

**MEMORANDUM**

**To:** Board of Regents  
**From:** Board Office  
**Subject:** Proposal for a Master of Arts in Teaching – Science at the Iowa State University  
**Date:** June 9, 2003

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**Recommended Action:** Refer Iowa State University’s proposal to establish a Master of Arts in Teaching – Science to the Interinstitutional Committee on Educational Coordination (ICEC) and the Board Office for review and recommendation.

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**Executive Summary:** Iowa State University is requesting approval for a Master of Arts in Teaching - Science in the College of Education.

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**Teacher Shortage Area** The Iowa Department of Education has designated all grades 7-12 science subjects as “teacher shortage areas” due to a high rate of teacher attrition.

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**Program Goal** The primary goal of this proposed program is to attract, prepare, and retain highly qualified secondary science teachers who will be immediately compensated for their expertise because of the Master’s degree.

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**Duplicative** The University of Northern Iowa has a similar program in science education in the College of Natural Sciences. The University of Iowa and Drake University offer post-baccalaureate teacher licensure programs with a master’s degree. The designation of Master of Arts in Teaching (M.A.T.) is used in both programs. According to Iowa State University, there is enough interest from potential students in the Des Moines area to justify the need for another program. Furthermore, it appears to be sufficiently different from SUI’s and Drake’s programs in length and curriculum to warrant duplication.

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**Link to Strategic Plan:** This effort is part of the institutional activities which help the Board of Regents achieve its objective to improve access to the Regent institutions as stated in its current Strategic Plan:

KRA 2.0.0.0 Provide access to educational, research, and service opportunities within the missions of the Regent institutions.

Objective 2.2.2.0 Evaluate annually and, where appropriate, make recommendations to meet relevant educational and service needs of the state.

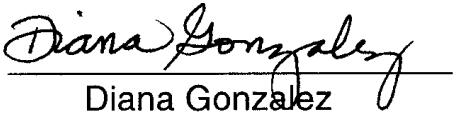
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Cost According to the University, no significant additional resources will be needed for the proposed program until enrollment exceeds 30 students. In the first year, \$7,600 will be required primarily for the student teaching component. A recent U. S. Department of Education grant has provided funding for faculty to develop this program.

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Regent Program Review Questions Attached is a copy of the University's responses to the Regent New Program Review Questions (pages 3–11).

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Diana Gonzalez

Approved:   
Gregory S. Nichols

## Regents Program Review Questions

**Name of Proposed Program:** Master of Arts in Teaching – Science

**Degree:** Master of Arts in Teaching **Major:** Science Education

**Department:** Curriculum and Instruction

**1. a. How will this proposed program further the education and curriculum needs of the students in this discipline?**

The Iowa Department of Education has designated all grade 7-12 science subjects as “teacher shortage areas.” With accelerating retirements and the unacceptably high rate of teacher attrition, an urgent need exists in Iowa to prepare excellent secondary science teachers in a timely, but effective, manner. The primary goal of this proposed secondary science Master of Arts in Teaching (M.A.T.) program is to attract, prepare, and retain highly qualified secondary science teachers who, with an M.A.T. degree, will be immediately compensated for their expertise when hired to teach. The better pay M.A.T. recipients earn will attract prospective teachers to the program, reward them for their efforts and life-experiences, and make remaining in the classroom more likely. Recent federal “No Child Left Behind” legislation encourages the development of alternative programs for post-baccalaureate students in science and other shortage areas. The M.A.T. degree name is recognized across the nation as a graduate level preservice teacher education professional program.

The proposed science M.A.T. program (approved by the Curriculum & Instruction Department faculty on 3/5/02, the University Teacher Education Committee on 3/26/02, the College of Education Curriculum Committee on 10/8/02, the Graduate College Curriculum Committee on 1/27/03, the Graduate Council on 2/20/03, and the Faculty Senate Curriculum Committee on 2/27/03) will attract individuals already possessing a bachelor’s degree in a science field, because it is designed so that teacher licensure and a master’s degree will be completed in a summer-fall-spring-summer cycle. The program, reflecting what is known about effective teacher education: 1) is longitudinal, occurring over four contiguous semesters; 2) is experience-based, requiring extensive public school science teaching that, over the course of the program, ensures experience at the middle and high school levels; 3) utilizes a spiraling curriculum (i.e. concepts, strategies, and teacher behaviors are readdressed in new and more complex situations as students advance through the program); 4) requires significant quantitative and qualitative student self-evaluation; and 5) emphasizes the nature of science and its implications for science education.

These efforts reflect and promote the desired state outlined by the national Teacher Education and Accreditation Council (TEAC), the National Research Council (National Science Education Standards), the American Association for the Advancement of Science (Project 2061 and Benchmarks), and the joint National Science Teachers Association (NSTA) and Association for the Education of Teachers in Science (AETS) Certification and Accreditation in Teacher Education (CASE) Standards. Well-prepared teachers are far more likely to be successful classroom teachers who remain in the profession. Additionally, as all 7-12 science subjects have been designated as

shortage areas, science M.A.T. students obtaining a Stafford Student Loan and/or Supplemental Loan while becoming licensed to teach may be eligible for up to three years of deferment of their loan. Federal Cancellation benefits may also be available to new borrowers.

To address the critical need for science teachers, we would like to have the first M.A.T. cohort group graduate in August 2004 and be teaching that fall. The attached state requirements for secondary teacher licensure, proposed science M.A.T. program map, and course descriptions illustrate how very high quality science teachers will be prepared in a tightly coordinated program. The proposed science M.A.T. program ensures accelerated movement toward teacher licensure in a post-baccalaureate program that will attract, prepare, and retain highly qualified secondary science teachers who, with an advanced degree, will be immediately compensated for their expertise when hired to teach.

**b. How does it further the educational and curriculum needs of other units in the college or university?**

The proposed M.A.T. program will increase the number of graduate students in Curriculum and Instruction, which is in line with external review recommendations (April 17, 2001) and our department goals. In addition, it will serve as a model for other units in the college and university developing similar programs that wish to move toward post- baccalaureate teacher certification. Moreover, the proposed M.A.T. program will promote three of the University's four priorities for 2002-2003 as outlined in President Geoffrey's convocation speech. They are:

- We have to increase the number of our academic programs that are counted among the very best in their fields. Reflecting the desired program advocated by professional teacher education organizations, our proposed science M.A.T. program is designed to be one of the best science teacher education programs in the nation, and will serve as a model for exemplary science teacher education.
- A second major priority for the university and one that we must always keep in front of us is to ensure that we provide a superior education to our students. We have to ensure that we provide a top-quality education to our students. The purpose of the proposed M.A.T. program is to provide a superior education to our preservice science teacher education students so that they become exemplary science teachers.
- The third priority, which is essential if we are truly to be the best university in fulfilling our land-grant mission, is to be strongly connected with the people we serve the citizens of Iowa. And we have to increase our connectivity to the people that we serve the citizens of Iowa. The proposed M.A.T. program has the citizens of Iowa as its primary focus. Our effort to produce highly qualified science teachers in a timely manner illustrates our connectivity to the needs of Iowa citizens.

Finally, the proposed science M.A.T. program reflects President Geoffrey's message to the College of Education (October 25, 2002) that as a university of science and technology, we ought to be leaders in science and technology education.

**2. a. What programs in this field of study are available in other colleges and universities in Iowa?**

The University of Iowa and Drake University offer post-baccalaureate teacher licensure programs along with a master's degree. In both these programs, the Master of Arts in Teaching (M.A.T.) designation is used. The state of Iowa recently passed an alternative licensure route for those with a bachelor's degree and three years of post-baccalaureate work experience. This alternative route requires 12 credits of coursework prior to taking a teaching position, plus further coursework during the first year of teaching and 12 credits afterwards. Few colleges and universities are choosing to offer the alternative route because it does not effectively prepare individuals for the demands of teaching.

**b. With what representatives of these programs have you consulted in developing this proposal? Provide a summary of the reactions of each institution consulted as well as the complete text of the responses.**

Before coming to Iowa State University in 1999, Michael Clough was a faculty member in the Science Education Center at the University of Iowa. Hence, the proposed M.A.T. program follows from conversations with U. of I. science education faculty, robust knowledge of the strengths and limitations of that program, and conversations with science education faculty from Drake University (i.e. Dr. Lisa Martin), peer institutions and other science educators around the country. This consultation and support is illustrated in the many letters of support from the University of Iowa, peer institutions, and other research extensive universities.

**c. In what ways is this proposed program similar to those mentioned in 2a? In what ways is it different, or does it have a different emphasis?**

The proposed science M.A.T. program is similar to that of the University of Iowa in that it has a required nature of science component and multiple science methods courses each associated with a practicum experience. However, Iowa's M.A.T. requires two science application courses, and requires two full academic years to complete despite having an equal number of credits. Our proposed M.A.T. program is a 15-month, summer-fall-spring-summer sequence and has students returning for coursework after student teaching -- a positive feature noted in U. of I's letter of support from Dr. James Marshall. Our proposed program will produce highly qualified science teachers in a shorter period of time thus helping alleviate the shortage of science teachers in Iowa and the nation. Drake University's recently developed master's level science certification program begins in January 2003. The program consists of 36 graduate credits. While Drake's program leads to licensure, it consists of only one general methods course (i.e. prospective teachers from all subject areas are lumped together), no science methods experience, and no required history and nature of science experience. Our proposed program incorporates more intensive science-specific, teacher education experiences (four science methods experiences, each associated with science teaching experiences, and a required Nature of Science and Science Education course), yet our students will complete the M.A.T. in the same amount of time as in the Drake program. Our science M.A.T. also benefits from unique

collaborations between science educators in our Center for Excellence in Science and Mathematics Education and scientists at ISU nationally known for their efforts in improving science education.

**d. How does the proposed program supplement the current programs available?**

The Iowa Department of Education has designated all grade 7-12 science subjects as “teacher shortage areas” (please see pp. 20-21 below). With accelerating retirements, and the unacceptably high rate of teacher attrition in Iowa and across the nation, an urgent need exists to prepare excellent secondary science teachers in an effective and timely manner. The only attraction of alternative certification routes is their short duration, but the resulting inadequate preparation leads to poor teaching practices and high teacher attrition rates. Our proposed M.A.T. program, unlike ill-conceived alternative certification routes, prepares high quality science teachers in a relatively short period of time (15 months). It thus addresses both the long-term and short-term shortage of science teachers by preparing high quality science teachers (who will more likely remain in teaching) in a timely manner.

**e. Has the possibility of some kind of inter-institutional programs or other cooperative effort been explored? What are the results of this study?**

An effective teacher education program requires seamless continuity between science methods courses, tight integration of those courses with field-based teaching experiences, and close supervision of students in field settings. This makes inter-institutional cooperation more difficult. However, some of the more foundational courses required in our proposed M.A.T. program could be transferred from other institutions.

**f. List the Iowa institutions in which articulation agreements are being developed for the proposed program.**

Because the M.A.T. degree is graduate-level degree, students possessing a bachelor’s degree in an appropriate science content area from any accredited higher education institution may, if other admittance criteria are met, be admitted to the proposed science M.A.T. program.

**g. Provide the Classification of Instructional Program (CIP) code for the proposed program.**

The Classification of Instructional Program (CIP) code for the proposed science M.A.T. program is 13.1316 “Science Teacher Education, General.”

**3. Estimated enrollment in the proposed science M.A.T. program for the next five years:**

	1	2	3	4	5
<b>a. Undergraduate</b>					
Majors	0	0	0	0	0
Non-majors	0	0	0	0	0
<b>b. Graduate</b>					
Majors	15	20	25	30	30
Non-majors	0	0	0	0	0

**c. On what basis were these estimates made?**

These estimates are based on the current list of interested students, a growing awareness of the science teacher shortage, and the attractive nature of the proposed M.A.T. program. Moreover, a recently funded U.S. Department of Education grant, **Recruiting, Educating, Inducting, Supporting and Retaining Mathematics and Science Teachers to Improve the Quality of Mathematics, Science and Technology Education for K-12 Students in the 21st Century** (Andre, Hand, Sharp, Lubienski, Davis, Olson, and Clough) has provided funding for faculty to develop this program, see it through the approval process, and fund on- and off-campus advertisement efforts. Advertising efforts will target recent science graduates, mid-career professionals interested in teaching, and ISU alumni.

**d. What are the anticipated sources of these students?**

The anticipated sources of these students are science graduates from ISU and other universities, and mid-career change individuals interested in becoming science teachers.

**4. Please provide any available data or information on employment opportunities available to graduates of this program in Iowa and nationally.**

During the next ten to fifteen years, more than 2 million new teachers will be needed in our nation's classrooms (Olson, 2000). The recent Glenn Commission Report points out the urgency for America to recruit and prepare science and mathematics teachers. Within the next decade nearly one-quarter million new science and mathematics teachers will be needed. Because of this enormous demand, efforts are already underway to attract and certify greater numbers of science teachers. The Iowa Department of Education has designated all grade 7-12 science subjects as "teacher shortage areas" (please see accompanying pdf file). Consequently, science M.A.T. students who obtain Stafford Student Loans and/or Supplemental Loan for Students (SLS) while becoming licensed to teach may, if employed full time, be eligible for up to three years of deferment of their loans. Federal cancellation benefits may be available to new student loan borrowers.

**5. Are there accreditation standards for this program? If so, please provide a copy of the Accreditation standards.**

**a. What is the accreditation organization?**

Teacher Education Accreditation Council (TEAC). Please see appendices for the relevant Accreditation standards. For more information see <http://www.teac.org/>

**b. What accreditation timetable is acceptable?**

Jackie Blount, Associate Dean in the College of Education, has reported that this new program, if approved, will be part of the accreditation process beginning in 2004.

**6. Does the proposed program meet minimal national standards for the program (e.g. Council of Graduate Schools or other such bodies?)**

The proposed program far exceeds minimal national standards and is expected to serve as a model science teacher education program.

**7. Report reactions of the Iowa Coordinating Council for Post-High School Education.**

The proposal was sent to the Council listserve on 4/11/03. No objections were received.

**8. How does this program relate to the college's/university's strategic plan?**

Meeting University Goals

The ISU Strategic Plan for 2000-2005 (<http://www.iastate.edu/~president/plan/2005/goals.html>) is structured around three goals and their intersections. The proposed M.A.T. program reflects important attributes identified in the strategic plan as common to all three goals. First, the program reflects a clear need that was identified through communication and collaboration with our constituent stakeholders. Second, it encourages best practices and new ideas. Third, the program is designed, in part, to lead to life-long learning. At the intersection of goals 1 and 2, the M.A.T. program will improve student learning through curriculum development and instructional innovation that must keep pace with the challenging profession of science teaching. At the intersection of goals 1 and 3, the proposed program enhances service learning experiences for graduate students through extensive internship experiences linked to university-based course work. Finally, at the intersection of goals 2 and 3, the proposed M.A.T. program increases Iowa's quality of life by producing highly qualified science teachers for our children, and does so in a timely manner addressing the already existing and accelerating science teacher shortage. Moreover, the proposed M.A.T. program will promote three of the University's four priorities for 2002-2003 as outlined in President Geoffrey's convocation speech. They are:



- We have to increase the number of our academic programs that are counted among the very best in their fields. The proposed science M.A.T. program is designed to be one of the best science teacher education programs in the nation, and will serve as a model for exemplary science teacher education.
- A second major priority for the university and one that we must always keep in front of us is to ensure that we provide a superior education to our students. We have to ensure that we provide a top-quality education to our students. The purpose of the proposed M.A.T. program is to provide a superior education to our preservice science teacher education students so that they become exemplary science teachers.
- The third priority, which is essential if we are truly to be the best university in fulfilling our land-grant mission, is to be strongly connected with the people we serve the citizens of Iowa. And we have to increase our connectivity to the people that we serve the citizens of Iowa. The proposed M.A.T. program has the citizens of Iowa as its primary focus. Our effort to produce highly qualified science teachers in a timely manner illustrates our connectivity to the needs of Iowa citizens.

#### Meeting College Goals

The College of Education (COE) goals for (<http://www.educ.iastate.edu/overview/5yr-plan/homepage.htm>) are designed to enhance the intersection of learning, discovery, and engagement. Goal one addresses, in part, the development and implementation of high quality curricula that serve the citizens of Iowa and prepare individuals for productive careers and life-long learning. One identified strategy for reaching this goal is creating programs to achieve national and international distinction, thereby attracting outstanding students. The proposed M.A.T. will be a model post-baccalaureate science teacher licensure program and has already attracted the interest of outstanding students. A second COE goal emphasizes the centrality of teacher education within the university, and this is reflected in creating an exemplary post-baccalaureate science teacher licensure program. The research that will be conducted on graduates of this program will address a third COE goal to encourage the creation, synthesis, and dissemination of new knowledge and innovation through basic and applied research. The proposed M.A.T. in science education will also promote a fourth goal of improving the visibility of the College of Education to prospective students and constituents.

#### Meeting Department Goals

The overarching goal of the Curriculum and Instruction (CI) department is to contribute significantly to the discipline of education by offering high quality educational programs and producing distinguished scholarship in learning, discovery, and engagement. Towards those ends the department seeks to create nationally recognized graduate programs that produce highly competent professionals in targeted areas. The proposed M.A.T. program will increase the number of graduate students in Curriculum and Instruction, which is in line with external review recommendations (April 17, 2001) and our department goals.

**Additional Resource Needs**

**1. Will the program require new resources?** Yes \_\_\_ No X

If “yes,” what is the plan to obtain new resources?

**2. Will the program require reallocated resources?** Yes X No \_\_\_

If “yes,” what is the university’s reallocation plan to fund this program?

Because the proposed M.A.T. program fits seamlessly into the College of Education Curriculum & Instruction department graduate level licensure component (HPC 504, SpED 501, C I 533, 506, and 505 are already offered), the already existing undergraduate science teacher preparation program (C I 518 and 519 will be dual listed with 418 and 419 respectively), and because C I 546 and 547 are already offered, no additional faculty are needed. This is the case even though C I 514 is a new course, because it will be offered during the summer. C I 514 will meet for 15 clock hours (1 credit faculty load) and have a required 20 clock hours field component. The number of student teachers needing supervision will increase, but as with the current fluctuating number of student teachers each semester, this will be handled through reallocating departmental resources.

While the science education faculty will advise more graduate students and must supervise the creative component (C I 599C) of all M.A.T. students, this will be done in a manner that does not add a significant workload to any single faculty member. No significant additional resources are needed to operate this new program unless a decision is made in the future to add additional sections of the methods courses to meet greater demand - a situation that could arise as the shortage of science teachers becomes more acute. General expenses such as copying and materials for activities in the methods courses will increase, but insignificantly. According to the Curriculum & Department Chair, Dr. Tom Andre, resources within the department will be reallocated to fund the additional general expenses associated with the M.A.T. program.

<u>Pedagogy Component of M.A.T. Program</u>	<u>First Year Expenses</u>
C I 514 New course	\$1,750
C I 518 Dual listed with C I 418	
C I 519 Dual listed with C I 419	
C I 546 Currently taught	
 <u>Field Experience Component of M.A.T. Program</u>	
C I 591D	
C I 517S (≈15 additional student teachers)	\$5,625
 <u>Licensure Component of M.A.T. Program</u>	
C I 533 Currently taught	
SpED 501 Currently taught	
C I 506 Currently taught	
HPC 504 Currently taught	
C I 505 Currently taught	

Additional Courses for Masters Degree

C I 547 Currently taught

C I 599C Part of faculty advising

**3. At what level of enrollment will additional resources be required for the program?**

When enrollment exceeds 30 students, additional resources will be required.

**4. Estimate the probable marginal increases in expenditure for the next three years that may be necessary as a result of the adoption of this program.**

**Estimated (incremental increase) Costs**

	First Year	Second Year	Third Year
<b>a. Faculty</b>	<b>\$1,750</b>	<b>\$0</b>	<b>\$0</b>
<b>b. Graduate Assistants</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>c. General Expenses</b>	<b>~ \$225</b>	<b>~ \$75</b>	<b>~\$ 75</b>
<b>d. Equipment</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>e. Library Resources</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>f. New Space Needs</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>g. Computer Use</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>h. Other Resources (\$375/student teacher)</b>	<b>\$5,625</b>	<b>\$1,875</b>	<b>\$,1875</b>
<b>TOTAL</b>	<b>\$7,600</b>	<b>\$1,950</b>	<b>\$1,950</b>

**5. For programs planning to use external grants, what would be the effect of the grant termination?)**

The U.S. Department of Education grant, **Recruiting, Educating, Inducting, Supporting and Retaining Mathematics and Science Teachers to Improve the Quality of Mathematics, Science and Technology Education for K-12 Students in the 21st Century** provides funding for faculty to develop this program, see it through the approval process, and initial advertisement efforts. The termination of this grant will in no way impact the proposed program.