PROGRAM PROPOSAL

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

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

3. **Department:** Curriculum and Instruction

4. **Need for the Proposed Program**

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, 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. 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 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.

5. Program Objectives and Student Outcomes

Students will:

Outcome Category 1: Purposes of schooling, education, and science education

a) Develop and articulate a well-informed position concerning the purposes of education and schooling and the role of science education.
b) Develop a set of student goals that reflect the purposes of schooling and the emerging consensus among leading organizations in science education.
c) Develop and articulate a well-informed and fervent rationale for accurately portraying the nature of science (NOS) in everyday instruction.
d) Describe the connections between science, technology, and society and their implications for science teaching.

Outcome Category 2: How people learn

e) Articulate a clear and robust understanding of how children learn science.
f) Use multiple learning theories in guiding decisions regarding content, activities, materials, teacher behaviors and strategies.
g) Develop student objectives that 1) appropriately reflect multiple learning theories and 2) are consistent with the consensus goals for science education.

Outcome Category 3: Scholarship of teaching

h) Demonstrate confidence and competence with inquiry-based science teaching as recommended in the *National Science Education Standards*.
i) Locate, assess, and integrate in their emerging research-based framework several research-supported statements regarding science teaching and learning.
j) Modify at least two pre-existing laboratory activities so they better reflect desired student goals, contemporary learning theories, and the nature of science.
k) Create lesson plans and assessments promoting the goals for science education, and reflecting how people learn.
l) Create and orally defend a thorough research-based framework for teaching science that reflects and facilitates desired student goals. The paper and the oral defense must clearly describe what teaching congruent with a research-based framework looks like in the complex reality of classrooms.

Outcome Category 4: Teaching

m) Consistently implement research-based teaching behaviors and strategies that facilitate student goals congruent with the desired state of science education.
n) Accurately assess their own and others' classroom practices using both quantitative and qualitative means.
o) Effectively implement explicit NOS content, materials, and activities in decontextualized settings (i.e. the focus is exclusively on the nature of science) and in contextualized settings (e.g. the focus is on science content using typical activities, videos, reading assignments, and teacher talk).
p) Accurately assess NOS teaching (and lack of) in science lessons.
q) Appropriately integrate technology, taking into account student goals, how students learn, and the nature of technology.
r) Conduct, analyze, and reflect upon action research connecting their research-based framework to classroom practices.

Outcome Category 5: Professionalism

s) Exhibit professional and positive behaviors that promote effective science learning, teaching, and teacher education.
t) Consistently exhibit a vigorous and altruistic work-ethic.
u) Use all of the above to move teaching and learning toward the desired state of science education.

Assessment of Program Objectives and Student Outcomes

The power of what we know about teaching and learning is in the synergy that results when research findings are collected into a coherent whole—into a research-based framework (RBF) for teaching science Reflecting this, the M.A.T. program is directed towards the creation and implementation of an RBF that includes and relates science education goals for students, congruent student actions, how students learn, how science content decision will be made, the character and role of science inquiry and writing activities, teacher behaviors and interaction patterns, and self-evaluation. The RBF created in C I 518, revised in C I 519, and the accompanying oral defenses in both courses will assess Outcome Categories 1, 2 and 3. Lesson planning assignments in C I 518, C I 519 and C I 547 will further assess students' competence in Outcome Categories 1, 2 and 3 including incorporating the nature of science seamlessly in science lesson planning.

During field experiences the self-reflection required of preservice teachers, the extensive supervision reports generated, and feedback from the cooperating teacher will provide extensive evidence regarding Outcome Categories 1–5. Practicum students will be required to audiotape a minimum number of lessons and turn in quantitative and qualitative assessments of their behaviors, interaction patterns, and decision-making. During student teacher supervision, the preservice teacher wears a cordless microphone while the supervisor sits in the room with headphones on typing into a word processor the actions and interactive patterns exhibited by the student teacher. In addition, the action research required as part of C I 546, along with the creative component, will provide further evidence of student achievement in regards to each Outcome category.

Finally, efforts are already underway to initiate research that will follow M.A.T. students longitudinally to determine the program's effectiveness at preparing effective science teachers who will remain in the field. The results of this research, along with evidence from the above sources, will be available when completing the Regents Post-Audit Review, but more importantly will inform the larger community of science teacher education and general teacher education.

STATE REQUIREMENTS FOR SECONDARY TEACHING LICENSE

(1) Baccalaureate degree from a regionally accredited institution

	Undergraduate Course(s) for Demonstrating Competencies	M.A.T. Course(s) for Demonstrating Competencies
(2) Human relations component	C I 406 Mulitcultural Gender Fair Education (3 cr.)	C I 506 Multicultural Gender Fair Education in Curriculum Development & Instruction (3 cr.)
(3) Exceptional learner program	SpED 250 Education of the Exceptional Learner in a Diverse Society (3 cr.)	SpED 501 Teaching Students with Disabilities in General Education (3 Cr.)
(4) Professional Core		
a. Student learning	C I 333 Educational Psychology (3 cr.) C I 280 M Pre-Student Teaching Experience – Secondary Science (2 cr.)	C I 533 Educational Psychology of Learning, Cognition, and Motivation (3 cr.) C I 514 Introduction to the Complexities of Learning and Teaching Science (2 cr.)
b. Diverse learners	C I 406 and SpED 250	C I 506 and SpED 501X
c. Instructional planning	C I 418 Science Methods I (2 cr.) C I 419 Science Methods II (2 cr.) C I 347 NOS & Science Education (3 cr.)	C I 518 Science Methods I (2 cr.) C I 519 Science Methods II (2 cr.) C I 546 Advanced Pedagogy in Sci. Ed. (3 cr.) C I 547 NOS & Science Education (3 cr.)
d. Instructional strategies	C I 418, C I 419, and C I 347	C I 518, C I 519, C I 546, and C I 547
e. Learning environment/ classroom management	C I 418 and C I 419	C I 518, C I 519, and C I 546
f. Communication	C I 280L, C I 418, C I 419, C I 468J and C I 468K	C I 514, C I 518, C I 519, C I 546, and C I 591D
g. Assessment	C I 419	C I 519, C I 546, C I 599C
h. Foundations, reflection and professional development	HPC 204 Social Foundations of American Education (3 cr.) C I 280M	HPC 504 Studies in the Foundations of American Education (3 cr.) C I 514, C I 599C
i. Collaboration, ethics and relationships	SpED 250, C I 406, C I 419	SpED 501, C I 506, C I 519, C I 546
j. Computer technology related to instruction	C I 201 Introduction to Instructional Technology (2 cr.)	C I 505 Introduction to Using Technology in Learning and Teaching (2 cr.)
k. Prestudent teaching field-based experiences	C I 280L (0.5 cr.) C I 468J (2 cr.) C I 468K (2 cr.)	C I 514 C I 591 (4 cr.)
l. Methods of teaching with an emphasis on the subject area and grade level endorsement desired	C I 280M C I 418 C I 419	C I 514 C I 518 C I 519 C I 546 C I 547
m. Student teaching in the subject area and grade level endorsement desired	CI/LAS 417B, D or J Student Teaching (12 cr.)	C I 524S Student Teaching (12 cr.)
(5) Reading in content area (secondary)	C I 419	C I 519 and C I 546

(6) Content/subject matter specialization.

6. General Program Description

The proposed program plugs into both the recently approved College of Education Curriculum & Instruction department graduate level licensure component and the already existing science teacher preparation program. Hence, only the courses underlined need to be created or dual listed.

Semester	Pedagogy	Field Experience	Licensure	Masters	Credits
Summer I	**C I 514** (2 cr.)[1]		C I 533 (3 cr.) (psych) SpED 501X (3 cr.) C I 506 (3 cr.) (multicultural)		11
Fall	**C I 518** (2 cr.)[2]	C I 591D (2 cr.)[4] (supervised field exp.)	HPC 504X (3 cr.)	C I 547 (3 cr.) (Nature of Science and Science Education)	10
Spring	**C I 519** (2 cr.)[3]	C I 591D (2 cr.)[4] **C I 524S** (12 cr.)[5]			16
Summer II	C I 546 (3 cr.) (Adv. Pedagogy)		C I 505 (2 cr.) (tech.)	C I 599C (3 cr.) (creative comp)	8
Total credits	9	16	14	6	**45**

[1] C I 514 will be a new course "Introduction to the Purposes and Complexities of Science Teaching."
[2] C I 518 will be dual-listed with C I 418 "Secondary Science Methods I" which already exists.
[3] C I 519 will be dual-listed with C I 419 "Secondary Science Methods II" which already exists.
[4] C I 591D "Supervised Field Experience" already exists.
[5] C I 524S (will be a new course corresponding to ArtEd 518: Art Ed. Secondary Student Teaching).