3a, 3b)
6. Moral/ethical/social issue on which students must make/defend decisions (includes student analysis of risks, costs, benefits, alternate solutions related to the personal goals and values of the student) (4a, 4b)
7. Various methodologies that address the needs and interest of diverse learners (e.g. via inquiry) (5a)
8. Demonstrate multiple student skills and levels of understanding (5b)
9. Recognition of student diversity (5b)
10. Examples of collaborative learning (5c)
11. Examples of technology and the philosophical tenets, assumptions, goals, and values that distinguish the technology used in the lesson from science (2b,5d)

[1] This assessment was adapted and modified with permission (Robert Cohen) from East Stroudsburg University.

12. Student use of technology to collect, process and present data (e.g. a lab activity) (5d)
13. An interdisciplinary lesson
14. Safety/hazard warnings on every lesson to include the proper treatment of animals, and the use, maintenance and proper disposal of materials (include MSDS sheets) (9a, 9b)
15. A lesson that involves students in activities that relate science to resources and stakeholders in the community or to the resolution of issues important to the community (7a, 7b)
16. Multiple assessments strategies (both formative and summative) (8a)
17. Modify instruction based on student assessments (8b)
18. Engage students in reflective self-analysis of their own work (8c)
19. Reflection paper to address the success of the unit based on the above criteria

II. Lesson Plans

Include 4-5 lesson plans based on the 5E method (Engagement, Exploration, Explanation, Elaboration, Evaluation)

1. For each lesson plan, list the specific objectives of each lesson and the Essential question(s) with reference to the NH State Frameworks and NSES (1a)
2. For each lesson plan, identify the unifying concept(s)/theme(s) that is(are) addressed in the lesson (1b)
3. Safety/hazard warnings/procedures and ethical/humane treatment of all animals explicitly stated in lesson plan and on any handouts/instructions to students. Attach MSDS sheets to lesson plan and to all student handouts/instructions (9a, 9b, 9d)
4. For each lesson, produce/attach student pre-tests and post-tests to demonstrate student learning of the lesson objectives
5. Use pre-tests to design and/or modify the lesson plans (5e)

III. Resources

For each bulleted area, identify one resource that can be <u>used with your unit</u>:

1. Internet site
2. Article from a journal devoted to science education
3. Piece of equipment from a science education equipment catalog
4. Readings from a science textbook
5. Idea from a teacher's edition of a science textbook
6. Community resource (museums, scientific companies, environmental education centers, etc.)
7. Media resource (TV programs, movies, newspapers, magazines, etc.)

For each resource:

a) Describe the resource, pointing out possible good and bad points (note: if the bad points are significant, replace the resource with a better one – this activity is to demonstrate one's ability to identify *useful* resources).
b) Explain how one can access the resource. In other words, you must completely identify the source (i.e. provide enough information that someone else can obtain the resource). A copy of the web page, journal article, etc., may be useful.
c) Describe how the resource can be utilized to support your unit. You must state explicitly any **adjustments** you plan on making that will make your use of the resource different

from the intended use. The "use" must be something that can be **reasonably** carried out in the classroom. Note: If any materials are needed for the use, you must list and describe each piece of equipment, where they can be obtained and the **cost** (referenced to catalog prices, if appropriate).

Support resources: Of the seven bulleted resources above, the following topics must be addressed in the resources and where you used them in your unit:

8. Use of technology to collect, process and present data (e.g. a lab activity) (3b)
9. The needs and interests of diverse students (e.g. via inquiry) (5b)
10. The historical and philosophical nature of science (historical context) (2a)
11. Explore the social context of science (e.g. lesson on an issue) (4b)
12. Investigate personal and technological applications (1c)

5B: Scoring Guide for the Assessment

Note: **All** of the components for each of the categories (unacceptable, developing, proficient, or advanced) must be met to obtain the appropriate score.

I. Objectives and Unit Standards

1.0 Unacceptable: Objectives not present, not linked to NH State Frameworks or NSES, not written in terms of what students should be able to do, not written clearly and unambiguously, or not reflective of NH State Frameworks and NSES purpose, includes less than 10 of the 16 numbered requirements;

2.0 Developing: Objectives present and linked to NH State Frameworks and NSES but either are not written clearly in terms of what students should know and/or be able to do or area not reflective of NH State Frameworks and NSES purpose, includes 10-12 of the 16 numbered requirements;

3.0 Proficient: Objectives and unifying concepts/themes present and linked to NH State Frameworks and NSES, written clearly in terms of what students should know and/or be able to do, and reflective of NH State Frameworks and NSES purpose; includes 13-14 of the 16 numbered requirements;

4.0 Advanced: Objectives clearly and appropriately address unifying concepts/themes and science as inquiry standards in addition to content standards, includes 15-16 of the 16 numbered requirements

II. Lesson Plans

1.0 Unacceptable: Less than four lab or lessons provided or lab/lessons are not appropriate for the unit, little or no safety requirements in lessons, no pre- or post-test artifacts for document student learning, no reflective paper

2.0 Developing: At least three lab or lessons provided are appropriate for the unit, but none have a conceptual focus or engage the students in inquiry, or candidate fails to describe how the lesson(s) supports the objectives of the unit, safety requirements lacking in some lesson plans, pre- or post-test artifacts are of poor quality and do not reflect objectives, poorly thought out self-reflection of the lesson

3.0 Proficient: At least four lab or lessons provided are appropriate for the unit along with an explanation of how the lesson supports the unit objectives, with at least one lesson/lab having a conceptual focus and at least one lab/lesson that engages students in inquiry, safety is

mentioned in every lesson, pre- and post-test artifacts accurately reflect objectives of the lesson, self-reflection of the lesson is adequate

4.0 Advanced: More than four lab or lessons are provided appropriate for the unit (along with an explanation of how the lesson supports the unit objectives), several of which have a conceptual focus and/or engage students in inquiry, safety and ethical treatment of animals very specifically delineated with attached MSDS sheets, pre- and post-tests of student work indicate a definite increase in student learning, self-reflection is well written and demonstrates a high degree of critical thinking and critique of the lesson

III. Resources

1.0 Unacceptable: Resources provided from less than four of the resource avenues, or resources provided without an explanation of the possible good or bad points, or resources lacking source information; No resources provided for the five "support" areas of science education: (a) the use of technology to collect, process and present data, (b) the needs and interests of diverse students, (c) the history and nature of science, (d) the social context of science and (e) personal and technological applications;

2.0 Developing: Resources provided from all seven resource avenues (internet site, science education journal, equipment catalog, science textbook, teacher's edition, community and media) along with appropriate source information but resources are not appropriate or candidate fails to provide an explanation of the possible good or bad points or how the resource will be utilized to support the unit; At least one resource identified for each of the five support areas but the resources fail to adequately address the areas as reflected in the NSES;

3.0 Proficient: Resources, appropriate for the unit, are provided from all seven resource avenues along with relevant source information, with explanation of possible good or bad points and a description of how the resource will be utilized to support the unit along with any adjustments that must be made and cost of materials, if necessary; At least one support resource included for each of the five areas that adequately address the areas as reflected in the NSES;

4.0 Advanced: In addition to that required for "proficient", multiple resources are provided from several resource avenues; Multiple resources identified for several of the five areas

Candidates must have a minimum of 2.0 in each of the above three areas (Objectives and Unit Standards, Lesson Plan, Resource packet) to pass ESEC 384/386 (Middle School methods and Field experience) or ESEC 385/386 (Secondary and Field experience) and a minimum of 3.0 in each of the above three areas to pass ESEC 450/460 (Student Teaching Seminar and Student Teaching).

Rating Sheet for the Unit and Resource Packet

Assessment #3
Unit Plan and Resource Packet

Candidate Name	Methods candidate _____	Term/Year
Date of exit interview	Student Teacher _____	Licensure Area(s)

	Check List	**Evaluation (Points)**	**Evidence and Comments**
I. Objectives and Unit Standards	1 ___ (6a) 2 ___ (1b) 3 ___ (2a) 4 ___ (2c) 5 ___ (3a,3b) 6 ___ (4a, 4b) 7 ___ (5a) 8 ___ (5b) 9 ___ (5b) 10 ___ (5c) 11 ___ (2b, 5d) 12 ___ (5d) 13 ___ 14 ___ (9a, 9b) 15 ___ (7a, 7b) 16 ___ (8a) 17 ___ (8b) 18 ___ (8c) 19 ___	Rating _____	
II. Lesson Plans	1 ___ (1a) 2 ___ (1b) 3 ___ (9a, 9b, 9d) 4 ___ 5 ___ (5e)	Rating _____	
III. Resources	1 ___ a ___ b ___ c ___ 2 ___ a ___ b ___ c ___ 3 ___ a ___ b ___ c ___ 4 ___ a ___ b ___ c ___ 5 ___		

	a ___ b ___ c ___ 6 ___ a ___ b ___ c ___ 7 ___ a ___ b ___ c ___ 8 ___ (3b) 9 ___ (5b) 10 ___ (2a) 11 ___ (4b) 12 ___ (1c)	Rating _____	

Candidate Signature _____

Science Educator Signature _____

5C: Student Data

Data Table #3: Unit Plan and Resource Packet

This assignment was a collaborative effort, developed by the Methods candidates and the Methods science educator. It was used for the first time with the Methods candidates in the Fall 2005 and then was used in their Student Teaching experience Spring 2006.

Course	Year		Section I – Objectives and Unit Standards	Section II— Lesson Plans	Section III – Resource Packet
ESEC 384/385/386: Science Methods (Middle and Secondary)	Fall 2005	Methods Student #1 Methods Student #2 Methods Student #3 Methods Student #4	2 2 2 2	3 2 2 2	2 2 2 2
ESEC 450: Student Teaching Seminar	Spring 2006	Student Teacher #1 Student Teacher #2 Student Teacher #3 Student Teacher #4	3 3 3 3	3 3 3 3	3 4 4 3
ESEC 384: Science Methods (Middle School, General Science)	Fall 2006	Methods Student #1 Methods Student #2 Methods Student #3	2 2 2	3 2 2	3 2 3

		Methods Student #4	2	3	2
ESEC 450: Student Teaching Seminar	Spring 2007	Student Teacher #1	3	3	3
ESEC 384, Middle School General Science Methods	Fall 2007	Methods Student #1 Methods Student #2	2 2	3 2	2 2
ESEC 450: Student Teaching Seminar	Fall 2007	Student Teacher #1 Student Teacher #2	3 3	3 4	3 3
ESEC 450: Student Teaching Seminar	Spring 2008	Student Teacher #1 Student Teacher #2	3 3	3 4	3 4
ESEC 384/385/386: Science Methods (Middle School, General Science, Biology, Earth/Space)	Fall 2008	Methods Student #1 Methods Student #2 Methods Student #3	2 2 2	3 2 2	3 2 3
ESEC 450: Student Teaching Seminar	Spring 2009	Student Teacher #1 Student Teacher #2 Student Teacher #3	3 3 4	3 4 4	3 4 3