Apprentice Teaching Significant Unit of Study
Candidate Work Sample (CWS)
SCIENCE
TSM 495C/595 Secondary Science
NSTA Assessment Five

Directions: The purpose of this Key Assessment is to engage you in the planning and reflection process of "what, why and how" to teach in a manner that will impact student learning. This assessment provides the evidence that you are ready to begin your professional career as an educator. More importantly, this process that is a reflection of best practice helps build a habit of mind that you, as an educator, will use to grow professionally throughout your career.

This assessment requires you to focus on what **your students learned** during a unit of instruction designed and implemented by you. You will analyze the effect of your planning and teaching on student learning over a **1 to 2 week period** as evidenced in student work. You will document your planning, teaching and analysis in an essay formatted with single-spacing, 1-inch margins, and 12 point font. **APA format** http://owl.english.purdue.edu/owl/resource/560/01/ needs to be used for citations, style, tables, etc. Your paper must also include a **title page** (but no abstract required) and an **appendix**. You need to address the following six sub-topics in your paper, which are explained in more detail further on in these directions below the scoring rubric.
1. Introduction (~1 page max.)
2./3. Pre-planning (~2 - 4 page table):
   - Aligning Standards, Objectives and Assessments
   - Lesson Design
   NOTE: Sections 4 and 5 may be combined into one narrative section
4. Instructional Decisions Narrative Based on Analysis of Student Work (~1 – 2 pages)
   - This is a narrative summary of your teaching and what students learned for each of the required content items (rubric lines 2-6).
   - You need to explain how you met the rubric item through your instruction, what students learned, and a reference to student work sample evidence. (*Actual student work sample evidence goes in the appendices.*) (3-4 pages)
5. Pre-post assessment comparison and analysis (~1–3 pages including graphs)
6. Analysis of instructional effectiveness (~1–2 pages)
Appendices

The title page contains: Title of your unit, your name, dates when CWS was implemented and the course number (495C or 595).

As most of you are well aware, the requirements for your teacher preparation degrees and subsequent teaching certifications are governed by a complex web of multiple organizations including the Council for Accreditation of Educator Preparation (NCATE/CAEP), the National Science Teachers Association Pre-service Teacher Standards (NSTA), Interstate Teacher Assessment and Support Consortium (InTASC) and the State of Arizona. You have already completed many of the requirements during your time in our programs and the remaining requirements will be met through your student teaching experience. Some of these requirements are met through observations of your in-class instruction, some are met through your student teaching portfolio/notebook and reflections, and this Candidate Work Sample (CWS) completes the requirements (see the NSTA description below).

NSTA Assessment 5 Description
Effect on Student Learning: Knowledge and skills are exemplified in the candidate's ability to effect learning with secondary students. This type of assessment usually involves the use of pre- and posttest results that match the standards and allows the candidate to reflect on their teaching. Addresses NSTA standards 1-5

and InTASC Standards 1-10. (www.**nsta**.org/pd/ncate/docs/**2012NSTA**PreserviceScience**Standards**.pdf) (http://www.ccsso.org/documents/2011/intasc_model_core_teaching_standards_2011.pdf)

The requirements are clarified in the rubric below, with explanations of what is required to receive a passing score. You need to receive a score of 2 or 3 for *each item on the rubric*. A final score of 1 for any of these categories would prevent you from passing the student teaching course! You may need to work with the CWS faculty evaluator to have the opportunity to revise your paper. Please read through the rubric below to gain a general understanding of the requirements for your CWS. Be sure to note what constitutes a passing score and the emphasis on providing *evidence through student work and quantifiable data* as a common requirement.

EVIDENCE OF STUDENT LEARNING RUBRIC

Item	Descriptors: NSTA & InTASC	Emerging 1	Basic 2	Professional 3
1 **The Learner and Learning:** Learning Differences Learning Environments *Overview of school context, demographics and implications for instruction.*	***School Community, Context and Learning Environment:*** *The Teacher Candidate uses information about the learning-teaching context and student individual differences to plan instruction and establish a learning environment.* (InTASC 2, 3)	The Teacher Candidate demonstrates limited or incomplete evidence of understanding how school community, classroom, and individual characteristics of students influence instructional decisions and/or the learning environment.	The Teacher Candidate clearly articulates information about the school community, classroom, and individual characteristics of the students, and how this information was used to plan instruction and create a learning environment.	The Teacher Candidate clearly articulates information about the school community, classroom, and individual characteristics of the students, and how this information was used to plan instruction and create a learning environment. Selected instructional strategies demonstrate high-level understanding of how to address classroom contextual factors to create a supportive learning environment.
2 **Content Knowledge:** Content Knowledge Application of Content	*The candidate is able to successfully convey to students the major science concepts, principles, theories, laws, and interrelationships of their fields of licensure.* (NSTA 1a) (InTASC 4, 5)	The Teacher Candidate provides little to no evidence of student learning and understanding of a major science concept from a unit plan	The Teacher Candidate identifies and provides evidence of student learning and understanding of a major science concept from a unit plan	The Teacher Candidate identifies and provides clear evidence of student learning and understanding of two or more major science concepts included in a unit plan. Includes a reflective analysis of students' learning.

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Instructional Practice: Assessment Planning for Instruction Instructional Strategies ***Scientific Concepts***	*The candidate is able to present a clear picture of what students learned during the CWS unit through the analysis and reflection on formative and summative evidence.* (NSTA 5a) (InTASC 4, 5) (InTASC 6, 7, 8)	The Teacher Candidate provides limited or no evidence for the use of formative and summative assessments in evaluating student learning.	The Teacher Candidate provides evidence for the use of formative and summative assessments in evaluating what students learned and clearly articulates student learning.	The Teacher Candidate demonstrates the use of formative and summative evidence in evaluating what students learned and clearly articulates student learning. Includes a reflective analysis regarding how assessments were used to modify instruction.
3 Content Knowledge: Content Knowledge Application of Content **Instructional Practice:** Assessment Planning for Instruction Instructional Strategies ***Nature of Science***	*The candidate provides data about their students' ability to distinguish science from non-science, understand the evolution and practice of science as a human endeavor, and critically analyze assertions made in the name of science.* (NSTA 5b) (InTASC 4, 5) (InTASC 6 7, 8)	The Teacher Candidate provides little to no evidence of student learning and understanding of at least one aspect of the nature of science.	The Teacher Candidate provides evidence of student learning and understanding of at least one aspect of the nature of science as defined by the NSTA position statement. *www.nsta.org/ about/positions/ natureofscience.aspx*	The Teacher Candidate provides clear evidence of student learning and understanding of two or more aspects of the nature of science as defined by the NSTA position statement.
4 Content Knowledge: Content Knowledge Application of Content	*The candidate demonstrates their ability to design lessons where students collect and interpret data in order to: develop and communicate concepts, understand scientific processes and relationships and natural patterns from empirical experiences, and apply science-specific technology as*	The Teacher Candidate provides little to no evidence of instruction where students learn through scientific inquiry (i.e. students collect and interpret data to develop scientific concepts and understandings).	The Teacher Candidate provides evidence of instruction where students learn through scientific inquiry by interpreting data to develop and communicate scientific concepts.	The Teacher Candidate provides evidence of instruction where students learn through multiple scientific inquiry opportunities by interpreting data to develop and communicate scientific concepts.

| Instructional Practice:

Assessment

Planning for Instruction

Instructional Strategies

Scientific Inquiry | *appropriate.*

(NSTA 2b)
(InTASC 4, 5)
(InTASC 6, 7, 8) | | | |
|---|---|---|---|---|
| | *The candidate develops lesson plans that show all students are expected to collect and interpret data using science-specific technology in order to understand scientific processes, relationships and patterns.*

(NSTA 3b)
(InTASC 4, 5)
(InTASC 6, 7, 8) | The Teacher Candidate does not provide evidence for student use of science specific technology to collect and interpret data, or lesson plans do not indicate *all* students are expected to learn from this experience. | The Teacher Candidate implements lesson plans that outline use of science specific technology in order for *all* students to collect and interpret data. | The Teacher Candidate implements lesson plans that outline use of science specific technology in order for *all* students to collect and interpret data. Includes a reflective analysis regarding success of the lesson(s) and potential modifications for future instruction. |

	The candidate provides evidence of engaging students in inquiries that contribute to their students' understanding of science concepts and relationships through empirical observations, data collection and making logical inferences. (NSTA 5c) (InTASC 4, 5) (InTASC 6, 7, 8)	The Teacher Candidate does not provide evidence of engaging students through scientific inquiries that require students to develop science concepts through learning experiences including (but not limited to) data collection, observations, and inferences.	The Teacher Candidate provides evidence of engaging students through scientific inquiries that require students to develop science concepts through learning experiences including (but not limited to) data collection, observations, and inferences.	The Teacher Candidate provides evidence of engaging students through scientific inquiries that require students to develop science concepts through learning experiences including (but not limited to) data collection, observations, and inferences. Includes a reflective analysis regarding success of the lesson(s) and potential modifications for future instruction.
5 **Instructional Practice:** Instructional Strategies ***College and career readiness and technology***	*The candidate demonstrates an understanding of the supporting role of mathematics and language arts and the use of technology for students to develop scientific understandings.* (NSTA 1b) (InTASC 8)	The Teacher Candidate provides little to no evidence of ability to effectively utilize cross-curricular disciplines and science specific technology to enhance teaching and learning.	The Teacher Candidate provides evidence of understanding the need to effectively utilize cross-curricular disciplines and science specific technology to enhance teaching and learning.	The Teacher Candidate provides evidence of ability to effectively apply cross-curricular disciplines and science specific technology to enhance teaching and learning.
6 **The Learner and Learning:** Learner Development Learning Differences **Instructional Practice:** Assessment Instructional Strategies	*The candidate designs instruction and assessment strategies that identify and address students' naïve concepts or preconceptions.* (NSTA 2c) (InTASC 1, 2) (InTASC 6, 8)	The Teacher Candidate demonstrates limited or incomplete evidence of understanding instructional decisions based on assessments of individual understandings. The Teacher Candidate uses unclear/ inappropriate pedagogical strategies to address the needs of diverse learners.	The Teacher Candidate articulates his/her instructional decisions based on assessments. The Teacher Candidate identifies the pedagogical strategies used to assess and build effectively upon student's prior knowledge, beliefs, experiences, individual differences and interests.	The Teacher Candidate demonstrates highly accurate and perceptive evidence of understanding instructional decisions and assessments. The Teacher Candidate demonstrates high level learning/thinking through pedagogical strategies used to meet individual students' needs.

	The candidate uses a variety of teaching strategies to engage and motivate all students in learning. (NSTA 3a) (InTASC 6, 7, 8)	The Teacher Candidate does not demonstrate the use of multiple teaching strategies used to engage and motivate all students throughout instruction.	The Teacher Candidate demonstrates the use of multiple teaching strategies used to engage and motivate all students throughout instruction.	The Teacher Candidate demonstrates the effectiveness on student learning of using multiple teaching strategies to engage and motivate all students throughout instruction.. Articulates how strategies were designed to meet the needs of all learners.
	The candidate applies ongoing fair and equitable assessment strategies to analyze student learning and evaluate preconceptions and ideas that students hold. (NSTA 3c) (InTASC 6, 7, 8)	The Teacher Candidate does not provide evidence of using equitable assessment strategies to analyze both students' prior knowledge and their learning as a result of instruction.	The Teacher Candidate provides evidence of using assessment strategies that equitably analyze students' prior knowledge and learning as a result of instruction.	The Teacher Candidate provides evidence of using assessment strategies that equitably analyze students' prior knowledge and learning as a result of instruction. Articulates how assessment strategies were designed to demonstrate understanding of all learners.
7 Professional Responsibility : Professional Learning & Ethical Practice Leadership and Collaboration	***Reflection, Professional Responsibilities and Ethics:*** *The Teacher Candidate reflects on his or her demonstrated professional responsibilities to improve teaching practice.* (InTASC 9, 10)	The Teacher Candidate provides a limited or incomplete reflection on professional responsibilities such as interacting effectively with colleagues, parents and students, the completion of professional duties or the demonstration of ethics of the profession to improve their daily practice.	The Teacher Candidate provides a clear reflection on their demonstration of professional responsibilities such as interacting effectively with colleagues, parents and students, the completion of professional duties or the application of ethics of the profession to improve their daily practice.	The Teacher Candidate provides a highly accurate and perceptive reflection on their demonstration of professional responsibilities such as interacting effectively with colleagues, parents and students, the completion of professional duties or the application of ethics of the profession to improve their daily practice.

1. Introduction (~1 page max): Provide an overview of the school, community and students you are working with that introduces the context for the unit you are teaching.

- What are the characteristics of the community, school, and classroom *that may affect learning*?
- Identify student and course differences (do not give student names) in your classes and how that may affect learning (i.e. diversity, special Ed IEPs, ESL students, students in athletic programs, 504s, gifted program students, AP class, remedial class, etc.).
- What are some specific implications for instruction and assessment based on the individual students, community, school, and classroom characteristics you are working with? (i.e. How might you need to adjust instruction if you have a diverse population? How might your instruction be adjusted if your school is in a rural vs. urban setting.

2./3. Pre-Planning: A table outlining your instructional unit. Identify the topic(s) and main activity(ies) for each instructional day of your CWS. Indicate the alignment between the standards, objectives, assessments (Pre/post tests and formative), and instructional activities. This is not to be written at the detailed level of lesson plans; rather it is a brief overview of your instructional unit.

An example table can be found at the end of this document.

NOTE: <u>Pre-Planning Alignment Table-Instruction</u> must be approved by your instructor before you give the pre-assessment of your unit.

4. Instructional Decisions Narrative: Organize your paper with a section corresponding to *each* of the required items found in items 2 – 6 of the rubric. Each section is written as a narrative description of your instruction in the classroom related to that particular topic. It needs to include 1) *how you taught/met that(those) rubric item(s) through your instruction, 2) what students learned, and 3) reference to the corresponding evidence that supports your statement of student learning*. (Evidence = student work samples placed in the appendices). Title each of these sections in bold followed by your narrative. Your evaluator will look in your narrative for evidence to evaluate if your instructional decisions are pedagogically sound.

Example (rubric item #2):

The candidate is able to successfully convey to students the major science concepts, principles, theories, laws, and interrelationships of their fields of licensure.

  The major science concepts I covered through my instruction were Mitosis and Meiosis *(what/how you taught).* After assigning a pre-assessment, I began this unit with a microscope lab where students had to draw the field of vision of onion root tip cells at 10x, 40x, and 100x magnification. Prior to receiving instruction on the vocabulary or stages of mitosis, the students compared results and determined what they felt were the main stages that they observed. Next they put the different stages of Mitosis in what they predicted to be the correct order on the front board. They debated their reasoning as a class before turning in a final sheet that was to be graded.…

  …Through this students demonstrated that they successfully learned the basics of cell division: both why it occurs and the cellular processes that take place (*what students learned).* The table below demonstrates their level of improvement from their pre-test to their post-test (tests included in Appendix A) (*evidence of student learning).* The overall average improvement was from a 40% on the pre-test to a 75% on the post-test, demonstrating 35% improvement based upon the classroom instruction. Question 12 (included in the graph below) demonstrates a 67% improvement in their understanding of which process is related to cell division for reproduction, demonstrating student growth in my 3rd objective "Students will be able to…"

  Finally, I have included pictures of posters that students made (Appendix B) demonstrating their understanding by successfully drawing and labeling the stages of mitosis and meiosis.

5. Pre-Post Assessment Comparison and Analysis: Analyze the results of your pre/post tests **by learning objective** and discuss the students' growth. Calculate the % improvement by objective and provide a pre/post test analysis using graphs that demonstrate quantifiable growth according to objective.

6. Reflection on Instructional Effectiveness: Further analyze and reflect upon the unit you taught. Write a narrative that addresses line 7 on the rubric (reflection). The following questions may be helpful to consider for passing this section.

Be sure to also provide an insightful reflection on how you have effectively demonstrated (or not) **professional responsibilities** such as interacting effectively with colleagues, parents and students, the completion of professional duties and the application of ethics of the profession in order to improve your daily professional practice. What specific professional development needs do you plan on addressing early in your teaching career and why?

- Did all of your students learn?
- How well did your special populations do?
- Provide hypotheses for why some students did not meet learning goals.
- Which learning activities were effective or not effective and why?
- What changes could you make to your unit or your practice that could improve results of student learning?
- What is the connection between successful student learning and the alignment of standards, learning objectives, assessment and instruction?
- Should other data to be considered?
- Should achievement be determined by mastery of objectives alone?

Appendices: Organize the Appendices, providing evidence to support your analysis.
- Appendix A: A full copy of the pre and post-assessments, indicating the objective(s) addressed by each question.
- Appendix B: Other referenced evidence such as student work samples *(do not reveal the identification of any specific student),* examples of formative assessments or exemplary lesson plans.
- Appendix C: Other supporting documentation such as handouts, photos, etc.

The above are the absolute minimum requirements to successfully pass your CWS. We have found there are a number of things you can do that will be helpful towards your success, primarily thoughtful and thorough planning. Below are some additional supporting directions that have proven to be instrumental to student success.

More on pre-planning:

It is very helpful to create a planning table that aligns the CWS requirements (rubric lines 2-6), your assessments, and instructional activities. This helps to get some big picture ideas for your unit and make sure you are addressing *all* of the required content. See the example below.

Objectives (SWBAT): In collaboration with your cooperating teacher and university supervisor identify the objectives for the topic(s) that you are teaching. Be sure to:
a) align with state and/or national standards (content and process)
b) include a **measurable** skill or performance that students should be able to complete as a result of instruction

c) indicate the **conditions** under which students will complete the skill or task, as appropriate (i.e., a performance assessment, a traditional exam, etc. (pre assessment and post assessment plan); and

Pre-assessment and post-assessment plan. Your plan needs to include a pre-assessment that documents the current level of knowledge and skill that students possess for each of your identified objectives before you begin teaching your unit. Ideally, your pre-assessment data will be collected several days prior to the beginning of the unit you will teach in order to give you time to modify your instructional plans. The post-assessment needs to be closely aligned with your pre-assessment so that you are comparing "apples to apples", and thus measuring student learning for each objective. Remember that in order to provide evidence of student learning, it is helpful to collect quantifiable data through closely aligned assessments rather than rely upon descriptive or qualitative data.

Example of Pre-Planning Table:

Day	Topic & Objective(s)	Standards (State & National)	Assessments (formative & summative)	Instructional Activity(ies)	Alignment to rubric rows 2-6
1	Development of microscopes: SWBAT…	Arizona: NGSS:	Pre & post-test question 4: ….. Formative: Journal entry on how the invention of the microscope has affected present day society.	Build a microscope Chapter 7 readings	The candidate facilitates their **students' learning the nature of science.**
2	Mitosis / meiosis: Student will be able to correctly put the stages if mitosis in the correct order.	Arizona: NGSS:	Pre & post-test question 8: Put the stages of mitosis in the correct order. Formative: Draw the stages of mitosis and label them correctly journal entry.	Microscope lab Chapter 7 readings	The candidate is able to successfully convey to students the **major science concepts, principles, theories, laws, and interrelationships** of their fields of licensure. (row 2)
3	Mitosis/Meiosis: SWBAT….	Arizona: NGSS:	Pre & post-test questions 2 & 3: …………. Formative: • microscope lab • order the stages of mitosis design a play acting out cell division	Multiple inquiry based labs: • microscope lab • order the stages of mitosis design a play acting out cell division	The candidate engages students effectively through multiple instructional strategies including **scientific inquiry and investigations.**
4	Mitosis/Meiosis: SWBAT….	Arizona: NGSS:	Pre/post-test questions: (etc…)	Virtual microscopes used to collect data.	The candidate demonstrates an ability to

			Formative: • microscope lab • online web quest handout.	On-line web quest.	effectively **utilize technology to enhance teaching and learning.**
5	Mitosis/Meiosis: SWBAT….	Arizona: NGSS:	Pre/post-tests: multiple choice, short answer, short essay, label diagrams Formative: • TPS • Quiz Microscope lab presentations	Ongoing activities throughout this unit.	The candidate uses the results of **multiple assessments** to assess students' prior knowledge, address individual differences, and guide and modify instruction.

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