Program Report for the Preparation of Science Teachers

National Science Teachers Association (NSTA)
2004 Standards[1]

NATIONAL COUNCIL FOR ACCREDITATION OF TEACHER EDUCATION

C O V E R S H E E T

Institution William Carey University **State** MS

Date submitted September 10, 2007

Name of Preparer Randall K. Harris, Ph.D., Chair, Department of Biological Sciences

Phone # 601-318-6595 **Email** randall.harris@wmcarey.edu

Program documented in this report:

Name of institution's program (s) Biology/General Science
Grade levels for which candidates are being prepared 7-12
Degree or award level Bachelor of Science in Biology

Is this program offered at more than one site? □ **Yes** **X No**

If yes, list the sites at which the program is offered _____

Title of the state license for which candidates are prepared

Five Year Educator License

Program report status:

- **X Initial Review**
- ☐ **Response to a Not Recognized Decision**
- ☐ **Response to National Recognition With Conditions**
- ☐ **Response to a Deferred Decision**

State licensure requirement for national recognition:

NCATE requires 80% of the program completers who have taken the test to pass the applicable state licensure test for the content field, if the state has a testing requirement. Test information and data must be reported in Section III. Does your state require such a test?

X Yes □ **No**

[1] Institutions submitting program reports in fall 2005 may write to either the 1997 or the 2004 edition of the NSTA standards. All institutions submitting program reports in spring 2005 and beyond must write to the 2004 standards.

SECTION I—CONTEXT

The Department of Biological Sciences at William Carey University serves a broad population of students preparing for various careers. These populations include the following:
1. students studying for admission to various professional schools, such as medical, dental, nursing, or other health-related areas;
2. students studying for careers as professional biologists in areas such as microbiology, molecular biology, and environmental biology; and
3. students studying for admission to Teacher Education and eventual licensure in Biology and General Science.

The department has almost 100 majors but the number of teacher licensure students is typically between 9 and 12 in any given year, making it possible to give each student the individualized attention and tracking he or she needs in terms of advisement and progression through the program. Additionally, advisement of these students is undertaken as a joint responsibility of the Biological Sciences department and the School of Education.

A curricular example of this dual involvement in Biology teacher education is the following. For some years, all secondary education students have been required to take EDU 446, Teaching in the Secondary School. While this has always been a valuable source of experience and training for our students, the faculty from both the science and education areas were concerned that this course did not adequately target the various proficiencies and issues involved in teaching Biology at the secondary level. So in 2006, the faculty of the Biological Sciences department recommended the addition of BIO 340, Teaching Biology in the Secondary School, as a way to improve our discipline-specific training of teacher candidates. Furthermore, students are not allowed to take this course any earlier than their junior year, at a point at which they almost certainly have been admitted to teacher education, creating synergy between the Biology coursework and the teacher education coursework.

All of the professors in the Biological Sciences department teach at least one course that is required for teacher licensure students; therefore, the entire department is involved and committed to the successful training of these students.

Admission to Teacher Education

1. Completion of the 44 hour liberal arts core with a grade point average of 2.5 or better. (Note: Students must make a C or better in English 101 and 102.)
2. Take and pass PRAXIS I with the following scores: Reading 170 (CBT 316); Writing 172 (CBT 318); and Mathematics 169 (CBT 314). Alternatively, students can meet this requirement with high school ACT scores of 21 or higher (composite), and no subscore below 18.
3. Make application for admission to Teacher Education.

Secondary majors are limited to six hours of EDU courses prior to admission to teacher education. No 400 level courses may be taken prior to being officially admitted to teacher education. All candidates must be admitted to teacher education at least one trimester prior to student teaching.

Bachelor of Science General core
44 hours of courses are required for admission to teacher education:

ENG 101: Composition (3 hours)
ENG 102: Research and Composition (3 hours)
ENG 211: World Literature I (3 hours)
Literature with an ENG prefix (3 hours) or PHI 201: Introduction to Philosophy
Fine Arts (3 hours): MUM 101: Music Appreciation or ART 200: Art Appreciation or THE 135: Theatre Appreciation
HIS 101: World History to 1500 or HIS 201: United States to 1865 (3 hours)
HIS 102: World History since 1500 or HIS 202: United States since 1865 (3 hours)
Social Science (3 hours): SOC 101: Introduction to Sociology or SOC 111: Introduction to Anthropology or PSC 201: American Federal Government
Lab Science (8 hours) – covered by the major requirements
Physical Science (3 hours) – covered by the major requirements
MAT 131: College Algebra (3 hours)
PSY 201: General Psychology (3 hours)
COM 101: Public Speaking or COM 230: Oral Interpretation of Literature

Additional University/General Education Requirements (23 hours)
REL 101: Introduction to the Old Testament (3 hours)
REL 102: Introduction to the New Testament (3 hours)
Physical Education activity courses (2 hours): Any PED prefix courses
Any Math course higher than College Algebra (3 hours)
PSY 351: Introduction to Psychological Statistics (4 hours)
BUS 102: Fundamental Computer Concepts and Applications (3 hours)
PSY 203: Adolescent Psychology (3 hours)
PSY 204: Educational Psychology (3 hours)
English Proficiency Exam

Biology Major, Teacher Licensure Track
A minimum of 40 hours (at least 20 upper-level) is required of BIO/HRP courses. All biology majors must take the following biological sciences core curriculum:
BIO 111: Principles of Biological Science I (4 hours)
BIO 112: Principles of Biological Science II (4 hours)
BIO 113: Principles of Biological Science III (4 hours)
BIO 498: Biology Capstone (3 hours)
CHE 111: Inorganic Chemistry I (4 hours)
CHE 112: Inorganic Chemistry II (4 hours)
CHE 211: Organic Chemistry I (4 hours)

The following courses are required for teacher licensure students in addition to the biological sciences core:
BIO 234: Anatomy and Physiology I (4 hours)
BIO 235: Anatomy and Physiology II (4 hours)
BIO 260: General Microbiology (4 hours)
BIO 310: Genetics (4 hours)

BIO 320: Ecology (4 hours)
BIO 340: Teaching Biology in the Secondary School (4 hours)
PHS 151: Physical Science (3 hours)
PHS 201: Earth and Space Science (3 hours)

To complete the biology major, teacher licensure students select one course from the following:
BIO 309: Vertebrate Form and Function (4 hours)
BIO 405: Biological Research (4 hours)
BIO 416: Applied Microbiology (4 hours)
BIO 419: Immunology (4 hours)
BIO 430: Field Biology (4 hours)

Students also have the option of using summer courses at the Gulf Coast Research Laboratory (GCRL) to complete the major hours. These courses can be directly transferred as William Carey credit due to an affiliation agreement with the GCRL.

Professional Education coursework (27 hours):

EDU 300: Introduction and Foundations of Education (3 hours)
EDU 300.1: Pre-Teaching Field Experience (0-1 hours; this course provides the student with 21 hours of early field experience in a local school)
EDU 372: Survey of the Exceptional Child (3 hours)
EDU 436: Classroom Management (3 hours)
EDU 446: Teaching in the Secondary School (3 hours)
EDU 450: Tests, Measurements, and Evaluation (3 hours)
EDU 484: Directed Teaching in the Secondary School (12 hours; this is the "student teaching" course, which provides 65 school days of supervised teaching experience in a local school; the student also attends seminars on the STAI or INTASC)

Approval for Student Teaching in Biology

Students must:
1. Be a senior
2. Pass the English Proficiency Exam
3. Earn an overall GPA of 2.5 or better
4. Earn a grade of C or better in all professional education courses
5. Earn a grade of C or better in all courses in the major teaching field
6. Pass PRAXIS I AND PRAXIS II (Principles of Teaching and Learning, and the Biology Content Knowledge exam). Students are encouraged to take the PRAXIS II examinations at least one trimester before student teaching.
7. Have a statement from the student's advisor certifying the student's competency in Biology
8. Have approval of the chair of the Department of Biological Sciences and the director of student teaching

SECTION II— LIST OF ASSESSMENTS

In this section, list the 6-8 assessments that are being submitted as evidence for meeting the2003 NSTA standards. All programs must provide a minimum of six assessments. If your state does not require a state licensure test in the content area, you must substitute an assessment that documents candidate attainment of content knowledge in #1 below. For each assessment, indicate the type or form of the assessment and when it is administered in the program.

	Name of Assessment[2]	Type or Form of Assessment[3]	When the Assessment Is Administered[4]
1	**PRAXIS II – Licensure Test Results**	Praxis II: Biology Content Knowledge	Candidates take the PRAXIS II: PLT and Biology Content Knowledge at least one trimester before student teaching.
2	**a. NSTA Content Analysis Tables to demonstrate alignment with NSTA content standards (Secondary Science)** **b. Major Field Test in Biology**	a. NSTA Content Analysis chart for Secondary Science b. comprehensive senior examination	a. Completion of the degree program b. BIO 498: Biology Capstone
3	**Planning instruction and assessment**	Lesson plans	BIO 340: Teaching Biology in the Secondary School
4	**Student Teaching Assessment**	Student Teacher Assessment Instrument (STAI) -- evaluation	Upon completion of student teaching
5	**Oral Senior Presentation**	Presentation	BIO 498: Biology Capstone
6	**Teaching Biology Classes and Labs Assignment**	Essay assignment	BIO 340: Teaching Biology in the Secondary School
7	**Research Proposal**	Project	BIO 405: Biological Research
8	**History of Biology Timeline Assignment**	Portfolio assignment	BIO 340: Teaching Biology in the Secondary School

[2] Identify assessment by title used in the program; refer to Section IV for further information on appropriate assessment to include.
[3] Identify the type of assessment (e.g., essay, case study, project, comprehensive exam, reflection, state licensure test, portfolio).
[4] Indicate the point in the program when the assessment is administered (e.g., admission to the program, admission to student teaching/internship, required courses [specify course title and numbers], or completion of the program).

SECTION III—RELATIONSHIP OF ASSESSMENT TO STANDARDS

For each NSTA standard on the chart below, identify the assessment(s) in Section II that address the standard. One assessment may apply to multiple NSTA standards.

NSTA STANDARD[5] [6]	APPLICABLE ASSESSMENTS FROM SECTION II
1. Content. Teachers of science understand and can articulate the knowledge and practices of contemporary science. They can interrelate and interpret important concepts, ideas, and applications in their fields of licensure; and can conduct scientific investigations. To show that they are prepared in content, teachers of science must demonstrate that they **(a)** understand and can successfully convey to students the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association;	X #1 X#2 ☐#3 ☐#4 X#5 ☐#6 ☐#7 ☐#8
(b) understand and can successfully convey to students the unifying concepts of science delineated by the National Science Education Standards;	☐#1 X#2 X#3 ☐#4 ☐#5 ☐#6 ☐#7 ☐#8
(c) understand and can successfully convey to students important personal and technological applications of science in their fields of licensure;	☐#1 ☐#2 X#3 X#4 X#5 ☐#6 ☐#7 ☐#8
d) understand research and can successfully design, conduct, report evaluate investigations in science	☐#1 ☐#2 ☐#3 ☐#4 X#5 ☐#6 X#7 ☐#8

[5] NCATE will provide a link to the full set of SPA standards, including indicators/elements/dimensions and supporting explanations.
[6] Dimensions of standards are split out from each other when it is highly likely they will be found in different assessment instruments. When the dimensions are likely to be apparent in the same assessment instrument, they have been left together.

NSTA STANDARD[5] [6]	APPLICABLE ASSESSMENTS FROM SECTION II
(**e**); and understand and can successfully use mathematics to process and report data, and solve problems, in their field(s) of licensure.	☐#1 X#2 ☐#3 ☐#4 ☐#5 ☐#6 X#7 ☐#8
2. Nature of Science. Teachers of science engage students effectively in studies of the history, philosophy, and practice of science. They enable students 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. To show they are prepared to teach the nature of science, teachers of science must demonstrate that they:	
(a) understand the historical and cultural development of science and the evolution of knowledge in their discipline;	☐#1 X#2 ☐#3 ☐#4 ☐#5 ☐#6 ☐#7 X#8
(b) understand the philosophical tenets, assumptions, goals, and values that distinguish science from technology and from other ways of knowing the world;	☐#1 X#2 ☐#3 ☐#4 ☐#5 ☐#6 ☐#7 X#8
(c) engage students successfully in studies of the nature of science including, when possible, the critical analysis of false or doubtful assertions made in the name of science	☐#1 ☐#2 X#3 ☐#4 ☐#5 ☐#6 ☐#7 ☐#8
3. Inquiry. Teachers of science engage students both in studies of various methods of scientific inquiry and in active learning through scientific inquiry. They encourage students, individually and collaboratively, to observe, ask questions, design inquiries, and collect and interpret data in order to develop concepts and relationships from empirical experiences. To show that they are prepared to teach through inquiry, teachers of science must demonstrate that they:	
(a) understand the processes, tenets, and assumptions of multiple methods of inquiry leading to scientific knowledge;	☐#1 ☐#2 X#3 ☐#4 ☐#5 ☐#6 ☐#7 ☐#8
(b) engage students successfully in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner.	☐#1 ☐#2 X#3 ☐#4 ☐#5 ☐#6 ☐#7 ☐#8

NSTA STANDARD[5] [6]	APPLICABLE ASSESSMENTS FROM SECTION II
4. Issues. Teachers of science recognize that informed citizens must be prepared to make decisions and take action on contemporary science- and technology-related issues of interest to the general society. They require students to conduct inquiries into the factual basis of such issues and to assess possible actions and outcomes based upon their goals and values. To show that they are prepared to engage students in studies of issues related to science, teachers of science must demonstrate that they: **(a)** understand socially important issues related to science and technology in their field of licensure, as well as processes used to analyze and make decisions on such issues;	☐#1 ☐#2 X#3 ☐#4 X#5 ☐#6 ☐#7 ☐#8
(b) engage students successfully in the analysis of problems, including considerations of risks, costs, and benefits of alternative solutions; relating these to the knowledge, goals and values of the students.	☐#1 ☐#2 X#3 ☐#4 X#5 ☐#6 ☐#7 ☐#8
5. General Skills of Teaching. Teachers of science create a community of diverse learners who construct meaning from their science experiences and possess a disposition for further exploration and learning. They use, and can justify, a variety of classroom arrangements, groupings, actions, strategies, and methodologies. To show that they are prepared to create a community of diverse learners, teachers of science must demonstrate that they **(a)** vary their teaching actions, strategies, and methods to promote the development of multiple student skills and levels of understanding;	☐#1 ☐#2 X#3 X#4 X#5 ☐#6 ☐#7 ☐#8
(b) successfully promote the learning of science by students with different abilities, needs, interests, and backgrounds;	☐#1 ☐#2 X#3 X#4 X#5 ☐#6 ☐#7 ☐#8
(c) successfully organize and engage students in collaborative learning using different student group learning strategies;	☐#1 ☐#2 X#3 X#4 X#5 ☐#6 ☐#7 ☐#8
(d) successfully use technological tools, including but not limited to computer technology, to access resources, collect and process data, and facilitate the learning of science;	☐#1 ☐#2 X#3 X#4

NSTA STANDARD[5] [6]	APPLICABLE ASSESSMENTS FROM SECTION II
	X#5 ☐#6 ☐#7 ☐#8
(e) understand and build effectively upon the prior beliefs, knowledge, experiences, and interests of students; and	☐#1 ☐#2 X#3 X#4 X#5 ☐#6 ☐#7 ☐#8
(f) create and maintain a psychologically and socially safe and supportive learning environment.	☐#1 ☐#2 X#3 X#4 X#5 ☐#6 ☐#7 ☐#8
6. Curriculum. Teachers of science plan and implement an active, coherent, and effective curriculum that is consistent with the goals and recommendations of the National Science Education Standards. They begin with the end in mind and effectively incorporate contemporary practices and resources into their planning and teaching. To show that they are prepared to plan and implement an effective science curriculum, teachers of science must demonstrate that they:	
(a) understand the curricular recommendations of the National Science Education Standards, and can identify, access, and/or create resources and activities for science education that are consistent with the standards;	☐#1 ☐#2 X#3 ☐#4 X#5 ☐#6 ☐#7 ☐#8
(b) plan and implement internally consistent units of study that address the diverse goals of the National Science Education Standards and the needs and abilities of students.	☐#1 ☐#2 X#3 ☐#4 ☐#5 ☐#6 ☐#7 ☐#8
7. Science in the Community. Teachers of science relate their discipline to their local and regional communities, involving stakeholders and using the individual, institutional, and natural resources of the community in their teaching. They actively engage students in science-related studies or activities related to locally important issues. To show that they are prepared to relate science to the community, teachers of science must demonstrate that they:	
(a) identify ways to relate science to the community, involve stakeholders, and use community resources to promote the learning of science;	☐#1 ☐#2 X#3 ☐#4 ☐#5 ☐#6 ☐#7 ☐#8

NSTA STANDARD[5 6]	APPLICABLE ASSESSMENTS FROM SECTION II
(b) involve students successfully in activities that relate science to resources and stakeholders in the community or to the resolution of issues important to the community.	☐#1 ☐#2 X#3 X#4 ☐#5 ☐#6 ☐#7 ☐#8
8. Assessment. Teachers of science construct and use effective assessment strategies to determine the backgrounds and achievements of learners and facilitate their intellectual, social, and personal development. They assess students fairly and equitably, and require that students engage in ongoing self-assessment. To show that they are prepared to use assessment effectively, teachers of science must demonstrate that they: **(a)** use multiple assessment tools and strategies to achieve important goals for instruction that are aligned with methods of instruction and the needs of students;	☐#1 ☐#2 X#3 X#4 X#5 ☐#6 ☐#7 ☐#8
(b) use the results of multiple assessments to guide and modify instruction, the classroom environment, or the assessment process;	☐#1 ☐#2 X#3 X#4 ☐#5 ☐#6 ☐#7 ☐#8
(c) use the results of assessments as vehicles for students to analyze their own learning, engaging students in reflective self-analysis of their own work.	☐#1 ☐#2 X#3 X#4 ☐#5 ☐#6 ☐#7 ☐#8
9. Safety and Welfare. Teachers of science organize safe and effective learning environments that promote the success of students and the welfare of all living things. They require and promote knowledge and respect for safety, and oversee the welfare of all living things used in the classroom or found in the field. To show that they are prepared, teachers of science must demonstrate that they: **(a)** understand the legal and ethical responsibilities of science teachers for the welfare of their students, the proper treatment of animals, and the maintenance and disposal of materials;	☐#1 ☐#2 ☐#3 ☐#4 ☐#5 X#6 ☐#7 ☐#8
(b) know and practice safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used in science instruction;	☐#1 ☐#2 ☐#3 ☐#4 ☐#5 X#6 ☐#7 ☐#8

NSTA STANDARD[5] [6]	APPLICABLE ASSESSMENTS FROM SECTION II
(c) know and follow emergency procedures, maintain safety equipment, and ensure safety procedures appropriate for the activities and the abilities of students;	☐#1 ☐#2 ☐#3 ☐#4 ☐#5 X#6 ☐#7 ☐#8
(d) treat all living organisms used in the classroom or found in the field in a safe, humane, and ethical manner and respect legal restrictions on their collection, keeping, and use.	☐#1 ☐#2 ☐#3 ☐#4 ☐#5 X#6 ☐#7 ☐#8
10. Professional Growth. Teachers of science strive continuously to grow and change, personally and professionally, to meet the diverse needs of their students, school, community, and profession. They have a desire and disposition for growth and betterment. To show their disposition for growth, teachers of science must demonstrate that they: **(a)** engage actively and continuously in opportunities for professional learning and leadership that reach beyond minimum job requirements;	☐#1 ☐#2 ☐#3 X#4 ☐#5 ☐#6 ☐#7 ☐#8
(b) reflect constantly upon their teaching and identify ways and means through which they may grow professionally;	☐#1 ☐#2 X#3 X#4 ☐#5 ☐#6 ☐#7 ☐#8
(c) use information from students, supervisors, colleagues and others to improve their teaching and facilitate their professional growth;	☐#1 ☐#2 X#3 X#4 ☐#5 ☐#6 ☐#7 ☐#8
(d) interact effectively with colleagues, parents, and students; mentor new colleagues; and foster positive relationships with the community.	☐#1 ☐#2 ☐#3 X#4 ☐#5 ☐#6 ☐#7 ☐#8

SECTION IV—EVIDENCE FOR MEETING STANDARDS

Section IV
Assessment #1: Content Knowledge
PRAXIS II

1. Brief description of the assessment and its use in the program

The PRAXIS II Biology Content Knowledge exam (Biology 0235) is a nationally recognized exam for use in the certification of teachers of Biology. It is a requirement of the WCU Department of Education, to be taken and passed at least one trimester before the candidate plans to student teach.

2. Description of how this assessment specifically aligns with the standards

This assessment aligns with NSTA Standard 1a (the candidate understands the major concepts, principles, theories, laws, and interrelationships of the content area), and is generally regarded as an adequate assessment of a candidate's knowledge of NSTA standards.

3. Brief analysis of the data findings

The only data available to the Biological Sciences department is the PRAXIS II scores for 2005-2006 (from 11/05 to 6/06). Additionally, these scores include not only teacher licensure candidates from the Biology secondary education program, but also students who were sitting for the exam as part of the alternate route to teacher certification. From the data provided, there is no way to know which students are which. However, out of a total of 17 students that sat for the exam during the designated time frame, 14 achieved a passing score (82.4% passing), and this is within NCATE expectations.

4. Interpretation of how the data provides evidence for meeting standards

The combination of an acceptable overall pass rate and the nationally recognized validity of the PRAXIS II Biology Content Knowledge exam indicate to us that this standard has been met adequately.

5a. Assessment tool or description

PRAXIS II, Biology Content Knowledge exam (0235)

5b. Scoring guide for the assessment

The Educational Testing Service provides scores for the exam, and the minimum passing score (150) is set by the Mississippi Department of Education.

5c. Candidate data derived from the assessment

Testing Cycle	Passed 1st time	Failed 1st time	Failed 2nd time	Total passed
11/05 – 1/06	1	4	2	5 out of 7
2/06	1	2	0	3 out of 3
3/06 – 4/06	3	3	1	6 out of 7
5/06 – 6/06	0	0	0	0
Totals	5	9	3	14 out of 17

Section IV
Assessment #2a
NSTA Content Analysis Tables

1. Brief description of the assessment and its use in the program

We are providing the NSTA Content Analysis Tables to show alignment of the WCU Biology education curriculum (as outlined in Section I) with NSTA standards.

2. Description of how this assessment specifically aligns with the standards

WCU Biology education students are required to take a rigorous and restricted curriculum that meets the content areas of the NSTA standards; specifically, these standards include 1a, 1b, 1e, 2a, and 2b. Many of the standards are fulfilled by our freshman series, Principles of Biological Science I, II, and III. These courses, taken sequentially, provide a good foundation for all biology students. Biology education students are also required to take 12 hours of chemistry and 6 hours of math, further fulfilling NSTA standards. It is clear from the Content Analysis Tables that our curriculum covers all the bases of the standards, and that the courses used to meet the standards are spread throughout the curriculum, at all class levels.

3. Brief analysis of the data findings

Over the past three years, all program completers have passed these required courses with a minimum grade of C, since this is a requirement for the transition point into student teaching.

4. Interpretation of how the data provides evidence for meeting standards

This data is strong evidence that the WCU Biology education curriculum meets the NSTA standards. One weakness revealed in the data, however, is that there are some courses in the curriculum that all students do not take; students get a choice of taking either BIO 309 (Vertebrate Form and Function), BIO 405 (Biological Research), BIO 416 (Applied Microbiology), BIO 419 (Immunology), or BIO 430 (Field Biology), meaning that there is some natural variation in the preparation of each student. However, with respect to meeting the NSTA standards, we do not believe this is a serious weakness, as each of the standards is also met by required coursework.

Another issue of note is that these are the same courses being taken by all other science students, with the possible exception of BIO 340, Teaching Biology in the Secondary School; because of its more focused content, Biology education students are more likely to take this course, although enrollment in the course is open to any Biology or Science upperclassman.

5a. Assessment tool or description

See the NSTA Content Analysis Tables, below.

5b. Scoring guide for the assessment

Not applicable.

5c. Candidate data derived from the assessment

Self-evident/not applicable.

NSTA Content Analysis Tables

Competency Requirements for All Science Teachers
Table I: Unifying Concepts

A: Competency (numbers 1-5)	B: Required Courses or advising requirements
1. Multiple ways we organize our perceptions of the world and how systems organize the studies and knowledge of science.	BIO 111: Principles of Biological Science I BIO 112: Principles of Biological Science II BIO 113: Principles of Biological Science III CHE 111: Inorganic Chemistry I CHE 112: Inorganic Chemistry II
2. Nature of scientific evidence and the use of models for explanation.	BIO 111: Principles of Biological Science I BIO 112: Principles of Biological Science II BIO 113: Principles of Biological Science III CHE 111: Inorganic Chemistry I CHE 112: Inorganic Chemistry II
3. Measurement as a way of knowing and organizing observations of constancy and change.	BIO 111: Principles of Biological Science I CHE 111: Inorganic Chemistry I
4. Evolution of natural systems and factors that result in evolution or equilibrium.	BIO 111: Principles of Biological Science I PHS 201: Earth and Space Science
5. Interrelationships of form, function, and behaviors in living and nonliving systems.	BIO 111: Principles of Biological Science I BIO 112: Principles of Biological Science II BIO 113: Principles of Biological Science III

Science Content Requirement Analysis Tables A, B, and C for Biology
Table A: Biology

A. Core Competencies (numbers 1-12)	B: Required Courses or advising requirements
1. Life processes in living systems including organization of matter and energy.	BIO 111: Principles of Biological Science I
2. Similarities and differences among animals, plants, fungi, microorganisms, and viruses	BIO 111: Principles of Biological Science I BIO 112: Principles of Biological Science II BIO 113: Principles of Biological Science III

3. Principles and practices of biological classification	BIO 111: Principles of Biological Science I BIO 112: Principles of Biological Science II BIO 113: Principles of Biological Science III
4. Theory and principles of biological evolution	BIO 111: Principles of Biological Science I BIO 310: Genetics BIO 309: Vertebrate Form and Function
5. Ecological systems including the interrelationships and dependencies of organisms with each other and their environments.	BIO 111: Principles of Biological Science I BIO 320: Ecology BIO 430: Field Biology
6. Population dynamics and the impact of population on its environment.	BIO 111: Principles of Biological Science I BIO 320: Ecology BIO 430: Field Biology
7. General concepts of genetics and heredity	BIO 113: Principles of Biological Science III BIO 234: Anatomy and Physiology I BIO 310: Genetics
8. Organizations and functions of cells and multi-cellular systems.	BIO 111: Principles of Biological Science I BIO 234: Anatomy and Physiology I BIO 260: General Microbiology
9. Behavior of organisms and their relationships to social systems.	BIO 320: Ecology BIO 309: Vertebrate Form and Function BIO 430: Field Biology
10. Regulation of biological systems including homeostatic mechanisms	BIO 111: Principles of Biological Science I BIO 234: Anatomy and Physiology I BIO 309: Vertebrate Form and Function BIO 419: Immunology
11. Fundamental processes of modeling and investigating in the biological sciences	BIO 111: Principles of Biological Science I BIO 340: Teaching Biology in the Secondary School BIO 405: Biological Research BIO 430: Field Biology BIO 498: Biology Capstone

12. Applications of biology in environmental quality and in personal and community health	BIO 260: General Microbiology BIO 340: Teaching Biology in the Secondary School BIO 416: Applied Microbiology

Table B: Biology

B. Advanced Competencies (numbers 13-21)	**B: Required Courses or advising requirements**
13. Bioenergetics including major biochemical pathways	BIO 111: Principles of Biological Science I BIO 234: Anatomy and Physiology I BIO 260: General Microbiology BIO 416: Applied Microbiology
14. Biochemical interactions of organisms and their environments	BIO 111: Principles of Biological Science I BIO 234: Anatomy and Physiology I BIO 260: General Microbiology
15. Molecular genetics and heredity and mechanisms of genetic modification	BIO 111: Principles of Biological Science I BIO 113: Principles of Biological Science III BIO 310: Genetics BIO 416: Applied Microbiology
16. Molecular basis for evolutionary theory and classification	BIO 111: Principles of Biological Science I BIO 310: Genetics
17. Causes, characteristics, and avoidance of viral, bacterial, and parasitic diseases	BIO 260: General Microbiology BIO 419: Immunology
18. Issues related to living systems such as genetic modification, uses of biotechnology, cloning, and pollution from farming.	BIO 260: General Microbiology BIO 310: Genetics BIO 416: Applied Microbiology
19. Historical development and perspectives in biology including contributions of significant figures and underrepresented groups, and the evolution of theories in biology	BIO 111: Principles of Biological Science I BIO 260: General Microbiology BIO 310: Genetics BIO 340: Teaching Biology in the Secondary School BIO 498: Biology Capstone
20. How to design, conduct, and report research in biology	BIO 405: Biological Research BIO 498: Biology Capstone
21. Applications of biology and biotechnology in society, business, industry, and health fields	BIO 260: General Microbiology BIO 310: Genetics BIO 416: Applied Microbiology BIO 498: Biology Capstone

Table C: Biology

C. Supporting Competencies (numbers 22-25)	**B: Required Courses or advising requirements**
22. Chemistry, including general chemistry and biochemistry with basic laboratory techniques.	CHE 111: Inorganic Chemistry I CHE 112: Inorganic Chemistry II CHE 211: Organic Chemistry I PHS 151: Physical Science
23. Physics including light, sound, optics, electricity, energy and order, magnetism, and thermodynamics.	PHS 151: Physical Science
24. Earth and space sciences including energy and geochemical cycles, climate, oceans, weather, natural resources, and changes in the Earth.	PHS 201: Earth and Space Science
25. Mathematics, including probability and statistics	MAT 131: College Algebra MAT course higher than College Algebra BIO 310: Genetics PSY 351: Introduction to Psychological Statistics

Section IV
Assessment #2b
Major Field Test in Biology

1. Brief description of the assessment and its use in the program

The Major Field Test in Biology, developed and administered by the Educational Testing Service, is a nationally recognized exam designed to measure student learning outcomes in four broad content areas: Cell Biology, Molecular Biology and Genetics, Organismal Biology, and Population Biology/Evolution/Ecology. The test consists of approximately 150 multiple choice questions, and it tests concepts in a mixture of standard recall type questions as well as in the context of an experimental description or data analysis type question.

Prior to 2006, the WCU Biological Sciences department made use of the Biology ACAT (Area Concentration Achievement Test) due to the modular nature of the test and the flexibility of concepts tested. However, we determined that the Biology ACAT did not give us the comparison to national benchmarks that the MFT in Biology does. Beginning with the 2006 school year, we switched over to the MFT and have now given this to two groups of senior Biology majors in the context of BIO 498 (Biology Capstone). Biology education students are required to take this course before student teaching.

2. Description of how this assessment specifically aligns with the standards

Another advantage of using the MFT in Biology over the ACAT is that it more clearly aligns with the NSTA standards by default. If a department is able to choose the topics to be tested with the ACAT, it runs the risk of not testing the content of all the NSTA standards, as we believe was true for us before 2006.

The MFT also allows us to see group scores and trends on nine assessment areas, namely:

1. Biochemistry and Cell Energetics
2. Cell Structure, Organization, and Function
3. Molecular Biology and Molecular Genetics
4. Diversity of Organisms
5. Organismal – Animals
6. Organismal – Plants
7. Population Genetics and Evolution
8. Ecology
9. Analytical Skills

We believe these nine areas are a good match for the NSTA content standards.

3. Brief analysis of the data findings

One drawback to the use of any achievement test is how to intelligently interpret the results obtained from the test. On a test with national aspects such as the MFT, this can be problematic because of natural variation in the way different Biology education programs interpret and meet the NSTA standards. However, the faculty of the WCU Biology department have decided that each year, as part of our overall departmental assessment, we will set a benchmark for the year based on past student performance on achievement tests, and then seek to meet or exceed this benchmark yearly. The benchmark will also, over time, be raised as the departmental faculty discover deficiencies in our curriculum and address those deficiencies.

4. Interpretation of how the data provides evidence for meeting standards

Examination of the assessment areas above shows that the MFT is a good fit to the NSTA content knowledge standards, and by extension, to the required curriculum for Biology education students.

5a. Assessment tool or description

The MFT in Biology paper test (150 questions, 2 hours in length) is given at the end of BIO 498 (Biology Capstone). All Biology education students must take this test before student teaching.

5b. Scoring guide for the assessment

There is no minimum score that students have to make to complete this curricular requirement. The scale range for the exam is 120-200.

5c. Candidate data derived from the assessment

For the 2005-2006 academic year (MFT given in Spring 2006), the departmental average score was 131.9 (n=8), and among the Biology education students that took the exam, the average score was 130.7 (n=3); therefore, this appears to be a consistent measurement of the success of the curriculum in breadth of biology content knowledge.

For the 2006-2007 academic year (MFT given in Spring 2007), the departmental average score was 139.2 (n=20), and among the Biology education students that took the exam, the average score was 148.3 (n=4).

Section IV
Assessment #3
Planning Instruction and Assessment

1. Brief description of the assessment and its use in the program

As part of the course requirements for BIO 340 (Teaching Biology in the Secondary School), a required course for all Biology education majors, students must write and execute four lesson plans, to be evaluated by both the instructor and the student (self-evaluation).

2. Description of how this assessment specifically aligns with the standards

This assessment aligns specifically with NSTA standards 1b (understanding and conveying science concepts to students), 2c (successfully engaging students in studies of the nature of science), 3a-b (engaging students in methods of inquiry), 4a-b (understanding and engaging students in issues related to science and technology), 5a-f (general skills of teaching, including the use of technology), 6a-b (understanding and being able to implement the curricular recommendations of the National Science Education Standards), 7a-b (involving students in relating science to the community), 8a-c (using and analyzing the results of multiple assessment tools for students), 10b (reflection on their professional teaching skills), and 10c (using feedback from various sources to improve their teaching).

3. Brief analysis of the data findings

Since this was a brand-new course for the 2006-2007 academic year, Biology education students were not required to take the course (it had not been incorporated into the required Biology education curriculum at this point); therefore, data is extremely limited for this assessment. Only two Biology education students were able to take the course. Out of 100 possible points for the four lesson plans together, one student made a score of 100, while the other student made a score of 83. In our view, both of these students should be regarded as meeting the standards covered by this assessment.

4. Interpretation of how the data provides evidence for meeting standards

The high scores of both students show that they can adequately plan, execute, and assess their teaching abilities as outlined by the NSTA standards.

5a. Assessment tool or description

Four lesson plans are required in BIO 340: Teaching Biology in the Secondary School. They are:
1. a direct instruction lesson plan;
2. a guided inquiry lesson plan;
3. a technology lesson plan; and
4. a lesson plan in which students are allowed to choose their favorite approach, or to blend elements of each.

Upon evaluation and approval of each lesson plan, the student is required to present the lesson in front of the class, using any experiments or other activities outlined in the lesson plan. In this way, the student gains valuable experience in the process of not only planning, but executing, lesson plans.

5b. Scoring guide for the assessment

BIO 340: Teaching Biology in the Secondary School
Scoring Rubric for Lesson Plans

	Excellent (4)	Good (3)	Fair (2)	Poor (1)
Name				
Assignment Title				
Class Section				
Date				
Teaching Method				
Research Findings:				
1.				
2.				
3.				
Grade				
Duration of each section				
Topic				
Objectives:				
1.				
2.				
Content Skill				
Process Skill				
National Science Standards:				
Content Standard				
Process Standard				
Mississippi Science Framework:				
Specific Competency				
Materials				
Classroom Arrangement				
Procedure:				
Direct Instruction (if applicable):				
Motivation				
Presentation				
Guided Practice				
Independent Practice				
Closure				
Concept Map				
Guided Inquiry (if applicable):				
Motivation				
Questions				
Data Collection				
Data Processing				
Closure				

Concept Map				
Assessment:				
1. Why?				
2. Why?				
Totals				
(Total/112) X 25 = Grade				

5c. Candidate data derived from the assessment

	Candidate #1	**Candidate #2**
Direct Instruction	25	20
Guided Inquiry	25	22
Technology	25	21
Student's choice	25	20
Overall grade for lesson plans	100	83

Section IV
Assessment #4
Student Teaching Assessment (STAI)

1. Brief description of the assessment and its use in the program

Upon completion of student teaching, and after the student has successfully completed his or her unit lesson, the Student Teacher Assessment Instrument (STAI) is administered to all Biology education students. This assessment is completed by the student teacher's WCU faculty member supervisor, as well as their supervising teacher in the local school. Data are compiled by personnel in the Department of Education, and results are disseminated to each content area department.

2. Description of how this assessment specifically aligns with the standards

This assessment aligns specifically with NSTA standards 1c (successful conveyance of important applications of science), 5a-f (general skills of teaching), 7b (involving students in activities related to issues important to the community), 8a-c (use of effective assessment strategies), and 10a-d (demonstrating professional growth).

3. Brief analysis of the data findings

Data given below are for all student teachers during the periods indicated. However, it is clear that all students, including those who are Biology education students, are meeting the standards of student teaching and the STAI.

4. Interpretation of how the data provides evidence for meeting standards

Although there are various areas that are weaker than others, it is clear from the data that student teachers in all fields at WCU are meeting the appropriate standards of student teaching.

5a. Assessment tool or description

The Student Teacher Assessment Instrument (STAI) is a paper-based survey administered at the end of student teaching. The WCU faculty supervisor fills out an instrument with different indicators than that filled out by the supervising teacher, but both instruments focus on the successful application of all the student's professional training up to that point.

5b. Scoring guide for the assessment

The STAI uses a 4-point scale (4 = outstanding, effective practice) to assess the student teacher's performance during the 10-day unit lesson.

5c. Candidate data derived from the assessment

Student Teacher Assessment Instrument
WCU Faculty Supervisor

4=Outstanding, Effective Practice 3= Acceptable, Safe to Practice
2=Marginally Acceptable Practice 1=Ineffective, Unacceptable Practice

A. Affective Beginning/Anticipatory Set		**2004-2005**	**2005-2006**
1.	Teacher has materials and equipment ready.	3.90	3.98
2.	Teacher uses motivational, thought provoking, or unusual happening.		

		3.80	3.83
3.	Teacher reviews previous lesson and/or past experiences.	3.90	3.92
4.	Teacher states lesson purpose and plan.	3.88	3.92
5.	Teacher states importance/relevancy of lesson, and has students personalize lesson/relate importance of content to real life.	3.83	3.76
B. Teaching			
6.	Teacher provides clear, concise and accurate information.	3.88	3.92
7.	Teacher clarifies expectations through models, rubrics and/or example.	3.85	3.93
8.	Teacher checks for understanding.	3.88	3.97
9.	Teacher uses instructional aids skillfully.	3.88	3.96
10.	Teacher gives clear verbal/written directions which are easily understood.	3.85	3.92
11.	Teacher provides opportunity for critical thinking and/or problem-solving.	3.83	3.90
12.	Teacher monitors individual / group learning, re-teaching when necessary.	3.90	3.96
13.	Teacher provides relevant independent and individual practice.	3.98	3.93
14.	Teacher provides appropriate closure to lesson.	3.80	3.86
C. Time on Task			
15.	Teacher uses instructional time efficiently.	3.88	3.96
16.	Teacher keeps students on task through participation/ involvement.	3.83	3.90
17.	Teacher uses effective transitions within lesson and group changes.	3.90	3.89
18.	Teacher maintains learner involvement with pacing/ varied activities.	3.85	3.94
D. Classroom Environment			
19.	Teacher creates instructive and interactive bulletin boards.	3.80	3.96
20.	Teacher expresses high expectations both verbally and non-verbally.	3.80	3.95
21.	Teacher conveys behavioral expectations to students.	3.88	3.97
22.	Teacher posts rules and consequences.	3.92	3.96
23.	Teacher creates positive climate through acceptance, appropriate wait time, and encouragement of creativity and risk taking.	3.87	3.87
24.	Teacher monitors behavior through positive remarks.	3.94	3.87
25.	Teacher maintains proper classroom management and discipline.	3.87	3.93
E. Interpersonal Skills			
26.	Teacher is eager (facial expression, time, voice, gesture, etc.).	3.93	3.97
27.	Teacher uses proximity, moves around the room.	3.94	3.96
28.	Teacher demonstrates patience and empathy for rates of learning.	3.98	4.00
29.	Teacher shows sensitivity to learning styles of students.	3.90	3.97
30.	Teacher uses acceptable oral/written grammar.	3.78	3.86
31.	Teacher's pronunciation is clear and distinct.	3.95	3.96
32.	Teacher uses acceptable handwriting on board, handouts, materials, etc.	3.85	3.97
33.	Teacher matches methods to both the learners and objectives.	3.90	3.97

34.	Teacher incorporates student responses in discussion or lesson.	3.95	3.97
35.	Teacher sequences topics / procedures appropriately for flow of lesson.	3.96	4.00
36.	Teacher uses a variety of teaching methods and strategies (2 or 3).	3.93	3.98
37.	Teacher responds positively to students' academic input.	3.95	3.97
F. Assessment			
38.	Teacher expands beyond workbook and worksheets.	3.95	3.90
G. Planning and Preparation 10 Day Unit			
39.	Title Page (STAI Unit, unit title, your name, date, grade level, subject area, college supervisor).		3.93
40.	The teacher selects and uses appropriate student **objectives** for unit lessons. Each objective should be labeled to a level of Bloom's Taxonomy and referenced to district or state benchmarks.		3.86
41.	The teacher selects and uses appropriate teaching **procedures** for unit lessons. Should have at least one cooperative learning activity.		3.86
42.	The teacher selects and uses appropriate supplementary **materials and technology** for unit lessons.		3.86
43.	The teacher selects and uses appropriate materials and procedures for a minimum of four **assessments** of student progress. A variety of assessment types should be used **in addition to an attitudinal questionnaire.**		3.70
44.	The teacher uses information about students to provide learning experiences which **accommodate differences** in developmental and educational needs. Include objectives for remedial and/or advanced students.		3.72
45.	The teacher **integrates** knowledge from several subject areas in unit lesson. This should be labeled in your procedures section.		3.93
46.	The teacher incorporates **multicultural perspectives** into the teaching unit.		3.80
47.	Includes Handouts/activity sheets used in the unit.		3.79

Section IV
Assessment #4

5c. Candidate data derived from the assessment (continued)

Student Teacher Assessment Instrument
Supervising Teacher

Planning and Preparation		**2004-2005 Mean**	**2005-2006 Mean**
1	The teacher selects and uses appropriate student objects for unit lessons.	3.93	3.96
2	The teacher selects and uses appropriate teaching procedures for unit lessons.	3.89	3.96
3	The teacher selects and uses appropriate supplementary materials and technology for unit lessons.	3.89	3.80
4	The teacher uses information about students to provide learning experiences which accommodate difference in developmental and education needs.	3.91	3.86
5	The teacher uses knowledge of students' backgrounds, interests, experiences, and prior knowledge to make instruction relevant and meaningful.	3.86	3.85
6	The teacher integrates knowledge from several subject areas in unit lessons.	3.84	3.85
7	The teacher incorporates multicultural perspectives into teaching units.	3.80	3.77
Communication and Interaction			
8	The teacher uses correct oral and written communication.	3.84	3.87
9	The teacher relates concepts using clear handwriting and appropriate language which is easily understood by and respectful toward others.	3.91	3.90
10	The teacher provides clear, complete directions for carrying out instructional activities.	3.82	3.86
11	The teacher communicates high expectations for learning to all students.	3.91	3.87
12	The teacher projects enthusiasm for teaching and learning.	3.89	3.85
13	The teacher listens to students and demonstrates interest in what they are saying by responding appropriately.	3.91	3.94
14	The teacher provides opportunities for students to work cooperatively with others to enhance learning.	3.86	3.96
15	The teacher meets and responds appropriately to parents/guardians.	3.76	3.87
Teaching For Learning			
16	The teacher demonstrates knowledge of the subject(s) taught.	3.94	3.87
17	The teacher uses a variety of appropriate teaching strategies.	3.91	3.87
18	The teacher provides opportunities for students to apply concepts in problem solving and critical thinking.	3.82	3.82
19	The teacher elicits and responds to student input.	3.89	3.96
20	The teacher probes, allows sufficient and equitable wait time, and encourages students to expand and support their responses.	3.80	3.86
21	The teacher uses questions to engage students in original, creative, and higher order thinking.	3.77	3.79
22	The teacher uses family and/or community resources in the student teaching experience to enhance student learning.	3.73	3.79
Management of the Learning Environment			
23	The teacher monitors and adjusts the classroom environment to enhance social relationships, motivation, and learning.	3.82	3.95
24	The teacher adjusts unit lessons according to individual student and group responses.	3.89	4.00
25	The teacher attends to and delegates routine tasks of an effective classroom management plan.	3.77	3.95

26	The teacher uses a variety of discipline strategies effectively, according to individual and situational needs.	3.70	3.85
27	The teacher is fair and supportive of students, resulting in a positive interactive learning environment.	3.89	4.00
28	The teacher uses instructional time effectively.	3.75	3.90
Assessment of Student Learning			
29	The teacher informs students of performance standards and assessment criteria.	3.86	3.96
30	The teacher provides timely feedback regarding academic performance and discusses corrective procedures to be taken.	3.86	3.90
31	The teacher provides opportunities for students to assume responsibility for learning and to engage in self-evaluation.	3.89	3.89
32	The teacher maintains records of student work/ performance and communicates progress to both parents and/or guardians and appropriate colleagues.	3.84	3.89
33	The teacher actively seeks opportunities to grow reflectively and professionally.	3.86	3.96

Section IV
Assessment #5
Oral Senior Presentation

1. Brief description of the assessment and its use in the program

As part of the requirements for BIO 498 (Biology Capstone), required of all Biology education students, the student must give a 20-minute presentation on a selected topic from the Biology content knowledge standards as identified by WCU Biology faculty (patterned after the requirements of our Biology education curriculum and the National Science Education Standards).

2. Description of how this assessment specifically aligns with the standards

This assessment specifically aligns with NSTA standards 1a (understanding and conveying to students the major concepts of Biology as recommended by the NSTA), 1c (conveying to students various applications of science), 1d (reporting and evaluating investigations in science), 6a (understanding the curricular recommendations of the National Science Education Standards), 5a-f (general skills of teaching), and 8a (use of assessment tools and strategies).

3. Brief analysis of the data findings

This assessment is required of all Biology education students. Even though this course has been offered experimentally for the past two years, we only have data from the 2006-2007 academic year, when the presentation was evaluated with a rubric and the presentation was specifically designed in part to address NSTA standards. Three Biology education students took this course in 2006-2007, and their average score on the presentation was higher than the class average, suggesting that they are well-prepared to understand and present Biological concepts in a classroom setting.

4. Interpretation of how the data provides evidence for meeting standards

In meeting the requirements of this assessment, Biology education students are not only practicing their teaching skills, but they are addressing the Biology content knowledge as well. Each student is presenting a different concept in Biology, but they all appear to be doing this with an adequate degree of proficiency.

5a. Assessment tool or description

The oral presentation is evaluated, using the following rubric, by up to three professors with various areas of expertise in Biology. Students are expected to be professional, use technology, and reinforce students' learning with handouts, activities, and research examples.

5b. Scoring guide for the assessment

Biology Capstone – BIO 498
Topic Evaluation Form

Student Name: _____ Date: _____

Topic: _____

I. Submitted Outline of Presentation

Areas of Evaluation	Assigned Points			Comments
Outline turned in *at* or *before* the time of presentation	0		2	
Outline typed AND neat	0		2	
Outline organized logically	1	2	4	
Length of outline sufficient to cover topic	0	1	2	

Total points earned: _____ (out of 10)

II. Presentation

Areas of Evaluation	Assigned Points					Comments
Depth of research (several refs)	1	2	3	4	5	
Completeness of topic	1	2	3	4	5	
Clarity of presentation	1	2	3	4	5	
Professionalism of presentation	1	2	3	4	5	
Delivery/style	1	2	3	4	5	
Quality of Questions/Answers	1	2	3	4	5	
Presentation loaded *prior* to class	0 (at class)				5 (prior to class)	
Appropriate length of present.	1 (too short/long)				5 (appropriate length)	

Total points earned: _____ (out of 40)

III. Additional Comments:

IV. Grade Earned:

[Points on outline (a) + Points on presentation (b)] / Total points possible

(a) _____ + (b) _____ = _____ / 50 = _____%

5c. Candidate data derived from the assessment

	Candidate #1	Candidate #2	Candidate #3
Capstone Presentation Score	86	86	95.3
Average score	89.1		
Class average	84.2		

Section IV
Assessment #6
Teaching Biology Classes and Labs Assignment

1. Brief description of the assessment and its use in the program

As part of the requirements for BIO 340 (Teaching Biology in the Secondary School), a required course for all Biology education students, the student must complete an essay assignment in which he or she demonstrates knowledge of basic lab safety procedure, as well as safe use and disposal of all biological materials, whether living or preserved.

2. Description of how this assessment specifically aligns with the standards

This assessment aligns specifically with NSTA standard 9: Safety and Welfare. The student is required to demonstrate: understanding of their responsibilities for the safety of students, laboratory animals, and proper disposal of materials (9a); knowledge of proper techniques for the handling of science instruction materials (9b); knowledge of emergency and safety procedures (9c); and understand the issues involved with the safe, legal, and humane treatment of living organisms in the classroom and laboratory (9d).

3. Brief analysis of the data findings

Since this was a brand-new course for the 2006-2007 academic year, Biology education students were not required to take the course (it had not been incorporated into the required Biology education curriculum at this point); therefore, data is extremely limited for this assessment. Only two Biology education students were able to take the course. Out of 100 possible points for the essay assignment, both students made a score of 100. As detailed below, the specific questions that target the appropriate NSTA standards are questions #3-6. In our view, both of these students should be regarded as meeting the standards covered by this assessment.

4. Interpretation of how the data provides evidence for meeting standards

Biology education students are required to use their text and information gained from the class to reflect on various ways they can instruct students on proper safety techniques and procedures, as well as safe, humane, and ethical ways of handling living organisms. Notably, students are not expected to parrot back material that is outlined in the textbook; instead, each student is encouraged to give his or her personal view of safety issues, as directed in the instructions to the assignment.

5a. Assessment tool or description

The assessment is a series of essay questions that are a required component of BIO 340. Each question is worth 10 points, for a total of 100 points.

5b. Scoring guide for the assessment

BIO 340: Teaching Biology in the Secondary School
Teaching Biology Classes and Labs Worksheet

Using our class text (teacher's section) discuss completely the following issues, giving thought to how you should set up your own class/lab for a successful class according to state/national standards and regulations.

1. How can you, as a teacher, keep abreast of current changes in Biology?
2. Using guided inquiry based Biology classes/labs, how would you conduct sessions?
3. Safety is a major consideration in a biology lab. How can you maintain a safe laboratory? Include safety, personal protective equipment, chemical hazards, First Aid, poisons, flammables, reactives, corrosives, storage/inventory/material safety data sheets, emergency procedures.
4. How could you safely use the following in Biology class/lab: Plants, Microbes, Preserved materials (including disposal)
5. What regulations should be followed in the release of Biological Organisms?
6. What considerations should be taken with the use of animals in Biology education?
7. What methods should be used in assessing Biology Lab skills?
8. What precautions and efforts should be taken with controversial Issues in Biology?
9. What good cooperative learning strategies should be used as students work together in groups or as classmates in a Biology class/lab?
10. What is the value of a Laboratory Safety Agreement befor lab classes begin at the first of a school session? What items should it cover?

5c. Candidate data derived from the assessment

Both Biology education candidates that took this class scored 100 on the assignment.

Section IV
Assessment #7
Research Proposal

1. Brief description of the assessment and its use in the program

As part of the requirements for BIO 405 (Biological Research), a course which Biology education students can use as part of the hours of their Biology major, the student is required to write a standard research proposal, including a literature review and experimental design. The student later executes the research proposed in this document as a further requirement of the course.

2. Description of how this assessment specifically aligns with the standards

This assessment specifically aligns with NSTA standards 1d (designing, conducting, reporting, and evaluating scientific investigations), and 1e (using mathematics to process and report data).

3. Brief analysis of the data findings

Not all Biology education students have to take this course; therefore, the data from the course cannot be used to describe the achievements of all students in our program. However, for those that do take the course, it is clear that they can successfully develop and produce a valid research proposal, and it is expected that these students will be able to take this knowledge and ability with them into the classroom. It also appears that we are doing a better job of advising Biology education students into this course.

4. Interpretation of how the data provides evidence for meeting standards

For the students that actually take this course, this assessment provides a "real-life" experience in putting concepts to an experimental test, in formulating a valid research question and designing experiments appropriately, and deciding on the best way to collect, analyze, and present anticipated data at the end of a project.

5a. Assessment tool or description

The research proposal is written over the course of 3-4 weeks with the help and guidance of a faculty mentor in the Biological Sciences department. All standard formatting and other features of a scientific proposal are adhered to.

5b. Scoring guide for the assessment

	Excellent (20 pts)	Good (15 pts)	Fair (10 pts)	Poor (5 pts)
Research Question	Well-defined and "doable"	Question adequately defined but needs focus	Question is loosely defined and may need extensive revision	Question is vague or non-existent
Detail	Sufficient detail to convince the reader of the worthiness of the project	Adequate detail, but could be more complete	Details are sketchy and may need to fleshed out	Generalities, and unsubstantiated statements
Literature Review	Complete, with current references from a variety of authoritative sources	Lacking one or more critical references; some sources are questionable	Serious issues with format, sources, or details	Skimpy, with inadequate references or non-authoritative references; no attention to format

5c. Candidate data derived from the assessment

Since Biology education students are not required to take Biological Research to complete their degree programs, the data from this assessment are spotty at best. However, some indicators are listed below:

Academic Year	Number of Biology education students taking the course	Grades
2004-2005	1	A
2005-2006	3	all A's
2006-2007	4	all A's

Section IV
Assessment #8
History of Biology Timeline Assignment

1. Brief description of the assessment and its use in the program

As part of the requirements for BIO 340 (Teaching Biology in the Secondary School), a required course for all Biology education students, the student must create a timeline showing the major scientists contributing to the history of biology, along with their seminal concepts. This timeline is incorporated into the portfolio presented at the end of the course, and it is also one of the major grades in the course. This assignment is worth 100 points in a total of 800 possible points for the course.

2. Description of how this assessment specifically aligns with the standards

This assessment specifically aligns with NSTA standard 2a: Biology education candidates must understand the historical and cultural development of science; and it also addresses standard 2b: Biology education candidates must understand the philosophical aspects of science as opposed to technology and from other ways of knowing the world.

3. Brief analysis of the data findings

Since this was a brand-new course for the 2006-2007 academic year, Biology education students were not required to take the course (it had not been incorporated into the required Biology education curriculum at this point); therefore, data is extremely limited for this assessment. Only two Biology education students were able to take the course, but each student received a score of 100 (out of 100 possible points) on the assignment.

4. Interpretation of how the data provides evidence for meeting standards

Students were required to submit a timeline depicting the history of some concept in Biology, such as the cell or evolution, or broader areas of research such as metabolism or inheritance. Students were encouraged to make the timeline "user-friendly" and visually appealing. The student was also required to submit an accompanying report that provided details about each timeline entry and also provided historical and scientific context for each of the entries.

5a. Assessment tool or description

The History of Biology Timeline assignment is required of each student fairly early in the course, to facilitate later understanding of concepts that they will want to address in their lesson plans and teaching. Students are invited to make the timeline as elaborate as they wish, while maintaining the educational foundation and validity of the assessment.

5b. Scoring guide for the assessment

BIO 340: Teaching Biology in the Secondary School
Grading Rubric for the History of Biology Timeline Assignment

	Excellent (25 pts)	**Very Good (20 pts)**	**Good (15 pts)**	**Adequate (10 pts)**	**Poor (5 pts)**
	COMMENTS				
1. Requirements Met: Timeline is complete and meets all the requirements of the assignment; all necessary information is supplied					
2. Accuracy: Timeline is accurate in terms of dates, name spelling, and any accompanying information					
3. Report Qualities: Report is complete and provides the reader with sufficient detail to understand the significance and context of each scientist or event					
4. Artistic Merit: Timeline is visually appealing and makes good use of color, graphics, and images of scientists; easy to read and interpret					

5c. Candidate data derived from the assessment

	Candidate #1	**Candidate #2**
1. Requirements Met	25	25
2. Accuracy	25	25
3. Report Qualities	25	25
4. Artistic Merit	25	25

SECTION V—USE OF ASSESSMENT RESULTS TO IMPROVE CANDIDATE AND PROGRAM PERFORMANCE

Content Knowledge

The Biological Sciences department at William Carey University has a curriculum which is clearly aligned to the NSTA content knowledge standards, and which appears to provide numerous opportunities for students to master this content knowledge, as well as demonstrating such mastery. There are, however, a number of ways in which the curriculum could be improved.

One issue is better alignment between a student's performance on the various assessments in the program and his or her performance on the PRAXIS II Biology Content Knowledge exam. Currently we do not know how to help students that may be having trouble on the PRAXIS II because it is difficult to identify them in the data we receive. More complete access to, and use of, testing data and records will help solve this issue.

In conjunction with the Biological Science department's overall institutional effectiveness plan, the faculty are in the process of developing an assessment instrument called the Biology Content Knowledge Exam (BCKE). The BCKE will be designed to closely mirror both the NSTA content knowledge standards as well as the National Science Education Standards and the Mississippi Science Framework. This exam will be incorporated into the curriculum at various levels (including as a counterpart to the MFT in the Biology Capstone course) to track students' mastery of Biological concepts, and because it is a "homegrown" test, it can easily and inexpensively be administered as both a pre-test and a post-test, providing the faculty with more insight into students' intellectual progression through the curriculum.

Another improvement would be to reorganize the curricular requirements slightly to further standardize each Biology education student's training. Currently, we believe that the research proposal requirement of the Biological Research course is the best training for, and indicator of, a student's true understanding of the scientific process. However, not all students take this course, and while they are exposed to scientific inquiry in other courses, they do not get adequate experience in experimental design and execution. We believe that, just as a teacher-in-training should have plenty of experiences in developing lesson plans and actual teaching, so a Biology teacher-in-training should have experiences in experimental design and proposal writing. Such a curricular change cannot be fully implemented until the 2008-2009 academic year; however, as seen from the data provided earlier in this document, we are steadily advising more Biology education students into the Biological Research course as a natural outcome of addressing the scheduling needs of our students.

Professional and Pedagogical Knowledge, Skill, and Dispositions

In the current academic year (2007-2008), the Teaching Biology in the Secondary School course has a lab component. This first time this course was taught, in the 2006-2007 academic year, it was taught largely as an experimental venture into more rigorous pedagogy for our Biology education students, and in fact was implemented at the suggestion of the Chair of the Department of Education. At that time, the course did not have a laboratory component. We very quickly realized that this was a mistake, because it would be in such a lab that our students would get additional experience in Biology-focused teaching. We believe that the addition of the laboratory will make BIO 340 a more fully-realized and effective methods course.

One shortcoming of our program is the lack of focus on a teacher candidate's dispositions. The WCU Teacher Education Committee recently developed a professional disposition statement that will be included in the syllabus of every course that is taken by any education student, including Biology education students. Additionally, this statement will have to be attested to in writing by the student.

Student Learning

Through the experiences designed to test a candidate's skills, and through assessment of their content knowledge, we believe that our Biology education students are learning what it means to be a quality Biology teacher. Most of the modifications to our program mentioned earlier will have the added benefit of increasing student learning and strengthening the entire program.

ATTACHMENT A

Candidate Information

Directions: Provide three years of data on candidates enrolled in the program and completing the program, beginning with the most recent academic year for which numbers have been tabulated. Report the data separately for the levels/tracks (e.g., baccalaureate, post-baccalaureate, alternate routes, master's, doctorate) being addressed in this report. Data must also be reported separately for programs offered at multiple sites. Update academic years (column 1) as appropriate for your data span. Create additional tables as necessary.

Program: Biology/General Science, B.S., undergraduate		
Academic Year	**# of Candidates Enrolled in the Program**	**# of Program Completers[7]**
2006	9	1
2007	11	2

[7] NCATE uses the Title II definition for *program completers*. Program completers are persons who have met all the requirements of a state-approved teacher preparation program. Program completers include all those who are documented as having met such requirements. Documentation may take the form of a degree, institutional certificate, program credential, transcript, or other written proof of having met the program's requirements.

ATTACHMENT B
Faculty Information

Faculty Member Name	Highest Degree, Field, & University	Assignment: Indicate the role of the faculty member	Faculty Rank	Tenure Track (Yes/ No)	Scholarship, Leadership in Professional Associations, and Service: List up to 3 major contributions in the past 3 years	Teaching or other professional experience in P-12 schools
Randall Harris	Ph.D., Microbiology and Immunology, Vanderbilt University	Department chair	Associate Professor	Yes, tenured	Obtained a Genomics Education Matching Funds grant from LI-COR Biosciences for the purchase and installation of an automated DNA sequencer for the Biological Sciences department	None
Thomas Rauch	Ph.D., Biology, University of Southern Mississippi	Faculty	Associate Professor	Yes	1. Published articles in *Gulf and Caribbean Research* and *Environmental Biology of Fishes* 2. Member of a diocesan task force charged with the establishment of a Catholic high school in Hattiesburg	1 year, junior high science teacher
Julie Smith	Ph.D., Biology, University of Southern Mississippi	Faculty	Assistant Professor	Yes	1. Coauthor of a chapter in *Oxidative Stress and Age-Related Neurodegeneration* 2. Published research articles in *Current Opinion in Clinical Nutrition & Metabolic Care* and *Applied Microbiology and Biotechnology*	None; held a MS Educator's License in Biology (7-12) for 3 years
B.J. Martin	Ph.D., Cell Biology, Rice University	Faculty	Visiting Professor	Yes, tenured	Executive Committee member of the Mississippi Democratic Party	None
Sydney Bailey	M.S., Medical Technology, University of Southern Mississippi	Faculty	Visiting Assistant Professor	No	WCU Medical Technology liaison with the Baptist Medical Center School of Medical Technology in Jackson, MS	None

Lynn Singletary	M.S., Biology, University of Southern Mississippi	Faculty	Assistant Professor	Yes, tenured	Outstanding Faculty Honoree, Higher Education Appreciation Day; Mississippi Legislature-Working for Academic Excellence Award (HEADWAE)	None
Marc Daniels	Ph.D., Cell Biology, University of Alabama at Birmingham	Faculty	Assistant Professor	Yes	None	None
Linda Keen	MEd, Combined Sciences concentration, William Carey College	Faculty	Adjunct Professor	No	None	31 years, junior high science teacher (AA certification in Biology, General Science, and Psychometry); Certified Provisional Educator Evaluator; NBCT in EA Science
William Smith	Ph.D., Biology, University of Southern Mississippi	Faculty	Adjunct Professor	No	None	None

ATTACHMENT C
Names of Programs

Degree Level	Grades of License	Model of Program	Disciplines
Undergrad	7-12	Single-field	Biology