



## University of Alaska Board of Regents Program Approval Summary Form

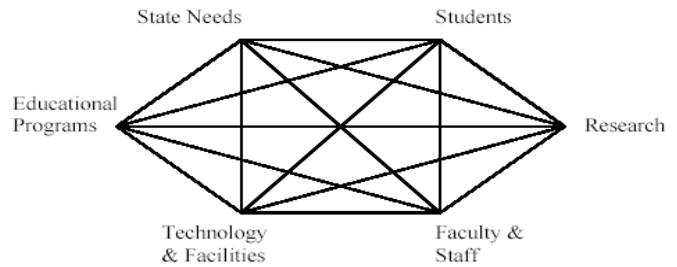
### Requirements:

1. 2 pages or less
2. Must be a stand-alone document

**MAU:** UAS

**Title:** Master of Education  
in Mathematics Education

**Target Admission Date:** Summer 2008



The Master of Education Program in Mathematics Education is an advanced degree program designed for certified K-8 teachers. The objective of this degree is to increase teacher understanding of mathematics pedagogy, strengthen the knowledge base of mathematics content, and develop specialists in mathematics education. This degree will create more opportunities for mathematics enrichment statewide, and will therefore help school districts better meet the acute need for improved mathematics education.

### **How does the program relate to the education mission of the University of Alaska?**

The M.Ed. in Mathematics Education supports the UA and UAS missions to inspire learning and student achievement through teaching and access to high-quality academic programs. The program also supports the UA and UAS strategic plan goals for student success, educational quality, and responsiveness to state needs, in particular, the federal No Child Left Behind guidelines.

The degree also supports the UAS strategic plan goal of assisting current teacher education practitioners to make progress toward their professional development goals and directly addresses the UA goal to develop new and relevant programs that expand the range of degree programs and opportunities through distance delivery.

### **What state needs are met by this program'?**

The M.Ed. in Mathematics Education degree supports the UA and UAS mission of responding to state workforce needs for highly qualified mathematics teachers to meet federal No Child Left Behind guidelines.

### **What are the student opportunities and outcomes? Enrollment projections?**

The M.Ed. in Mathematics Education will give certified K-8 teachers opportunities to expand their understanding of mathematics pedagogy and content and an avenue to attain Highly Qualified status. It also increases the number of mathematics education leaders and specialists across the state and provides them with career ladder and professional opportunities beyond the classroom.

The program's emphasis on the application of mathematics to local communities and cultures will help K-8 students see the connections between mathematics and real-life situations and assist Alaska schools to become more culturally responsive. Improving the

teaching of mathematics in the state of Alaska will give teachers the ability to better help their students reach the Grade Level Expectations put forth by the Alaska Department of Education and Early Development.

Currently there are 23 active teachers in the graduate certificate in Mathematics Education at UAS. In the past two years, 12 to 14 new teachers have enrolled. It is expected this trend will continue. The first graduates in the M. Ed. in Mathematics Education are expected by the spring semester of 2009. Four to six will graduate with the M. Ed. in Mathematics Education each year.

**Describe research opportunities.**

Research opportunities for K-8 teachers and UAS faculty will be enhanced as a result of the M.Ed. in Mathematics Education program. The program is designed to develop teacher-leaders who may pursue research in the development and teaching of mathematics lessons that are tied to their local communities through real-life problems and applications. A strong national interest in this subject provides many opportunities for graduates of the M.Ed. in Mathematics Education to share their research, lessons, and assessments through state, regional, and national conferences and publications.

**Describe fiscal plan for development and implementation:**

No major additional costs are projected for implementing the M.Ed. in Mathematics Education degree since this is an extension to the current UAS graduate certificate in Mathematics Education. The Mathematics Education major joins the family of UAS M.Ed. degrees in Reading, Educational Technology, Early Childhood Education, and Special Education.

## **New Degree or Certificate Program Proposal: Master of Education in Mathematics Education (UAS)**

### **1. Degree or Certificate Title, University or Community College Unit Responsible For Program**

Master of Education in Mathematics Education (UAS)

### **2. Educational Objectives and Rationale for the New Program**

Mathematics instruction is a high needs area for the nation and the state of Alaska. No graduate level master's degree program in Mathematics Education exists in Alaska. The proposed UAS Master of Education Program in Mathematics Education is an advanced degree program designed for certified K-8 teachers. The objective of this degree is to increase teacher understanding of mathematics pedagogy, strengthen the knowledge base of mathematics content, and develop specialists in mathematics education. This degree will create more opportunities for mathematics enrichment statewide, and will therefore help school districts better meet the acute need for improved mathematics education.

Successful completion of the M.Ed. in Mathematics Education will prepare teachers of middle school mathematics to take the middle school PRAXIS II math test. Passing this test will meet the state of Alaska requirements for a highly qualified (HQ) middle school math teacher. Achieving HQ status will help districts retain their mathematics teachers.

The M.Ed. in Mathematics Education degree builds on UAS' current graduate certificate in Mathematics Education and adds to the family of Masters of Education degree offerings available to UAS students statewide. The curriculum meets the standards set by the National Council of Teachers of Mathematics. It is also aligned to the Math Content and Performance Standards for Alaska Students, the Alaska Department of Education and Early Development Grade Level Expectations, and the Alaska Standards for Culturally Responsive Schools.

### **3. Relevance to the University or Community College Mission, Goals, and Objectives**

The M.Ed. in Mathematics Education degree supports the UA and UAS mission of responding to state workforce needs for highly qualified mathematics teachers to meet federal No Child Left Behind guidelines. The degree supports the UAS strategic plan goal of assisting current teacher education practitioners to make progress toward their professional development goals. It also directly addresses the UA goal to develop new and relevant programs that expand the range of degree programs and opportunities to deliver graduate training through distance delivery.

#### **4. Collaboration with Other Universities and Community Colleges within the University of Alaska**

Currently there are no master's degree programs in Mathematics Education in Alaska. UAS SOE will collaborate with the other universities within the UA system to coordinate courses so that, whenever similar programs are developed at UAA or UAF, students will experience an ease of transfer between programs. The faculty at UAS will also work closely with UAA faculty to ensure that appropriate achievement of standards by M.Ed. in Mathematics Education students and to share expertise and knowledge.

Additionally, because most of the courses in the program are taught distance, it is expected that as demand increases, faculty with appropriate expertise at the other MAUs will be approached to teach courses within the program.

#### **5. If at the Graduate Level, Identification of Other Universities in the WICHE Region Which Offer Similar Programs and an Explanation Why it is Necessary to Provide a Similar Offering in Alaska**

Many other universities offer a M.Ed. in Mathematics Education, however, no such degree program is offered within the state of Alaska.

The proposed M.Ed. in Mathematics Education is similar to programs offered at Boise State University, Montana State University (Bozeman), Oregon State University (Eugene), and the University of Washington. Typically the programs emphasize the preparation of teachers for leadership roles in mathematics education. All contain a research component. All emphasize the understanding of mathematics and the teaching and learning of that content. Content areas in some, if not all, of these programs include: algebra, geometry, problem solving, probability, and calculus concepts. The incorporation of pedagogy into content courses is emphasized in these programs, as is the use technology to teach mathematics. All include a capstone project of some form. The two universities with an M. Ed. in Mathematics Education do not require comprehensive exams, but the two with M. S. in Mathematics Education do.

#### **6. Demand For Program, Relation to State of Alaska Long-Range Development, Relation to Other Programs in the University of Alaska that may Depend on or Interact with the Proposed Program**

The proposed M.Ed. in Mathematics Education program will help meet the demand for mathematics education leaders and teachers in the state of Alaska. For example, it will meet the need for highly qualified middle school math teachers in Alaska by providing content knowledge in mathematics to help teachers of middle school math prepare to take the PRAXIS II test in middle school mathematics. Passing this test, teachers will help the state of Alaska meet federal No Child Left Behind requirements for highly qualified teachers of mathematics.

The proposed program will also meet the demand for knowledgeable K-8 mathematics teachers who understand how mathematics connects through the application of real-life problem situations. Research on applications of mathematics to local, real-life situations has shown that they strengthen student understanding of mathematics. Therefore, it is reasonable to conclude that the M. Ed. in Mathematics Education will also have a positive affect on student success in Alaska state mathematics examinations.

## **7. Outline of Schedule for Implementation of the Program**

Spring 2008: With approval from the UA Board of Regents the Master of Education Mathematics Education program will be added to the AY 2008-09 UAS Catalog.

Summer 2008: Teachers currently in the Mathematics Education Certificate (MEC) program will be encouraged to apply to the M.Ed. in Mathematics Education program. ED 658 will be offered for the first time, possibly as a summer institute on the UAS campus.

Spring 2009: Teachers enrolled in the MEC program are expected to complete the requirements and, be the first graduates of the M.Ed. in Mathematics Education.

## **8. Projection of Enrollments (FTE (full-time equivalent) and headcount) and Graduates Over Next Five Years**

Currently there are 23 active teachers in the graduate certificate in Mathematics Education at UAS. In the past two years, 12 to 14 new teachers have enrolled. It is expected this trend will continue. The first graduates in the M. Ed. in Mathematics Education are expected by the spring semester of 2009. Four to six will graduate with the M. Ed. in Mathematics Education each year.

## **9. Availability and Quality/or Requirement for New Faculty and/or Staff to Support the Program**

Because the proposed M.Ed. in Mathematics Education is an expansion of UAS' existing graduate certificate in Mathematics Education program, no additional faculty resources will be needed.

#### **10. Library, Equipment, and Similar Resource Requirement, Availability, Appropriateness, and Quality**

The M.Ed. in Mathematics Education will use existing library resources, including serials, books, online databases, and other electronic media. The technology services and facilities currently at UAS are also sufficient to support the distance teaching requirements of the program. No additional resources are required to support the requirements of the M. Ed. in Mathematics Education program.

#### **11. New Facility or Renovated Space Requirements**

No new or renovated facilities are required to implement the M.Ed. in Mathematics Education program.

#### **12. Projected Cost of Items 9, 10, and 11 and Budgetary Plan For Acquiring Resources**

No major additional costs are projected for implementing the M.Ed. in Mathematics Education degree program. Some adjunct faculty may be hired, as needed.

#### **13. Consultant Reviews, Reports from Visitations to Other Institutions, or Names and Opinions of Personnel Consulted in Preparing the Proposal**

Programs from a variety of institutions were studied and the relevant ideas, concepts, and standards were gleaned for inclusion in this program. Also, faculty from a variety of specialties in the School of Education provided input into the curriculum and outcomes assessment for this degree.

#### **14. Concurrence of Appropriate Advisory Councils**

In August 2007 the faculty of the UAS School of Education, with the approval of the dean, approved forwarding the proposal to the UAS Graduate Curriculum Committee.

In September 2007 the Graduate Curriculum Committee approved the proposal.

In October 2007 the UAS Faculty Senate approved the proposal. The UAS Provost approved forwarding the proposal for SAC review and Board of Regents approval.

## **15. An Executive Summary of About One Page**

### **Master of Education in Mathematics Education**

The proposed Master of Education in Mathematics Education degree allows the UA system to fill a void in a high needs education area for the state of Alaska. It allows K-8 teachers to expand their understanding of mathematics pedagogy and content, and provides them an avenue to attain highly qualified status. It also increases the number of mathematics education leaders and specialists across the state.

The program's emphasis on the application of mathematics to local communities and cultures will help K-8 students see the connections between mathematics and real-life situations and assist Alaska schools to become more culturally responsive. Improving the teaching of mathematics in the state of Alaska will give teachers the ability to better help their students reach the Grade Level Expectations put forth by the Alaska Department of Education and Early Development.

The M.Ed. Program in Mathematics Education is an advanced degree program for certified teachers. It will consist of 36 graduate-level credits: 21 credits in mathematics content and pedagogy; 9 credits in classroom research, leadership, technology, and instructional design; 3 in a capstone master's degree portfolio course; and 3 credits elective in reading, special education, or mathematics pedagogy. It is a logical extension of the graduate certificate in Mathematics Education already in place at UAS. Students who obtain the UAS Graduate Certificate in Mathematics Education can expand their coursework to include the courses in the M. Ed. in Mathematics Education by completing the five additional required 3 credit graduate-level courses. The Mathematics Education major joins the family of UAS M. Ed. degrees in Reading, Educational Technology, Early Childhood Education, and Special Education.

## **Proposed Catalog Copy**

### **Admission Requirements**

Applicants must provide:

- A copy of a current teaching certificate;
- A completed graduate application;
- Official undergraduate/graduate transcripts with a minimum 3.0 GPA; and
- Two letters of recommendation

### **Program Completion**

To successfully graduate from this program, candidates must complete the following courses with a minimum GPA of 3.0 and complete the required professional portfolio.

### **Mathematics education course work:**

- ED S608 Mathematical Problem Solving: An Overview for K-8 Teachers (3)
- ED S614 Numeration and Operations: Math Content and Pedagogy for K-8 Teachers (3)
- ED S654 Algebra and Functions: Content and Pedagogy for K-8 Teachers (3)
- ED S655 Geometry and Measurement: Content and Pedagogy for K-8 Teachers (3)
- ED S656 Data Analysis, Statistics, and Probability: Content and Pedagogy for K-8 Teachers (3)
- ED S657 Concepts of Calculus and Trigonometry: Content and Pedagogy for K-8 Teachers (3)
- ED S658 Technology for Teaching and Learning Mathematics (3)

### **Additional education courses required:**

- ED S626 Classroom Research (Teacher Research) (3)
- ED S628 Technology in Instructional Design (3)
- ED S668 Educational Technology Leadership (3)
- ED S698 Masters Portfolio (3)

### **And one elective course from the following:**

- ED S616 Math Methods in the K-8 Classroom (3),
- ED S679 Reading and Literacy in the Content Areas (3)
- EDSE S682 Inclusive Education for Students with Disabilities (3)

## **Course Descriptions**

The first seven courses listed below (21 credits) are required for the Graduate Certificate in Mathematics Education. The five additional courses, four required and one elective (15 credits) must be completed for the M.Ed. in Mathematics Education.

## **Mathematics Education Certification Courses**

### **ED S608 Mathematical Problem Solving: An Overview for K-8 Teachers (3)**

Examines underlying concepts of problem solving. Identifies problem-solving strategies that can be introduced into K-8 classrooms. Instruction models appropriate teaching practices for K-8 classroom. Licensed teachers enrolled in this course will have practice developing instruction and assessment plans that are research and standards based and that support a curriculum that is organized around a problem-solving approach.

### **ED S614 Numeration and Operations: Math Content and Pedagogy for K-8 Teachers (3)**

Provides the content for K-8 teachers to understand numbers, the ways of representing numbers, relationships among numbers, number systems, meanings of operations and how they relate to one another. Current instructional and assessment practices in mathematics that are research and standards based and which lead to number sense, reasonable estimation strategies, and efficient computational skills for K-8 students will be emphasized. Course prerequisites, ED S608.

### **ED S654 Algebra and Functions: Content and Pedagogy for K-8 Teachers (3)**

Provides content for K-8 teachers to help them understand the underlying principles and concepts of algebra and functions. Emphasis is on building algebraic thinking through an examination of patterns, relationships, and functions. Multiple representations of functions using tables, graphs and verbal rules will be developed. Current instructional and assessment practices in mathematics that are research and standards based and that lead to algebraic reasoning for K-8 students will be examined. Course prerequisites: ED S608 and ED S614.

### **ED S655 Geometry and Measurement: Content and Pedagogy for K-8 Teachers (3)**

Provides content for K-8 teachers to help them understand and use the underlying principles of geometric and spatial sense and the levels of geometric learning. A variety of physical models, manipulatives, and software that can be used in K-8 classrooms will be examined and used. Current instructional and assessment practices in geometry that are research and standards based and that lead to visualization and spatial reasoning for K-8 students will be examined. Course prerequisites: ED S608 and ED S614.

### **ED S656 Data Analysis, Statistics, and Probability: Content and Pedagogy for K-8 Teachers (3)**

Provides content to help K-8 teachers understand the basic concepts data analysis, statistics and probability. Descriptive and inferential statistics will be used to analyze data, and make predictions and decisions. Experimental and theoretical probability will also be examined. Current research and standards based instructional and

assessment practices in the areas of collecting, displaying and analyzing data, and experimental and theoretical probability that lead to data analysis, inferential reasoning and real world applications for K-8 students will be examined. Course prerequisites: ED S608 and ED S614.

**ED S657 Concepts of Calculus and Trigonometry: Content and Pedagogy for K-8 Teachers (3)**

Examines the underlying concepts of calculus and trigonometry. K-8 teachers will connect the underlying concepts of calculus and trigonometry to the mathematical concepts in the typical K-8 math curriculum. Current instructional and assessment practices in mathematics that are research and standards based and which promote student understanding of the basic concepts on which trigonometry and calculus are founded are emphasized. Course prerequisites: ED S608 and ED S614.

**ED S698 Masters Project or Portfolio (3)**

Either a research paper or project approved by the student's graduate committee. The student research paper/project should coincide with the student's professional objectives. The portfolio should document the required knowledge and ability to apply the standards set by the conceptual framework of the UAS School of Education. Students creating a portfolio should request portfolio criteria from the School of Education or their graduate advisor. An oral defense of either the paper/ project or the portfolio may be required by the student's graduate committee.

**Additional Masters of Education in Mathematics Education Courses**

**ED S626 Classroom Research (Teacher Research) (3)**

Addresses the philosophy and methodology of ethnographic classroom research, the role of classroom research within the educational profession, and the reflective nature of such research. Students will learn methods of qualitative research and utilize them in classroom research. Prerequisite: current teaching certificate or permission.

**ED S628 Technology in Instructional Design (3)**

The focus of this course is to build on basic computing skills and their use within current educational practice of meaningful integration of technology into the classroom environment. Students will create a standards based instructional unit modeling appropriate uses of technology to support learning, develop a variety of techniques to use technology to assess student learning of subject matter, and research best practices related to applying appropriate technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.

**ED S658 Technology for Teaching and Learning Mathematics (3)**

Provides teachers with the knowledge and skills to apply technology to help students understand math content. The use and selection of technology to help meet local, state and national standards for the teaching and learning of math will be emphasized. Applications include: virtual manipulatives, calculators, spreadsheets, software tutors, web applications, modeling software, and GPS. Teachers will practice developing

instruction and assessment to integrate technology into a problem based constructivist mathematics curriculum.

**ED S668 Educational Technology Leadership (3)**

Provides a reflective overview of issues relating to school leadership policy and practice in the field of educational technology. Encompasses the wide range of responsibilities of the school technology leader as a collaborative member of a leadership team. Topics include organizational change, decision making, community partnerships, legal and ethical issues, coaching and mentoring, and teamwork. A web-based course; requires Internet and e-mail.

**Elective Course Options**

**ED S616 Math Methods in the K-8 Classroom (3),**

Philosophy, research, organization, methods and materials of an elementary math program. Emphasis on activities with large and small groups of students, using manipulatives to develop children's understanding of math concepts, processes and problem solving. Practicum in K-8 classroom required. Requires access to computer, Internet, e-mail. DVD, and audio conference. Prerequisite: Permission.

**ED S679 Reading and Literacy in the Content Areas (3)**

In this course students will learn reading strategies that support literacy in the content areas/disciplines. It will also focus on the inter-related processes of writing, reading, listening and speaking in the literacy development of students. Some emphasis will be given to the use of technology as a tool to enhance content area literacy. The role of teacher as researcher will also be explored.

**EDSE S682 Inclusive Education for Students with Disabilities (3)**

Survey of the philosophical, legal, and programmatic foundations of inclusion; characteristics of students with disabilities; and strategies to support students with special needs in inclusive classroom settings. Emphasizes the development, implementation, and evaluation of culturally responsive special education services in Alaska's remote, rural, and Native communities. Prerequisite: Permission. Requires Internet access.