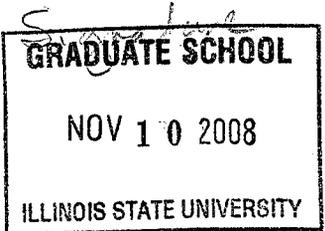


09-44



GRADUATE NEW/REVISED/DELETED GRADUATE PROGRAMS COVER SHEET (Degree Programs, Sequences, Graduate-Level Certificates) Graduate Curriculum Committee 2007-08

Deadlines for receipt by Graduate Curriculum Committee: Revised Degree Program, Sequence, Graduate Certificates: October 1, 2007, for inclusion in 2008-09 catalog. New Sequence, New Graduate Certificate: September 14, 2007, for inclusion in 2008-09 catalog. New Degree Program: February 8, 2008, for inclusion in 2009-10 catalog.

DEPARTMENT/SCHOOL Chemistry DATE 4-25-2008 TITLE OF DEGREE, SEQUENCE, OR CERTIFICATE Master of Science in Chemistry Education

Proposed Action: (Refer to Part I, Section C of GCC Proposal Guidelines and Procedures.)

- New\* (Check one): [x] Degree Program\*\* (goes beyond Graduate Curriculum Committee) [ ] Sequence (goes beyond Graduate Curriculum Committee) [ ] Post-Master's Graduate Certificate (goes beyond Graduate Curriculum Committee) [ ] Post-Baccalaureate Graduate Certificate (goes beyond Graduate Curriculum Committee) [ ] Graduate Certificate
Change in requirements for: (Check one.) [ ] Degree Program [ ] Sequence [ ] Certificate
Other program revisions
Deletion of: (Check one.) [ ] Degree Program (goes beyond Graduate Curriculum Committee) [ ] Sequence (goes beyond Graduate Curriculum Committee) [ ] Post-Master's Graduate Certificate (goes beyond Graduate Curriculum Committee) [ ] Post-Baccalaureate Graduate Certificate (goes beyond Graduate Curriculum Committee) [ ] Graduate Certificate

\*Attach approved Request for New Program Approval: Reporting of Financial Implications form (available at www.academicssenate.ilstu.edu/documents.html).

\*\*Obtain the New Program Request (NEPR) format from the Office of the Provost.

Summary of proposed action. For all proposals, provide current title and current catalog copy. Provide new title and new catalog copy for new programs, and for revised programs if catalog copy/title is altered. For revised programs, provide a summary of the changes. (Refer to New/Revised/Deleted Programs checklist in GCC Guidelines and Procedures.)

Routing and action summary:

- 1. Dept./School Curriculum Committee Chair Date Approved
2. Department Chair/School Director Date Approved
3. College Curriculum Committee Chair Date Approved
4. College Dean Date Approved
5. Teacher Education Council Chair Date Approved (28 copies to Dean of College of Education)
6. Graduate School Date Approved

Submit 10 copies of proposal to the Graduate Curriculum Committee. In addition, for new and deleted degree programs, sequences, and Post-Baccalaureate and Post-Master's certificates, submit an electronic version (MS Word format). These proposals are routed by GCC to the Academic Senate. The Senate requires electronic submission of all materials for posting to the Senate Web site.

## REQUEST FOR A NEW UNIT OF INSTRUCTION

### ***BACKGROUND***

1. **Name of Institution:** Illinois State University
  
2. **Title of Proposed Program:** Master of Science in Chemistry Education
  
3. **Contact Person** **Dr. William Hunter**
  - 3.1. Telephone 309 438 7905
  - 3.2. E-mail whunter@ilstu.edu
  - 3.3. Fax 309 438 5538
  
4. **Level of Proposed Unit**

<input type="checkbox"/> Undergraduate Certificate (1-2 years)	<input type="checkbox"/> Post-Baccalaureate Certificate
<input type="checkbox"/> Undergraduate Certificate (2-4 years)	<input type="checkbox"/> Post-Master's Certificate
<input type="checkbox"/> Associate	<input type="checkbox"/> First Professional Certificate
<input type="checkbox"/> Baccalaureate	
<input checked="" type="checkbox"/> Masters	
<input type="checkbox"/> First Professional	
<input type="checkbox"/> Doctorate <sup>1</sup>	
  
5. **Requested CIP Code (6-digits)** 13.1323
  
6. **Proposed Date for Enrollment of First Class:** January 2009
  
7. **Location Offered<sup>2</sup>:** **On-Campus**   
**Off-Campus**  : Region Number(s) \_\_\_\_\_ or Statewide

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<sup>1</sup> To assist staff in specialized areas of instruction, IBHE will retain two outside consultants to review all new doctoral program proposals.

<sup>2</sup> Institutions may request approval to offer a program, simultaneously, on- and off-campus, including statewide. However, assessments of program objectives and outcomes should be developed that address all of the locations and modes of delivery for which the institution is seeking approval. Note that "on-campus" approval extends to the entire region in which the main campus is located. New off-campus programs to be offered outside the institution's region require approval.

## **MISSION, OBJECTIVES AND PRIORITIES**

### **8. Mission**

#### **8.1 Tie to Mission**

*Educating Illinois* is the strategic planning document that identifies Illinois State University's mission and priorities to achieve excellence in a variety of areas. The document expresses these in the form of seven goals, in that ISU should be:

1. University of choice
2. Known for excellence
3. Foster creativity and growth
4. Affordable
5. Diverse
6. Enhance Employability
7. Partner engaged in outreach

The Master of Science in Chemistry Education Program advances these goals in the following ways:

- A separate degree, distinctly identifying graduate study in Chemistry Education, will enhance the visibility of the program and university, leading to more competitive pools of applicants at the undergraduate and graduate level [Goal 1, Goal 2] and distinct opportunities for potential students [Goal 5]
- Extends the university's commitment to support student growth and development by delivering outstanding programs and services [Goal 3, Goal 5]
- Models excellent inter-unit and inter-institutional partnerships to meet shared goals of student success [Goal 7]
- Enhances secure employment for alumni statewide and nationally, enhancing the reputation of the university and serving a significant recruiting function [Goal 1, Goal 6]

This new graduate program will lead to a new professional master's degree that provides conceptual knowledge and skills required for professional practice. The new degree, Master of Science in Chemistry Education, is proposed as a means to meet crucial and on-going needs for the State of Illinois and for the nation. The goal is to take current science teachers who teach chemistry with a strong background in chemistry and improve both their content knowledge and pedagogical knowledge so that they can improve the chemistry knowledge of their students.

**8.2 Explain how the program will meet regional and state needs and priorities, making specific reference to *The Illinois Commitment*.**

The Illinois Commitment was initially adopted by the Illinois Board of Higher Education in February 1999 as the state's strategic plan to guide higher education through the first decade of the millennium. The Board conducted a mid-term review of this plan during 2003-04 to ensure its continued relevance and responsiveness to the needs of the state and the higher education community. The Illinois Commitment, as revised in 2004, provides a policy framework that enhances accountability and communication efforts for higher education's stakeholders while being more responsive to a rapidly changing environment.

The Illinois Commitment emphasizes the diversity of Illinois higher education with the understanding that each institution will be expected to address the six statewide priorities in a manner that is consistent with the institution's mission, resources, and constituencies. Each institution will submit a performance report annually to share the ways it has contributed to achieving the state's higher education priorities. An annual statewide "Performance Report" will provide collective accountability in assessing progress toward meeting the six policy areas of The Illinois Commitment.

THE ILLINOIS COMMITMENT is premised on the conviction that higher education provides the foundation for Illinois' future by enhancing the social, economic, and civic well-being of the state and its residents.

**POLICY AREA ONE: ECONOMIC GROWTH**

Higher education will help Illinois sustain strong economic growth through its teaching, service, and research activities.

**POLICY AREA TWO: P-20 PARTNERSHIPS**

Higher education will join elementary and secondary education to improve teaching and learning at all levels.

**POLICY AREA THREE: AFFORDABILITY**

No Illinois resident will be denied an opportunity for a college education because of financial need.

**POLICY AREA FOUR: ACCESS AND DIVERSITY**

Illinois will increase the number and diversity of residents completing training and education programs.

**POLICY AREA FIVE: HIGH QUALITY**

Illinois colleges and universities will be accountable for providing high quality academic programs and the systematic assessment of student learning outcomes while holding students to ever higher expectations for learning and growth.

## POLICY AREA SIX: ACCOUNTABILITY AND PRODUCTIVITY

Illinois colleges and universities will continually improve productivity, cost effectiveness, and accountability.

The field of Chemistry Education is an essential component for the scientific and technological development of students across the state. Advanced students in Chemistry Education can help stimulate economic growth. This degree program is another way in which ISU can help improve the teaching of chemistry in the P-20 spectrum. The method of delivery (via the internet) for most courses means that it is accessible to a wide proportion of the state's chemistry teachers (and other sciences) such that the future of Illinois remains competitive.

Increasing the knowledge and skills of math and science teachers in their field(s) of specialization is a priority identified in studies and reports from the National Science Foundation, the US Department of Education, the Illinois State Board of Education, and the Illinois Board of Higher Education. For instance, Title II, Part B, Sections 2201-2203, of the No Child Left Behind Act of 2001 (NCLB) authorized the Mathematics and Science Partnerships (MSP) Program to improve teacher quality and to increase the academic achievement of students in mathematics and science. The primary means for achieving the MSP objectives are through enhancing the content knowledge and teaching skills of classroom teachers. This implies having new training opportunities for practicing teachers.

There are hundreds of teachers in Illinois who teach chemistry with a BS degree that does not have the same course requirements as our Illinois State University BS in Chemistry. These teachers teach primarily chemistry, but also biology, physics, and math. They are the primary teachers of chemistry in their own schools. Increasing the chemical knowledge of such teachers and providing them with the pedagogical tools for effective presentation of chemistry concepts is a direct approach to improving classroom outcomes of high school chemistry students. Furthermore, this has a strong potential to increase both the quantity and quality of students continuing to study chemistry.

ISU is in an excellent position to meet this need through the implementation of a new degree specifically aimed at improving the chemistry content and chemical pedagogy of in-service chemistry teachers.

**8.3 Identify similar programs and sponsoring institutions in the state. Compare these programs with the proposed program. Discuss the possible impact of the proposed program on these programs.**

**Other Similar Degree Programs**

There are similar programs in the State of Illinois, at SIUE and UIUC, but none of these programs include distinct combination of graduate coursework in chemistry, chemistry education, and science education with the classroom based Action Research all delivered via distance education. SIUE has had no graduates in the past three years, and UIUC has 5 graduates in the past 2 years.

Below is a sampling of other institutions that have similar degree programs. They include a range of credit hours from 30-45, with a similar mixture of chemistry content, and science education. ISU has more Chemical Education offerings than other institutions.

	UIUC MS Teaching of Chemistry	SIUE MS Sec. Ed. Chemistry	Indiana MAT- Chemistry	UMass- Dartmouth	SUNY- Stoneybrook MAT-Chem	Penn MCEP	Texas A&M MS ChemEd
Chemistry Content	16 graduate hours	15 hours	20 hours at our 300 and 400 level	15 hrs	15	24	12
ChemEd Content			0	0			
Science Education or Other Content	8 graduate hours in education + 8 electives	21 hrs + 9 hrs of electives	Up to 16	15	20	6	18
Research	No thesis is required	Thesis or an action research project	Thesis and non-thesis option Written or oral exam	Non-Thesis	6 hours student teaching	Non thesis	Thesis and non-thesis options
Total Credit Hours	32	45	36	30	41	30	36
Other Reqs.			Outreach and Teaching in Dept.				

**8.4. Discuss estimated future employment opportunities for graduates of this program. Compare the estimated need for graduates with the estimated number of graduates from this program and existing programs identified in 8.3 above. Where appropriate, provide documentation by citing data from such sources as employer surveys, current labor market analyses, and future workforce projections. Describe any special need for this program expressed by state agencies, industry, research centers, or other educational institutions.**

Two-thirds of the nation's K12 teachers are expected to retire or leave the profession over the coming decade, so it is estimated that schools will need to hire more than 2 million teachers during that period, including over 200,000 middle and high school mathematics and science teachers (National Commission on Mathematics and Science Teaching for the 21<sup>st</sup> Century, 2000; Committee on Prospering in the Global Economy of the 21<sup>st</sup> Century, 2006). Teachers' content knowledge, particularly in science and mathematics, is an important factor in determining student achievement (Goldhaber and Brewer, 1996, National Research Council, 2001). The need to recruit science, mathematics, and engineering majors into teaching is reflected in the goal of the *American Competitiveness Initiative* to have 100,000 highly qualified teachers by 2015 (Office of Science and Technology Policy, 2006) and the recommendations of the National Academies' report, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (Committee on Prospering in the Global Economy of the 21<sup>st</sup> Century, 2006). Data from the National Center for Educational Statistics show that students in high-poverty schools are more likely to be taught science and mathematics by teachers who lack a major or minor in the subject being taught (U.S. Department of Education, 2004). Approximately one-third of all new math and science teachers leave teaching within the first 3 years (Committee on Prospering in the Global Economy of the 21<sup>st</sup> Century, 2006), further exacerbating the teacher shortage, particularly in high poverty school districts. This program will help improve the competence of chemistry major teachers and their students' science achievement in a format that accessible to those teachers no matter where they choose to teach, including high-poverty schools.

## 9. Program Description

### 9.1. Provide a brief narrative description of the program, including a list of its central academic objectives. Explain how the curriculum is structured to meet the program's stated objectives. Provide a complete catalog description for the proposed program, including: program admission and graduation requirements; and curriculum design, including course descriptions.

To be admitted to the MSCE program a student must have at least a 2.8 GPA (on a scale in which A equals 4) for the last 60 hours of undergraduate work. The candidate must hold (or be eligible for) a valid certificate to teach science and chemistry. A minimum TOEFL score of 600 (250 for computer-based testing) is recommended for international students to be considered for admission to the program.

The degree requires 33 credit hours of coursework in three areas: Chemistry Content, Chemistry Education and Foundational Science Education. It would also require a continuing and capstone classroom Action Research project. By the time of final degree awarding, a candidate must have completed three years of full-time teaching.

Chemistry Content: 12 credit hours from the following: CHE 315, 350, 342, 360, 380.11, 380.41, 380.52, 380.53, 380.54, 388. Any CHE 380.xx or CHE 400 level course in Inorganic, Organic, Analytical, Physical, or Biochemistry for which the teacher has appropriate prerequisites. No credit for ISU courses in which students have an equivalent course already.

CHE 315 ANALYTICAL CHEMISTRY

CHE 342 GENERAL BIOCHEMISTRY

CHE 350 INORGANIC CHEMISTRY

CHE 380 TOPICS IN CONTEMPORARY CHEMISTRY

[Note: This includes CHE 380.45 X-Ray Diffractometry  
- one of the first offerings online]

CHE 454 TOPICS IN INORGANIC CHEMISTRY 1-3 sem. hrs.

[Note: This includes CHE 454.45 Laser Spectroscopy-  
- one of the first offerings online]

Chemistry Education: 9 credit hours from the following: CHE 380.48, 432, 433.

CHE 380.48 Advanced Chemistry: Curriculum & Pedagogy

CHE 432 LEADERSHIP IN CHEMISTRY EDUCATION

CHE 433 DEVELOPING PRACTICES IN CHEMISTRY EDUCATION

Science Education: 6 credit hours from the following: C&I 401, 450, 451, 453.

C&I 401 INSTRUCTIONAL MEDIA AND TECHNOLOGY

C&I 450 CURRICULUM IN SCIENCE EDUCATION

C&I 451 RECENT RESEARCH IN SCIENCE EDUCATION

C&I 453 INSTRUCTIONAL STRATEGIES FOR SCHOOL SCIENCE

Action Research: 6 credit hours: C&I 481, 482.

C&I 481 PROFESSIONAL RESEARCH I

C&I 482 PROFESSIONAL RESEARCH II

## **9.2 Explain what students are expected to know and/or be able to do upon completing the program.**

Overall, an MSCE graduate will have acquired skills, knowledge, values, and commitment necessary to improve their own chemistry instruction, to help others improve their chemistry instruction and to assume mid-level chemistry education leadership positions. As a separate degree, a MSCE degree graduate will have both the theoretical and practical knowledge and skills necessary to:

1. Learn and interpret current chemistry knowledge appropriate for the secondary school classroom [CHE 315, CHE 350, CHE 342, 360, CHE 380.XX, CHE 400.XX]
2. Be conversant in the historical, philosophical, organizational, and current research issues in chemistry and science education. [CHE 380.48, C&I 401, C&I 450, C&I 451, C&I 453]
3. Be committed to the continual education, growth, and understanding of all chemistry students. [CHE 432, CHE 433]
4. Facilitate the success of other chemistry teachers through effective development and implementation of professional development opportunities for others. [CHE 432, CHE 433]
5. Work successfully in chemistry teaching and leadership settings in secondary schools. [CHE 380.48, CHE 433]
6. Develop a series of action research projects aimed at identifying strengths and weaknesses in classroom instruction and process of continual improvement. [C&I 481, C&I 482]
7. Assess, evaluate, and improve chemistry education in secondary schools. [CHE 380.48, CHE 432, CHE 433, C&I 481, C&I 482]

The curriculum is sequential with a purposeful, prescribed progression through the program. Each course builds on prerequisite classes with foundational courses taken first, to provide knowledge, skills, and abilities necessary for success. The prerequisites listed for courses in the catalog explain and support the concept that knowledge and learning in this degree program is cumulative.

## Catalog description

### Catalog Copy

Old Catalog Copy

#### Master's Degree in Chemistry

The department offers a single, thesis-based M.S. degree requiring 32 credit hours. Four formal hours each in Chemistry 490 (Research) and Chemistry 499 (Thesis) are required as part of the 32 hour program, although most students will register for more than the total of eight formal hours while pursuing the degree. Students select a research adviser and work closely with that faculty member to complete a thesis based upon original research. Upon completion of a written thesis, a final oral examination/thesis defense is required.

The program is broad-based. It allows students to specialize in any of the subdisciplines (physical, organic, inorganic, analytical, biochemistry, or chemical education), although course work is required in at least four areas. The requirements to complete the M.S. degree include 22 hours of 400 and/or 300 level courses including a minimum of 12 credit hours of courses at the 400 level. Two hours of credit in Seminar (Chemistry 492) are also required.

#### Admission Requirements

To be admitted to the master's program a student must have at least a 2.8 GPA (on a scale in which A equals 4) for the last 60 hours of undergraduate work. The Department considers GRE scores for granting assistantships. Results of the General Test of the Graduate Record Examination should be sent to the Department's Graduate Program Director. A minimum TOEFL score of 600 (250 for computer-based testing) is recommended for international students to be considered for admission to the program.

New Catalog Copy (changes underlined)

#### Master's Degrees in Chemistry

The department offers a two (three) Master's degrees: MS Chemistry, (Master of Chemistry Education), and Master of Science in Chemistry Education. The MS Chemistry is a thesis-based M.S. degree requiring 32 credit hours. Four formal hours each in Chemistry 490 (Research) and Chemistry 499 (Thesis) are required as part of the 32 hour program, although most students will register for more than the total of eight formal hours while pursuing the degree. Students select a research adviser and work closely with that faculty member to complete a thesis based upon original research. Upon completion of a written thesis, a final oral examination/thesis defense is required.

The program is broad-based. It allows students to specialize in any of the subdisciplines (physical, organic, inorganic, analytical, biochemistry, or chemical education), although course work is required in at least four areas. The requirements to complete the M.S. degree include 22 hours of 400 and/or 300 level courses including a minimum of 12

credit hours of courses at the 400 level. Two hours of credit in Seminar (Chemistry 492) are also required.

### **Admission Requirements**

To be admitted to the MS Chemistry program a student must have at least a 2.8 GPA (on a scale in which A equals 4) for the last 60 hours of undergraduate work. The Department considers GRE scores for granting assistantships. Results of the General Test of the Graduate Record Examination should be sent to the Department's Graduate Program Director. A minimum TOEFL score of 600 (250 for computer-based testing) is recommended for international students to be considered for admission to the program.

### **Master of Science in Chemistry Education**

The Master of Science in Chemistry Education is a professional degree designed to improve the content and pedagogical knowledge of teachers of chemistry with a BS Chemistry. The degree requires 33 credit hours of coursework in three areas: Chemistry Content, Chemistry Education and Foundational Science Education. It would also require a continuing and capstone classroom Action Research project. By the time of final degree awarding, a candidate must have completed three years of full-time teaching.

Chemistry Content: 12 credit hours from the following: CHE 315, 350, 342, 360, 380.11, 380.41, 380.52, 380.53, 380.54, 388. Any CHE 380.xx or CHE 400 level course in Inorganic, Organic, Analytical, Physical, or Biochemistry for which the teacher has appropriate prerequisites. No credit for ISU courses in which students have an equivalent course already.

Chemistry Education: 9 credit hours from the following: CHE 380.48, 432, 433.

Science Education: 6 credit hours from the following: C&I 401, 450, 451, 453.

Action Research: 6 credit hours: C&I 481, 482.

### **Admission Requirements**

To be admitted to the MSCE program a student must have at least a 2.8 GPA (on a scale in which A equals 4) for the last 60 hours of undergraduate work. The candidate must hold (or be eligible for) a valid certificate to teach science and chemistry. A minimum TOEFL score of 600 (250 for computer-based testing) is recommended for international students to be considered for admission to the program.

The relevant course descriptions follow: (Note- There are no new courses are part of this program)

### **CHE 315 ANALYTICAL CHEMISTRY 3 sem. hrs.**

Emphasis on modern instrumental methods of chemical analysis including electroanalytical, optical, and chromatographic methods. Prerequisite: CHE 215; CHE 362 or concurrent registration. Lecture and laboratory. Materials and locker charge

optional.

**CHE 342 GENERAL BIOCHEMISTRY I 3 sem. hrs.**

Survey of the structure-function relationships of proteins, carbohydrates, lipids and nucleic acids, dynamic equilibria, energetics, reaction kinetics/mechanisms and metabolism. Prerequisites: C or better in CHE 232, or 1 year of organic chemistry or consent of instructor. Not for credit if had CHE 242.

**CHE 350 INORGANIC CHEMISTRY 3 sem. hrs.**

Survey of modern inorganic chemistry including structure of inorganic compounds, coordination chemistry, non-aqueous solvents, and selected inorganic reactions. Prerequisite: CHE 362.

**CHE 380 TOPICS IN CONTEMPORARY CHEMISTRY**

**1-3 sem. hrs.**

New concepts and recent developments in the fields of chemical education, organic, inorganic, analytical, physical, and biochemistry. Prerequisite: CHE 232; certain topics may require CHE 360. May be repeated.

[Note: This includes CHE 380.45 X-Ray Diffractometry, CHE 380.48 Advanced Chemistry: Curriculum & Pedagogy]

**CHE 432 LEADERSHIP IN CHEMISTRY EDUCATION 1-3 sem. hrs.**

Advanced study in theories of leadership, advanced ideas of teaching chemistry, and helping others to learn constructivist chemistry teaching techniques. Prerequisite: CHE 301 or equivalent.

**CHE 433 DEVELOPING PRACTICES IN CHEMISTRY EDUCATION 1-3 hrs.**

Advanced study for chemistry education leaders in developing opportunities for helping others to learn chemistry teaching techniques. Prerequisite: CHE 432 or equivalent. May be repeated for maximum of 8 credit hours.

**CHE 454 TOPICS IN INORGANIC CHEMISTRY 1-3 sem. hrs.**

Advanced study in selected areas of modern inorganic chemistry. Prerequisite: CHE 350. May be repeated. [Note: This includes CHE 454.45 Laser Spectroscopy]

**C&I 401 INSTRUCTIONAL MEDIA AND TECHNOLOGY 3 sem. hrs.**

Applications of technology to theories of learning and methods of instruction. Developing and evaluating courseware to facilitate classroom instruction.

**C&I 450 CURRICULUM IN SCIENCE EDUCATION 3 sem. hrs.**

An historical review of science education curricula and analysis of contemporary standards-based curricula.

**C&I 451 RECENT RESEARCH IN SCIENCE EDUCATION 3 sem. hrs.**

Review and critical analysis of research in science education. Application of research for reflection and improvement of practices in science education.

**C&I 453 INSTRUCTIONAL STRATEGIES FOR SCHOOL SCIENCE 3 sem. hrs.**  
Analysis and application of current theory and research to the design and delivery of science instructional strategies.

**C&I 481 PROFESSIONAL RESEARCH 3 sem. hrs.**  
Study of teacher-initiated research and design of a curricular or instructional research project in an educational setting. Prerequisites: C&I 407, 409, 411, and EAF 410; 18 semester hours of graduate study; consent of instructor.

**482 PROFESSIONAL RESEARCH II 3 sem. hrs.**  
Conduct and present a curricular or instructional research project in an educational setting. Prerequisite: C&I 481.

**9.3. Describe the strategies to be incorporated into the proposed program to promote student learning.**

The MSCE degree will provide significant opportunities for learning to occur both in class and out of class through the following activities and programs:

- Use of web-based technology to engage students in learning chemistry and chemistry education and science education ideas in locations relevant to the MSCE students and in turn their own students.
- Active and co-operative learning activities employed and implemented outside of classroom activities.
- Two (3 credit hour) rigorous Action Research experiences that teach students to take current classroom ideas and test them in a continual improvement process.
- Involvement in professional education and leadership of other chemistry teachers in their local setting.

## **RESOURCES**

**10. Complete Table I to show student enrollment projections for the program.**

**Table I STUDENT ENROLLMENT PROJECTIONS FOR THE NEW PROGRAM**

	<b>1<sup>st</sup> Year (July – June)</b>	<b>2<sup>nd</sup> Year</b>	<b>3<sup>rd</sup> Year</b>	<b>4<sup>th</sup> Year</b>	<b>5<sup>th</sup> Year</b>	<b>6<sup>th</sup> Year</b>
Number of Program Majors (Fall headcount)	3	3	3	3	3	3
Annual Full-Time-Equivalent Majors	1	1	1	1	1	1
Annual Credit Hours in EXISTING Courses	9	12	12	9	12	12
Annual Credit Hours in NEW Courses <sup>1</sup>	0	0	0	0	0	0
Annual Number of degrees Awarded	0	0	2	1	0	2

11. Complete Table II (even if no new state funding is requested in the budget year). Show all sources of funds, both state and non-state, and reallocations. Provide a narrative budget that includes the following:

- Projected increments in total resource requirements (line 1) in terms of projected staff requirements, equipment and instructional materials, library requirements, and contractual services for internships, practica, or clinical placements.
- Explanation of required new state resources (line 6) in the budget year in terms of assumptions and factors used to construct line items 7 through 11. If resource requirements in the budget year include non-recurring costs (e.g., one-time equipment purchases), describe how these resources will be reallocated in subsequent years.

**Table II PROJECTED RESOURCE REQUIREMENTS FOR THE NEW PROGRAM**

	1 <sup>st</sup> Year (July – June)	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	4 <sup>th</sup> Year	5 <sup>th</sup> Year	6 <sup>th</sup> Year
FTE Staff <sup>1</sup> (FTE)						
Summer teaching of 1 course	0	0	0	0	0	0
Academic year for 1 course						
Personnel Services ( \$ )	0	0	0	0	0	0
Clerical, copying, services						
Equipment and Instructional Needs ( \$ )	0	0	0	0	0	0
Library ( \$ )	0	0	0	0	0	0
Other Support Services <sup>2</sup> ( \$ )	0	0	0	0	0	0
Distance Education Course Development						

<sup>1</sup>Reflects the number of FTE staff to be supported with requested funds. Not a dollar entry.

<sup>2</sup>Other dollars directly assigned to the program. Do not include allocated support services.

*Grant supported during the 1st three years*  
*Budget narrative listing projected sources of program funding (including sources of reallocated funds).*

This degree proposal is linked to the attached Master of Chemistry Education degree proposal. Costs associated with this degree are included in the FTE Staff, Personnel Services and other costs of that proposal.

## **12. Institutional Resources Available**

**Describe the institutional resources available to develop and maintain a quality program. Include the following elements in your discussion:**

### Faculty

In the accompanying MCE proposal: one full-time faculty member in Chemistry coordinates all of Chemistry Teacher Education and teaches 3 of the required courses (0.17FTE). Nineteen other faculty in the chemistry are available to teach the required chemistry content courses as part of their assigned load (0.17 FTE). In Curriculum & Instruction the load is 0.28 FTE to offer 1.67 courses per year. **Please see attached letters of support from C&I and COE.**

### Library

The library at ISU has extensive holdings to support chemistry content, chemistry education, and curriculum & instruction courses. Although constantly under budget pressure, the library has worked to enhance collections that support students in the chemistry and science teacher education.

### Support services

1. Within the chemistry department the support staff (3 full-time) in the CHE office have worked with admissions applications, program administration and notification, and related correspondence between chemistry graduate students in our other programs. This MSCE program should not make a significant difference to the support staff needs. This support will also be on-going.
2. The CHE department currently supports three part-time academic advisor for the undergraduate and graduate programs; these positions will also be on-going.
3. Students in this program do not need additional equipment or supplies that are not already provided by the department or the university.

### Faculty qualifications, evaluation, and reward structure:

Requirements for full-time faculty in all three areas are already established in the University and Department ASPT documents. Qualification requirements include

terminal degree in an appropriate field, ability to support the mission of the department and college, abilities to teach effectively and conduct scholarly work. Faculty are evaluated annually regarding the quality of their performance in teaching, research, and service. Allocation of raises is based on that performance, along with considerations of equity. The Department's ASPT document and annual personnel reports are on file in the Department. No changes in current practice are anticipated with the approval of the new degree.

## QUALITY ASSURANCE

### **13. Program/Student Learning Outcomes Assessment**

#### 13.1. Assessment plan:

The Provost at Illinois State University requires a comprehensive assessment plan be in place for the assessments of every undergraduate and graduate program. The graduate program in Chemistry is subject to review every seven years within the normal ISU program review procedures. The next program review will be in 2010.

The faculty in the MSCE Program will collaborate to review curricular issues informed by multiple points of evidence, including student work from identified activities within the program, and feedback from key sources, including instructors, employers, and students' self-assessment. In addition, program review will include attention to emerging critical issues in the field as revealed by student and faculty active participation in professional associations.

#### Mission

The MSCE program at Illinois State University provides students with the theoretical and practical knowledge and skills necessary to enable them to understand modern chemistry at a profound level, to teach science and chemistry at a higher level, to help others improve their own teaching, and to conduct research in their own classrooms aimed at instructional improvement. Graduates will have a strong foundation for long-term professional careers and will be prepared to take leading roles the future of the profession. After completing the program, graduates will also have the opportunity to serve as leaders in science departments and school districts.

#### Objectives & Measures

A graduate awarded MSCE degree will have both the theoretical and practical knowledge and skills necessary to:

1. Learn and interpret current chemistry knowledge appropriate for the secondary school classroom

Measured by:

- a. pre- and post-test assessment of program participants at entry and at graduation
  - b. alumni survey administered 1 and 5 years after graduation
  - c. assessment activities in CHE 315, CHE 350, CHE 342, 360, CHE 380.XX, CHE 400.XX.
2. Be conversant in the historical, philosophical, organizational, and current research issues in chemistry and science education.
- Measured by:
- a. assessment activities in CHE 380.48, C&I 401, C&I 450, C&I 451, C&I 453
3. Be committed to the continual education, growth, and understanding of all chemistry students. [CHE 432, CHE 433]
- Measured by:
- a. alumni survey administered 1 and 5 years after graduation
  - b. assessment activities in CHE 432, CHE 433.
4. Facilitate the success of other chemistry teachers through effective development and implementation of professional development opportunities for others. [CHE 432, CHE 433]
- Measured by:
- a. alumni survey administered 1 and 5 years after graduation
  - b. assessment activities in CHE 432, CHE 433.
5. Work successfully in chemistry teaching and leadership settings in secondary schools.
- Measured by:
- a. assessment activities in CHE 380.48, CHE 433.
  - b. supervisor survey administered 1 and 5 years after graduation
6. Develop a series of action research projects aimed at identifying strengths and weaknesses in classroom instruction and process of continual improvement.
- Measured by:
- a. assessment activities in C&I 481, C&I 482.
7. Assess, evaluate, and improve chemistry education in secondary schools.
- Measured by:
- a. alumni survey administered 1 and 5 years after graduation
  - b. assessment activities in CHE 380.48, CHE 432, CHE 433, C&I 481, C&I 482
  - c. supervisor survey administered 1 and 5 years after graduation

#### End of program assessment

Capstone course (C&I 482) will have multiple objectives and comprehensive expectations for combining all aspects of the MSCE program in the Action Research project.

### Performance measures

There are no standardized measures of performance nor is there a certification awarded for this particular degree program.

### Feedback:

Feedback about the program will be solicited through: course evaluations, the alumni survey at 1 and 5 years post graduation, employer assessment, and on-going departmental meetings devoted to assessment of program outcomes and review.

**13.2. Identify measures to be used to assess and improve student learning, curriculum, and instruction. Evidence of success should include, but not be limited to, such specific outcomes as the following: Measures to assess learning, curriculum, instruction**

### Percent employed in chemistry teaching

Student employment of graduates will be tracked by the Chemistry Teacher Education program coordinator using a data base. Information will be solicited and updated using an e-mail, listserv as well as the alumni newsletter.

### Career advancement

Graduates of the program and their career advancement into leadership positions will be tracked by the Chemistry Teacher Education program coordinator. Information will be solicited and updated using an e-mail listserv as well as the alumni newsletter

### Graduate/employer satisfaction with program

An employer satisfaction assessment instrument will be developed and sent every five years to supervisors of recent graduates.

### Retention/graduation/time to degree

Retention and graduation rates of the MSCE program participants will be tracked by the Chemistry Teacher Education program advisor.

Percent involved in faculty research N/A

Percent involved independent studies N/A

Percent involved in program presentations N/A

Percent involved in faculty research N/A

Percent involved as teaching assistants N/A

Percent involved as Percent involved in N/A

Percent involved in Percent involved in N/A

Percent involved in presenting/publishing N/A

## **OFF-CAMPUS PROGRAMS ONLY**

- 14. In addition to responding to the above questions, if all or part of the proposed program is to be delivered off-campus and/or via the Internet, provide the following:**

### **14.1 Describe the program's mode(s) of delivery.**

Aside from our regular course offerings, our intention is to offer one class per semester online via distance education. Beginning in the Fall of 2008 or January of 2009 each fall and spring, we plan to offer one course to a cohort of 3 students. Each summer, one course will be offered for two or three weeks intensively in July. Simultaneous enrollment in C&I 481 and 482 during the latter stages of the degree will allow our first graduating class to be in 2011 or 2012.

### **14.2 Describe the process for assuring the quality of the off-campus program in the following areas: (a) faculty qualifications and evaluation; (b) student access to necessary library resources; (c) where appropriate, student and faculty access to technical support, including computing.**

Courses will be taught by ISU faculty through the extended university of ISU. The Extended University coordinates logistical support for all courses off campus and distance education courses, certificates, and programs. They also arrange for off-campus proctoring of exams and other assignments.

For these courses, class materials, discussions, projects, and student/faculty interactions are conducted via the Internet. To succeed students need good written communication skills, self-motivation, a minimum level of technological experience, and access to a computer and the Internet. In 2005 - 2006, the university offered 106 internet courses with 2,561 students enrolled.

### **14.3 Has this program been approved for on-campus delivery?**

This is the first approval sought for this program.

## Notice of Intent

### ILLINOIS STATE UNIVERSITY

#### Master of Science in Chemistry Education Region 5

Illinois State University has informed the Illinois Board of Higher Education of its intent to offer the Master of Science in Chemistry Education degree in Region 5.

The program is designed to provide students with knowledge and skills to interpret current chemistry appropriate for the secondary school classroom, to understand current research issues in chemistry and science education, and to lead continual education and growth of chemistry teachers and students. Completion of the program for a Master of Chemistry Education degree requires completion of 33 hours of coursework in three areas: Chemistry Content (12 cr. hrs.), Chemistry Education (9 cr. hrs) and Science Education (6 cr. hrs.) . It would also require a continuing and capstone classroom Action Research project (6 cr. hrs). The curriculum requirements are the same as the on-campus requirements.

The program is designed to serve current science teachers who teach chemistry with a strong background in chemistry and improve both their content knowledge and pedagogical knowledge so that they can improve the chemistry knowledge of their students. These teachers, because of other responsibilities, cannot attend ISU on a full-time basis. The classes will be delivered primarily in the evenings and on weekends via the internet with an intensive summer class on campus in July each year.

Illinois State University estimates that, every 3 years, approximately 3 students will enroll as a cohort, and expects those 3 students to graduate three years later.

Requests for additional information about the proposed program should be directed to Dr. William Hunter, Department of Chemistry, Illinois State University, Normal, IL, USA, 61790-4160 E-mail: [whunter@ilstu.edu](mailto:whunter@ilstu.edu).

ILLINOIS STATE  
UNIVERSITY



COLLEGE OF EDUCATION  
*Office of the Dean*

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March 12, 2008

William Hunter  
Associate Professor  
Departments of Chemistry & Curriculum and Instruction  
Associate Director  
Center for Mathematics, Science, and Technology  
Campus Box 4160  
Illinois State University  
Normal, IL 61790-4160

Dear Dr. Hunter:

Please consider this document to be a letter of support for the Master of Chemistry Education and Master of Science in Chemistry Education proposed programs. In addition to the fact that these programs will respond to a clear and pressing need in the field, I want to commend you and your Co-PI, Dr. Marilyn Morey, for the example you have set for collaboration across colleges and departments.

Collaboration of this type involves a great deal of work, is time consuming and challenging. With that said, it is important to recognize that this type of collaboration is what is most important on a large comprehensive campus such as Illinois State University. This project will likely provide a model for future cooperative endeavors that will prepare teachers with the requisite skills to meet some of the most critical staffing needs of schools in our state and nation.

Thank you for this effort. In the College of Education we will do our best to support the development and implementation of these two proposals.

Sincerely,

Dr. Deborah Curtis  
Dean  
College of Education  
Illinois State University

cc: Dr. Phyllis Metcalf-Turner  
Dr. Marilyn Morey

ILLINOIS STATE  
UNIVERSITY



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March 10, 2008

William Hunter, PhD  
Associate Professor  
Department of Chemistry  
Campus Box 4160  
Illinois State University  
Normal, IL 61790-4160

Dear Dr. Hunter,

The Department of Curriculum & Instruction is very pleased to submit this letter in support of the Master of Chemistry Education degree proposal. We look forward to collaborating with the Department of Chemistry faculty in meeting the needs of students interested in pursuing this degree. As you know, during the past five years we have had several chemistry major students who successfully completed our courses. We look forward to working with more of your students who may seek to earn the new Masters degree. There are several of our courses that may be of particular interest to students who would seek to earn the Master of Chemistry Education degree. Some of these include, *C&I 401: Instructional Media and Technology*, *C&I 450: Curriculum in Science Education*, *C&I 451: Research in Science Education*, *C&I 453: Instructional Strategies for School Science*, *C&I 481: Professional Research I*, and *C&I 482: Professional Research II*.

Should you have any questions or concerns, please feel free to contact me at: 438-8105 or [pmetcal@ilstu.edu](mailto:pmetcal@ilstu.edu). We look forward to working with you and your faculty.

Sincerely,

Phyllis Metcalf-Turner, PhD  
Professor and Chair

cc: K. Lind, Director CeMast  
M. Morey, Department of C&I