ACAP
Agenda Item 5b
3/18/10

CLEMSON UNIVERSITY

PROGRAM MODIFICATION

Bachelor of Arts –Science Teaching

BA Science Teaching: Concentration in Chemistry

Submitted to Commission on Higher Education

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President James F. Barker

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Classification

Program Title: **BA Science Teaching: Chemistry**

Academic unit involved: **Secondary Education**

Designation, type, and level of degree: **BA Science Teaching: Chemistry (4-year)**

Proposed date of implementation: **Fall 2010 or as soon as approved**

CIP code: 131316

Identification of program as New or Modification: **Program Modification**

Site: **on campus delivery**

Program qualifies for supplemental Palmetto Fellows Scholarship or LIFE Scholarship awards: **Yes__x__** No_____

Delivery mode (see definitions later on in this section): **Traditional**

Justification

There is and has been a state and national shortage of highly qualified teachers in the physical sciences (physics and chemistry). Few programs have been able to make a dramatic difference in this area. By providing more options for chemistry students, programs are more likely to attract students into education. Further, by providing a dual major option, students will graduate with solid competency in both content and pedagogy.

A statement of the purpose:

This program modification seeks to attract chemistry majors into teaching via a dual major option (BA in Chemistry and BA in Science Teaching: Chemistry).

Need for the program in the state:

There has been a critical shortage of chemistry teachers throughout the nation and statewide for many years. Further, very few programs are producing more than 1-2 chemistry educators each year. Our current BS in science teaching [teaching area: physical sciences] currently has a few students enrolled, but our intention is to add the proposed BA in science teaching [teaching area: chemistry] so that students will be able to double major in science teaching and

chemistry. It is hoped that this option will create more students who are interested in pursuing teaching. This expectation is based on our current success with double majors that have been added in 1) math and secondary education and 2) biological sciences and science teaching.

Specific justification comes from the following state information: science teacher shortages have continued to be a critical need list by the State Board of Education. This is determined based on data from CERRA (Center for Educator Recruitment, Retention, and Advancement) that tracks teacher shortages in SC and reports the data to the SDE.

A discussion of the centrality of the program to the mission of the institution as that mission is currently defined by the Commission.

This proposed program modification aligns with Clemson University's long-term focus on Engineering and Science. More recently, STEM education has become a central focus of the Provost and President. Specifically, the University seeks to align initiatives in STEM fields in a more collaborative sense. The proposed program modification unites the content area in the College of Engineering and Science (Chemistry) with the School of Education to allow students to enroll in a dual major of both Chemistry and Science Teaching: Chemistry in four years. This increases their future career options as well as increasing numbers in science education.

A discussion of the relationship of the proposed program to other related programs within the institution, including, if possible, description of strengths and weaknesses of the related programs as documented by evaluative reports of institutional and/or Commission consultants.

This program is being added because it will align with the newly adopted dual major in Biological Sciences and Science Teaching: Biological Sciences. We desire to reproduce the existing success with the Biological Sciences department by now adding Chemistry. Currently, we have a BS in Science Teaching: Physical Sciences, but this does not allow individuals who desire to become experts in Chemistry to pursue an education degree as well.

A description of similarities or differences between the proposed program and those with like objectives offered at other institutions including discussion of like programs within the state, and especially for graduate programs, the region and the nation. The discussion should include reference to programs offered by independent institutions headquartered in South Carolina, the Academic Common Market, and web-based institutions.

Currently, the following institutions have approved Chemistry Education programs: (Public Universities) Citidel, Clemson University, College of Charleston, USC-Aiken, USC-Columbia, USC-Upstate and (Private Universities) Converse College, Erskine College, Furman University, Newberry College, and Wofford College. Of the approved programs, none showed any graduates in chemistry education in 2007-08 according to CHE. The proposed program modification seeks to add a new option for students in an effort to recruit more students. Of the aforementioned programs, none have identified an explicit path for achieving a double major within four years. This proposed program would achieve that.

Enrollment

This section must contain at least the following information:

o A discussion of admissions criteria specific to the program: the admissions criteria will follow the current criteria for all secondary science education majors. Specifically, these students will have met the requirements currently in place for chemistry majors. In addition, they will have been admitted into the professional program and will have passed all sections of PPST (Praxis I) and a GPA of 2.5 or above.

o Projected Enrollment: this dual major option seeks to provide additional options for students that are currently in chemistry or desire to switch from other majors such as engineering into chemistry and education. We seek to provide additional avenues of study in an attempt to fill high needs careers such as chemistry teaching. Since it is rare for students to begin by majoring in science education, we expect that most of students will come from students that are currently enrolled at Clemson University.

PROJECTED TOTAL ENROLLMENT						
YEAR	FALL		SPRING		SUMMER	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2010-11	4	48	4	48	n/a	n/a
2011-12	8	96	8	96	n/a	n/a
2012-13	12	144	12	144	n/a	n/a
2013-14	16	192	16	192	n/a	n/a
2014-15	16	192	16	192	n/a	n/a

The table below only looks at estimated new enrollment of students. This table is a sub-set of the above table and reflects the previous comments that the majority of students for this program will likely be chemistry majors or switching into chemistry or education after being at Clemson University for a semester or two.

ESTIMATED NEW ENROLLMENT						
YEAR	FALL		SPRING		SUMMER	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2010-11	1	12	1	12	n/a	n/a
2011-12	3	36	3	36	n/a	n/a
2012-13	6	72	6	72	n/a	n/a
2013-14	10	120	10	120	n/a	n/a
2014-15	10	120	10	120	n/a	n/a

Curriculum

The proposed plan of study meets or exceeds the NCATE SPA requirements for chemistry education in content and pedagogy. The assessments of student learning will align with the current NCATE SPA plan that is currently in place for science education: biological sciences and science education: physical sciences. All eight assessments that are being used for the NSTA SPA will be aligned to specifically address the needs of those who intend to teach chemistry in secondary settings. The proposed curriculum plan is detailed on the following page and no new courses are required.

Sample Plan of Study

FRESHMAN YEAR

Fall Semester		Spring Semester	
CH 101 General Chemistry	4	CH 102 General Chemistry	4
CH 141 Chemistry Orientation	1	CH 152 Chemistry Communication I	2
MTHSC 106 Calculus of One Variable I	4	MTHSC 108 Calculus of One Variable I	4
Foreign Language[1]	3	PHYS 122 Physics with Calculus I	3
ENGL 103 Accelerated Composition	3	PHYS 124 Physics with Calculus II Lab	1
Total Semester Hrs.	15	Foreign Language[1]	3
		Total Semester Hrs	17

SOPHOMORE YEAR

Fall Semester		Spring Semester	
CH 223 Organic Chemistry	3	CH 205 Intro. to Inorganic Chemistry	3
CH 227 Organic Chemistry Lab	1	CH 224 Organic Chemistry	3
PHYS 221 with Calculus I	3	CH 228 Organic Chemistry Lab	1
PHYS 223 with Calculus II Lab.	1	ED F 301 Principles of American Education	3
ED 105 Orientation to Education	2	PHYS 222 General Physics III w/ Calculus	3
Arts and Humanities (Non-Lit.) Requirement[2]	3	ED F 315 Tech. Skills for Learning	1
HIST 122 or 124	3	Total Semester Hrs.	14
Total Semester Hrs.	16		

JUNIOR YEAR

Fall Semester		Spring Semester	
		BIOL 111/ (104/106) Principles of Biology II	5/4
BIOL 110/ (103/105) Principles of Biology I	5/4	Statistics Requirement[3]	3
EDSEC 327 Practicum in Secondary Science	3	ED F 302 Educational Psychology	3
CH 330 Introduction to Physical Chemistry	3	ED F 335 Adolescent Growth & Development	3
CH 313 Quantitative Analysis	3	BIOSC 482 Laboratory Tech. for Teaching Sci.	3
CH 317 Quantitative Analysis Lab	1	Total Semester Hrs.	16-17
Total Semester Hrs.	14-15		

SENIOR YEAR

Fall Semester		Spring Semester	
EDSEC 427 Teaching Secondary Science[4]	3	CH 452 Chemistry Communication II	1
READ 498 Secondary Content Area Reading[4]	3	CH 450 Chemistry Capstone	3
ED SP 370 Introduction to Special Education	3	EDSEC 447 Teaching Intern. in Sec. Sci.[6]	9
GEOG 103 World Regional Geography	3	EDSEC 457 Sec. Science Capstone Sem.[6]	3
Arts and Humanities (Literature) Requirement[5]	3	Total Semester Hrs.	16
Total Semester Hrs.	15	**TOTAL HOURS—123-125**	

[1] Two Semesters (through 202) in any modern foreign language or American Sign Language are required.
[2] See General Education Requirements.
[3] EXST 301, MTHSC 203, 301, 302, or 309
[4] To be taken the semester prior to EDSEC 447 and 457; EDSEC 427 and READ 498 must be taken concurrently
[5] ENGL 212, 213, 214, or 215
[6] EDSEC 447 and EDSEC 457 must be taken concurrently and are **offered only during spring**.

Faculty

Since this is a program modification, we will list the key faculty that have been involved in developing the program instead of every faculty member that teaches in the education and chemistry programs.

List Staff by Rank	Highest Degree Earned	Field of Study	Teaching in Field (yes/no)
Professor #1 (Melanie Cooper)	Ph.D.	Chemistry Education	Yes
Assistant Professor #1 (Jeff Marshall)	Ph.D.	Science Education	Yes
Assistant Professor #2 (Michelle Cook)	Ph.D.	Chemistry and Physics Education	Yes

No new faculty are needed at this time. The faculty are able to handle an increase in the number of science education majors and were hired to help grow the program to help address the state and national need.

UNIT ADMINISTRATION/FACULTY/STAFF SUPPORT						
YEAR	*NEW*		*EXISTING*		*TOTAL*	
	Headcount	FTE	Headcount	FTE	Headcount	FTE
Administration						
2010-2011	0	0	.2	.15	.2	.15
2011-2012	0	0	.2	.15	.2	.15
2012-2013	0	0	.2	.15	.2	.15
2013-2014	0	0	.2	.15	.2	.15
2014-2015	0	0	.2	.15	.2	.15
Faculty						
2010-2011	0	0	3.0	2.25	3.0	2.25
2011-2012	0	0	3.0	2.25	3.0	2.25
2012-2013	0	0	3.0	2.25	3.0	2.25
2013-2014	0	0	3.0	2.25	3.0	2.25
2014-2015	0	0	3.0	2.25	3.0	2.25
Staff						
2010-2011	0	0	0	0	0	0
2011-2012	0	0	0	0	0	0
2012-2013	0	0	0	0	0	0
2013-2014	0	0	0	0	0	0
2014-2015	0	0	0	0	0	0

Physical Plant:
No additional requirements will be needed in the foreseeable future from the physical plant to address the needs proposed in this program.

Equipment:
No additional equipment will be necessary that would not already be sought for normal instructional practice.

Library Resources:
No additional resources are necessary from the library to achieve the proposed program modification.

Accreditation, Approval, Licensure, or Certification
The program as required by state law will be accredited through NCATE. We will seek the same approval as we do for our existing science education initial certification programs. Specifically, we will meet all the requirements outlined by the NSTA SPA. This approval will be achieved on the same time schedule as the existing NCATE programs at Clemson University. Further, any graduates understand that they will have to meet the requirements of the state that they seek to attain certification from. For South Carolina, this includes but is not limited to passing the Praxis II in their field of study.

For the NSTA SPA we will collect data from students that demonstrate that they meet target performance on eight different assessments. The specific assessments are briefly described below (along with what will be collected or where they will be collected):
List of Assessments

Assessment 1—Praxis scores (PPST if taken and both Praxis II scores)
Assessment 2—GPA in content courses (2.5 minimum) and content alignment matrix
Assessment 3—Pedagogy—Unit Plan from science methods course (EDSEC 427)
Assessment 4—Pedagogy—Student teaching evaluations (ADEPT, midterm and final, and CF evaluations). This includes specific evaluations of inquiry instruction and safety issues that are pertinent to science teaching (EDSEC 457)
Assessment 5—Student learning—analysis project on the effects of student learning (EDSEC 457)
Assessment 6—Pedagogy—Safety issues in science. Online reading and quiz on legal and safety issues (BIOSC 482)
Assessment 7—Content—Assessment of research project (BIOSC 482)
Assessment 8—Content—Contextual learning. Collection of various assignments that demonstration understanding of Nature of Science, Inquiry, and Issues in Science (EDSEC 327)

Learner Outcomes

The **Learner Outcomes** become the basis for the results of teacher education programs at Clemson University. They are what we expect our students to value, to know, and to be able to do. There are six learner outcomes or "elements" in the conceptual framework.

Caring comprises beliefs and actions.

- *Beliefs*: Our candidates are committed to ethical and democratic dispositions including respecting the rights and responsibilities of all and recognizing diverse points of view.
- *Actions*: Our candidates act in accord with the rights and responsibilities of all, are sensitive to developmental, social, and cultural differences, and encourage a democratic culture.

Capable consists of knowledge and practice.

- *Knowledge*: Our candidates are knowledgeable about the foundations of education and about their specialty area(s), including appropriate practices.
- *Practice*: Our candidates apply their knowledge through best practices that include the effective use of educational and information technology and appropriate assessments.

Connected contains communication and integration.

- *Communication*: Our candidates communicate effectively through a variety of representations (spoken, written, and digital).
- *Integration*: Our candidates synthesize their knowledge and practices to integrate interdisciplinary perspectives and applications by making connections to real life and by making global issues locally relevant.

Assessment System

The **Assessment System** evolves from our mission, guiding principles, and learner outcomes. Each candidate is rated on each of the six elements of the conceptual framework at multiple times during his or her program. Initial candidates are rated four times in their program on a 4-point scale (unsatisfactory, developing, proficient, and distinguished) using a set of rubrics specific to each time period. Ratings of unsatisfactory and distinguished are accompanied by a detailed explanation. The assessment of advanced candidates varies by program, with two to four assessment points, and 2- to 4-point rating scales. Ratings are based on a variety of candidate products (for example, electronic portfolios, reflections, lesson plans, and internship/student teaching evaluations). The ratings for all candidates are recorded in an on-line database. Yearly program reports are generated, and program faculty react to the reports by addressing any apparent weaknesses with programmatic changes. A yearly, written statement of program and course changes is provided to the School of Education by the program chair.

Articulation

It is expected that the majority of students will enter the proposed program will do so during the freshman and sophomore year.

Estimated Cost

ESTIMATED NEW COSTS BY YEAR						
CATEGORY	1st	2nd	3rd	4th	5th	TOTAL
Program Administration	0	0	0	0	0	0
Faculty Salaries	0	0	0	0	0	0
Graduate Assistants	0	0	0	0	0	0
Clerical/Support Personnel	0	0	0	0	0	0
Supplies and Materials	0	0	0	0	0	0
Library Resources	0	0	0	0	0	0
Equipment	0	0	0	0	0	0
Facilities	0	0	0	0	0	0
TOTALS	0	0	0	0	0	0
SOURCES OF FINANCING BY YEAR						
Estimated FTE Revenue Generated from the State	$ 7,795	$ 23,385	$ 46,770	$ 77,950	$ 77,950	$ 233,850
Tuition Funding	$ 43,392	$ 86,784	$130,176	$173,568	$173,568	$ 607,488
Other State Funding	0	0	0	0	0	0
Reallocation of Existing Funds	0	0	0	0	0	0
Federal Funding	0	0	0	0	0	0
Endowment/External Funding						
Grants	0	0	0	0	0	0
TOTALS	$ 51,187	$110,169	$ 176,946	$ 251,518	$ 251,518	$ 841,338

Table for New Costs to Institution and Source of Financing:
Not applicable see section above.

Institutional Approval

Approval was necessary and achieved from the following committees:

Teacher Education 11/2009,
Department of Chemistry 12/2009,
University Curriculum Committee 2/5/2010
Provost, 2/12/2010
President, 2/12/2010
Board of Trustees, 10/16/2009