

BOARD OF HIGHER EDUCATION
REQUEST FOR COMMITTEE AND BOARD ACTION

COMMITTEE: Academic Affairs

NO: AAC 14-29

COMMITTEE DATE: March 11, 2014

BOARD DATE: March 18, 2014

APPLICATION OF WORCESTER STATE UNIVERSITY TO AWARD THE BACHELOR OF SCIENCE IN MATHEMATICS FOR ELEMENTARY TEACHERS

MOVED: The Board of Higher Education hereby approves the application of **Worcester State University** to award the **Bachelor of Science in Mathematics for Elementary Teachers**.

Upon graduating the first class for these programs, the University shall submit to the Board a status report addressing its success in reaching program goals as stated in the application and in the areas of enrollment, curriculum, faculty resources, and program effectiveness.

Authority: Massachusetts General Laws Chapter 15A, Section 9(b)

Contact: Winnie Hagan, Ed.D., Director for Educator Policy

BOARD OF HIGHER EDUCATION

March 2014

Worcester State University Bachelor of Science in Mathematics for Elementary Teachers

INTENT AND MISSION

This proposed Bachelor of Science in Mathematics for Elementary Teachers (BS/MET) program is an interdisciplinary double major that prepares students to become licensed elementary mathematics teachers, with the competencies and experiences to become mathematics resource personnel in public schools. It provides evidence of Worcester State University's commitment to teacher preparation. The proposed BS/MET degree, meets the current requirement of two majors for the initial license in elementary education in Massachusetts. The goals of the proposed BS/MET require that students have a deep understanding of mathematics subject matter knowledge for grades 1-6, specialized pedagogical knowledge for teaching mathematics, and curricular knowledge to become leaders in schools. For each goal, student learning outcomes have been developed and were determined to support the professional needs of a well prepared competent elementary mathematics teacher.

The proposed program has obtained all necessary governance approvals on campus and was approved by the Worcester State University Board of Trustees on April 1, 2013. The required letter of intent was circulated on July 18, 2013. No comments were received.

NEED AND DEMAND

National and State Labor Market Outlook

Common Core State Standards and the PARCC initiative call for a better mathematically prepared citizenry. The National Math Panel, Conference Board of the Mathematical Sciences (CBMS), the Association of Mathematics Teacher Educators, the National Council on Teacher Quality (NCTQ), the National Council of Teachers of Mathematics (NCTM), the American Mathematics Society (AMS), and the Mathematics Association of America (MAA) have all been advocating for mathematics specialist in the elementary grades. The National Bureau of Labor Statistics projects that the need for elementary school teachers is projected to grow 12 percent from 2012 to 2022¹.

Student Demand

Professors who teach course *MA 130 - Number and Operations for Teachers*, identify elementary education students who distinguish themselves with academic and mathematical ability to pursue a mathematics degree. Each year Worcester State

¹ Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2014-15 Edition*, Kindergarten and Elementary School Teachers, on the Internet at <http://www.bls.gov/ooh/education-training-and-library/kindergarten-and-elementary-school-teachers.htm> (visited February 12, 2014).

University (WSU) offers this course to approximately 80 students. The mathematics faculty is confident that a cohort community of elementary education students could be recruited from education students who take this course as a requirement. Currently more than 10 students are aware of the proposed program and will enroll once approved. It is expected that as the program becomes more well known at WSU more students will enroll. A survey to determine interest in the major was given to 94 Education and Mathematics majors indicating 60 students are interested in the program. A survey of 200 WSU Elementary Education alumni indicated the need for an Elementary Mathematics education program. In addition, superintendents from Worcester and 5 surrounding school districts provided letters that explicitly state the need for elementary teachers with stronger mathematics backgrounds.

OVERVIEW OF PROPOSED PROGRAM

Changes in math curriculum and new subject matter testing prompted the Math department leadership to support teacher preparation in mathematics. Several additional courses have been jointly developed, which has added substantial math offerings for elementary education majors. This proposed program has been designed to run jointly in the education and mathematics departments, and will be housed in the Mathematics Department.

Duplication

WSU notes that no other program in the Commonwealth of Massachusetts offers a similar program.

ACADEMIC AND RELATED MATTERS

Admission

It is planned that students will be admitted to the proposed program under the current requirements of Worcester State University. This includes a high school GPA of 2.7 or greater, SAT of 1000 or greater and required course work. Transfer students with an elementary and/or mathematics background will receive transfer credit providing the content knowledge is comparable. WSU has an articulated transfer agreement with Quinsigamond Community College.

Program Enrollment Projection

	# of Students Year 1	# of Students Year 2	# of Students Year 3	# of Students Year 4*
New Full Time	10	10	10	10
Continuing Full Time	0	7	14	21
New Part Time	3	3	3	4
Continuing Part Time	0	0	0	0
Totals	13	20	27	35

Curriculum (Attachment A)

The curriculum for the proposed program is designed to develop teachers who will substantially improve the way mathematics is taught and learned in the elementary grades. It is planned that this will be achieved by providing more mathematically educated teachers with a stronger pedagogical content base.

Field Resources and Internship

The proposed program will provide students with mentors from Professional Development Schools², to serve as models during their pre-practicum experiences during their first three years of study. Field learning experiences will be embedded in courses and will progress from observation requirements to supervised fieldwork, to the capstone experience. It is planned that students will be paired with an elementary mathematics teacher and that clinical faculty will ensure placement with mentors that can provide a rich and meaningful experience over a period of fifteen weeks. The capstone experience is Student Teaching. Students in the proposed degree program will perform their practicum experience with cooperating teachers who will assign all mathematics teaching to them. The Student Teaching Seminar co-requisite is designed to include weekly sessions that will serve as a time for reflection and support.

RESOURCES AND BUDGET

Fiscal (Attachment B)

Costs

The costs for implementing the proposed program are expected to be minimal since there are already teaching faculty from both the Mathematics and Education departments. A

² Worcester State University operates five Professional Development Schools in the Worcester Public Schools. These schools sites are utilized for pre-practicum and practicum experiences. WPS and WSU developed a Clinical Professor Partnership Program that allows for an Elementary school teacher to assume faculty membership in the Education department with the responsibility of finding appropriate placements for elementary students during their pre-practicum and practicum experiences.

graduate assistant is needed to provide support for the students in this program. Purchasing journals and materials to strengthen the pedagogical instruction, and advertising to sister institutions are expected to present additional costs. In year two it is anticipated that a faculty line would become available as a joint appointment in mathematics and education will be activated to replace a current vacant faculty position.

Faculty and Administration (Attachment C)

It is expected that the courses for this major will utilize current faculty in the education and mathematics departments. The teaching faculty members for the proposed program are reported to be highly competent in content and pedagogical knowledge. The program leader has acted as a joint member of both the math and education department for fifteen years, currently serving as Associate Dean of Education, and regularly teaching a mathematics class to elementary education students. Other faculty members are leading engagements with their counterparts across the state to increase mathematics course requirements for elementary education.

Facilities, Library and Information Technologies

The education department has plans for a curriculum library as part of its long range plan. Designated space for curriculum material related to Common Core State Standards, National Council of Teachers of Mathematics resources, and other materials that have the potential of impacting student's academic and professional life, are included as are many Mathematics Education journals and periodicals, and a wide selection of K-16 mathematics curricula. Among the Center's library holdings are over a thousand books covering areas of Mathematics Education.

Affiliations and Partnerships

Worcester State University operates five Professional Development Schools in the Worcester Public Schools. These schools sites are utilized for pre-practicum and practicum experiences. WPS and WSU developed a Clinical Professor Partnership Program that allows for an Elementary school teacher to assume faculty membership in the Education department with the responsibility of finding appropriate placements for elementary students during their pre-practicum and practicum experiences. Through the Education Advisory Committee, WSU maintains partnership with Worcester, Auburn, Leicester, Dudley Charlton, Sutton, and Southbridge public schools. The superintendents from these school systems are members of the Advisory Committee. The mathematics department has recently formulated a Mathematics Advisory Committee consisting of individuals from external organizations who are knowledgeable of mathematics education issues. These partnerships and affiliations will help guide the program toward its established goals and challenge it to remain competitive and relevant.

Program Effectiveness

Goal	Measurable Objective	Strategy for Achievement	Timetable
Students have a “deep” understanding of the mathematics subject matter knowledge for grades 1 – 6, and specialized mathematics knowledge for teaching.	Passing rate of 75% on MTEL 053.	Upon successful completion of upper level math courses, students will take an MTEL exam preparation class based on Professors’ knowledge of test objectives	Year 4
Students will acquire strong ability to communicate mathematical ideas through using written and verbal strategies.	Students will complete open response questions for assessment purposes as part of their final exams in MA130, MA200 and MA201. 75% of students will achieve a score of 3 or above on a rubric.	<ol style="list-style-type: none"> 1. Professors will model mathematical communication skills in lecture and notes. Students will have multiple opportunities to build mathematical communication skills through the completion of homework, quiz and test problems. 2. Education course work will support the assessing of mathematical communication skills using a rubric. 	Year 1, 2, 3
Students will be prepared to enter elementary school teaching positions and further their education in graduate school.	Place 70% of graduates from this program in elementary education positions	Program coordinator will network with schools & Ed Dept Advisory Committee	Year 5

EXTERNAL REVIEW AND INSTITUTIONAL RESPONSE

The proposed program was reviewed by Debra Borkovitz, Ph.D., Associate Professor of Mathematics at Wheelock College in Boston MA and Linda Dacey, Ph.D., Professor of Education / Mathematics at Lesley University in Cambridge MA. Both reviewers recommended the program for approval. The reviewers found the proposed program to be responsive to the national call for better math teachers at the elementary level. They also found the proposal to have a strong teaching component with no adjuncts and all tenure track faculty teaching mathematics. The reviewers noted that the sequence of courses and attention to elementary education from the math department to be a significant strength of the program. The reviewers remarked that the major represents an important and emerging field, and that school systems would be likely to find graduates desirable hires. They commended the important interdisciplinary efforts of the two departments in creating the proposal.

There was concern expressed that the calculus sequence “is a notoriously leaky pipeline” which could serve as a significant barrier, especially for low income students who may have gone to under-resourced schools and are under-represented in the teaching profession. The external review indicated that there was not enough geometry included in the curriculum and suggested that WSU consider ways to increase the amount of geometry provided to students. It was also suggested by the reviewers that mathematic practices for teaching math be emphasized at least commensurate with content knowledge.

The institution responded that there will be multiple tiers for pre-calculus and calculus placements for students and that more opportunities would be made available for students to take upper level mathematics instead of calculus in order to provide a gateway and not a barrier. The institution agreed with the perception that there was not enough geometry and further emphasized the geometry content in 6 of the courses offered, providing examples of how geometry is embedded throughout the curriculum. WSU modified the proposed program objectives and goals to accommodate and incorporate standards for mathematics practice for teaching math. The modifications demonstrate the processes and methods needed to do math and a shift toward a focus on student understanding.

STAFF ANALYSIS AND RECOMMENDATION

Staff thoroughly reviewed all documentation submitted by Worcester State **University** and external reviewers. Staff recommendation is for approval of the proposed **Bachelor of Science in Mathematics for Elementary Teachers**.

ATTACHMENT A: CURRICULUM OUTLINE

Required (Core) Courses in the Major (Total # courses required = 12)		
<i>Course Number</i>	<i>Course Title</i>	<i>Credit Hours</i>
MA 130	Number and Operations for Teachers (also required for Elementary Education major – below)	3
MA 131	Patterns, Functions & Algebra for Teachers	3
MA 132	Geometry, Measurement, Statistics & Probability for Teachers	3
MA 190	Precalculus	4
MA 200	Calculus I	4
MA 201	Calculus II	4
MA 240	Theory of Proof	3
MA 360	Number Theory	3
MA 303	Mathematical Modeling	3
MA 302	Probability and Statistics	3
ED 425	Seminar: Applying Educational Principles (Ancillary Requirement)	3
ED 435	Student Teacher in the Elementary School (Ancillary Requirement)	9
	Sub Total Required Credits	45
Additional Required (Core) Courses in the Education Major – an ancillary requirement for the Math for Elementary Education 1 – 6 major (Total # courses required = 9)		
ED148	Foundations of Reading	3
ED 155	Teaching and Learning in the Elementary	3
ED 250	Educational Psychology	3
ED 275	Curriculum and Instruction in Elementary	3
ED 200	Best Practices for English Language Learners	3
ED 320	Elementary Science	3
ED 325	Mathematics for Elementary School Educators	3
ED 330	Elementary Social Studies and Multiculturalism	3
ED 343	Elementary Reading, Language Arts and Literature	6
	Sub Total Required Credits	30
Elective Courses (Total # courses required = 1) (attach list of choices if needed)		
	No required upper level mathematics electives, however students can choose any one of the following upper level math courses to satisfy their free elective: MA340 Modern Geometry, MA380 Probability Theory,	3

	MA290 Discrete Mathematics II	
	Sub Total Elective Credits	3
Addition Distribution of General Education Requirements		# of Gen Ed Credits
Attach List of General Education Offerings (Course Numbers, Titles, and Credits) (Total # courses required = 14) <i>note: some of the math and education courses listed above fulfill one or more general education requirements. Below are the additional courses required to complete the general education program and degree</i>		
Writing (two courses)		6
Constitutions		3
First Year Seminar		3
Quantitative Reasoning		3
Natural Systems and Processes (two courses)		7
Unites States and its Role in the World		3
Global Perspectives		3
Human Behavior & Social Processes		3
Individual and Community Well-being		3
Creative Arts		3
Writing Across the Curriculum		3
Thought Language and Culture		3
Sub Total General Education Credits		43
Curriculum Summary		
Total number of courses required for the degree		36
Total credit hours required for degree		121
Prerequisite, Concentration or Other Requirements: Students must be Elementary Majors		

ATTACHMENT B: BUDGET

One Time/ Start Up Costs	Cost Categories	Annual Expenses			
		Year 1	Year 2	Year 3	Year 4
	Full Time Faculty (Salary & Fringe)		\$60,000	\$63,000	\$65,000
	Part Time/Adjunct Faculty (Salary & Fringe)				
	Staff (Grad Assistant)	\$14,500	\$14,000	\$12,500	\$12,500
	General Administrative Costs				
	Instructional Materials, Library Acquisitions	\$2,500	\$2,500	\$2,500	\$2,500
	Facilities/Space/Equipment				
	Field & Clinical Resources				\$10,000
	Marketing	\$2,000	\$1,500	\$1,000	
	Other (Specify)				
	TOTALS	\$19,000	\$78,000	\$79,000	\$90,000

One Time/Start-Up Support	Revenue Sources	Annual Income			
		Year 1	Year 2	Year 3	Year 4
	Grants	\$0	\$0	\$0	\$0
	Tuition	\$13,000	\$20,000	\$27,000	\$35,000
	Fees	\$91,442	140,680	\$189,918	\$246,190
	Departmental	\$0	\$0	\$0	\$0
	Reallocated Funds	\$0	\$0	\$0	\$0
	Other (Health, Activity, Capital Improvement)	\$7,800	\$12,000	\$16,200	\$21,000
	TOTALS	\$112,242	\$172,000	\$233,118	\$302,190

Summary of Faculty Who Will Teach in Proposed Program

Please list full-time faculty first, alphabetically by last name. Add additional rows as necessary.

Name of faculty member (Name, Degree and Field, Title)	Check if Tenured	Courses Taught Put (C) to indicate core course. Put (OL) next to any course currently taught online.	Number of sections	Division of College of Employment	Full- or Part-time in Program	Full- or part-time in other department or program (Please specify)	Sites where individual will teach program courses
Bebas, Christina Ed.D, Assistant Professor		• ED 275 (C)	(3)	Day	Full-time	No	• Main Campus
Bisk, Richard Ph.D. in Mathematics Professor	<input checked="" type="checkbox"/>	• MA 130 (C) • MA 131 (C) • MA132 (C) • MA 200 (C) • MA 303 (C)	(3) (3) (3) (4) (3)	Day	Full-time	No	• Main Campus
Bouchard, Margaret, Ed.D	<input checked="" type="checkbox"/>	• ED 343 (C) • ED 148 (C)	(3) (3)	Day	Full-time	No	• Main Campus
Foley, Denise		• ED 250 (C)	(3)	Day	Full-time	No	• Main Campus
Fowler, Mary Ph. D. in Statistics Associate Professor		• MA 130 (C) • MA 132(C) • MA 302	(3) (3) (3)	Day	Full-time	No	• Main Campus
Fung, Maria PhD in Mathematics Associate Professor	<input checked="" type="checkbox"/>	• MA 130 (C) • MA 131 (C) • MA 132(C) • MA 190 (C) • MA 200 (C) • MA 201 (C)	(3) (3) (3) (4) (4) (4)	Day	Full-time	No	• Main Campus

		<ul style="list-style-type: none"> • MA 240 (C) • MA 360 (C) 	(3) (3)				
Ginkus-Allen, Jean Ed.D	<input type="checkbox"/>	• ED 325 (C)	(3)	Day	Part-time	Yes, Education	• Main Campus
Ginsberg, Hy PhD in Mathematics Assistant Professor	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> • MA 190 (C) • MA 200 (C) • MA 201 (C) • MA 240 (C) • MA 360 (C) 	(4) (4) (4) (3) (3)	Day	Full-time	No	• Main Campus
Hollander, Pamela Ed.D Assistant Professor		<ul style="list-style-type: none"> • ED 148 (C) • ED 200 (C) 	(3) (3)	Day	Full-time	No	• Main Campus
Lewis, Raynold Ph.D. in Mathematics Ed Professor	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> • MA 130 (C) • MA 131 (C) • MA 132 (C) • ED 325 (C) 	(3) (3) (3) (3)	Day	Full-time	Yes, Education	• Main Campus
Schmoyer, Susan PhD in Mathematics Assistant Professor	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> • MA 190 (C) • MA 200 (C) • MA 201 (C) • MA 240 (C) • MA 360 (C) 	(4) (4) (4) (3) (3)	Day	Full-time	No	• Main Campus
To, Hansen	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> • MA 190 (C) • MA 200 (C) • MA 201 (C) • MA 240 (C) 	(4) (4) (4) (3)	Day	Full-time	No	• Main Campus
Winders, Michael Ph.D. in Mathematics Assistant Professor	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> • MA 130 (C) • MA 131 (C) • MA 132(C) MA 190 (C) • MA 200 (C) • MA 201 (C) • MA 240 (C) • MA 360 (C) 	(3) (3) (3) (4) (4) (4) (3) (3)	Day	Full-time	No	• Main Campus
Young, Sara, Ed.D Professor	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> • ED 155 (C) • ED 275 (C) 	(3) (3)	Day Day	Full-time	No	• Main Campus
Wright, Audrey Ed.D Professor	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> • ED 155 (C) • ED 275 (C) 	(3) (3)	Day Day	Full-time	No	• Main Campus

