

NOV 14 2012

OFFICE OF THE
SENATE COUNCIL

Cover Page for STEM PLUS Undergraduate Program Change

This past Spring 2012, the new STEM PLUS undergraduate degree program was approved by the University and CPE for the areas of mathematics and physics. This program allows future secondary (grades 8-12) to attain initial certification by earning a Bachelors of Science in Education with a double major in STEM Education and their content major (i.e., mathematics, physics, chemistry, earth science, computer science) with secondary teaching certification (grades 8-12) in one or more state-certifiable STEM subjects in just 4 years (120-126 credit hours).

This program change addresses changes to the STEM Education, mathematics and physics majors and adds the additional major areas of chemistry, earth science, and computer science.

An undergraduate certification option for secondary mathematics, science, or computer science students did not exist prior to STEM PLUS. This degree program and major will allow for greater flexibility and multiple pathways towards becoming a mathematics, science, and/or computer science teacher.

An overview of the changes include:

STEM Education major – addition of the distance learning assessment course (SEM 423) as a required course to be concurrently taken during student teaching

Mathematics major – aligning the major with the recent mathematics major changes in the College of Arts & Sciences

Physics major – addition of PHY 460, a inquiry based laboratory course specific for secondary teachers

Chemistry, Computer Science, and Earth Science – addition of the major curricula for these three majors equivalent to the major requirements in their respective departments/colleges.

CHANGE UNDERGRADUATE PROGRAM FORM

1. General Information

College: <u>Education</u>		Department: <u>STEM Education</u>	
Current Major Name: <u>STEM Education and <content area> (Mathematics, Physics)</u>	Proposed Major Name: <u>STEM Education and <content area> (Mathematics, Physics, Chemistry, Earth Science, Computer Science)</u>		
Current Degree Title: <u>Bachelor of Science</u>	Proposed Degree Title: _____		
Formal Option(s): _____	Proposed Formal Option(s): _____		
Specialty Field w/in Formal Option: _____	Proposed Specialty Field w/in Formal Options: _____		
Date of Contact with Associate Provost for Academic Administration ¹ : <u>Fall 2009; March 2011</u>			
Bulletin (yr & pgs): _____	CIP Code ¹ : <u>13.1399</u>	Today's Date: <u>April 9, 2012</u>	
Accrediting Agency (if applicable): <u>National Council of Accreditation of Teacher Education (NCATE)</u>			
Requested Effective Date: <input checked="" type="checkbox"/> Semester following approval. OR <input type="checkbox"/> Specific Date ² : _____			
Dept. Contact Person: <u>Margaret Mohr-Schroeder</u>	Phone: <u>257-3073</u>	Email: <u>m.mohr@uky.edu</u>	

2. General Education Curriculum for this Program:

The new General Education curriculum is comprised of the equivalent of 30 credit hours of course work. There are, however, some courses that exceed 3 credits & this would result in more than 30 credits in some majors.

- There is no foreign language requirement for the new Gen Ed curriculum.
- There is no General Education Electives requirement.

Please list the courses/credit hours currently used to fulfill the University Studies/General Education curriculum:
MA 113 or MA 137; STA 210; PSY 100; EPE 301

Please identify below the suggested courses/credit hours to fulfill the General Education curriculum.

General Education Area	Course	Credit Hrs
I. Intellectual Inquiry (one course in each area)		
Arts and Creativity	_____	_____
Humanities	↓	_____
Social Sciences	<u>PSY 100</u>	<u>4</u>
Natural/Physical/Mathematical	_____	_____
II. Composition and Communication		
Composition and Communication I	✓ CIS or WRD 110	3
Composition and Communication II	✓ CIS or WRD 111	3
III. Quantitative Reasoning (one course in each area)		

¹ Prior to filling out this form, you MUST contact the Associate Provost for Academic Administration (APAA). If you do not know the CIP code, the APAA can provide you with the correct code for the semester following approval. No program will be made effective until all approvals are received.

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Quantitative Foundations ³	<u>MA 113 or MA 137</u>	<u>4</u>
Statistical Inferential Reasoning	<u>STA 210</u>	<u>3</u>
IV. Citizenship (one course in each area)		
Community, Culture and Citizenship in the USA	<u>EPE 301</u>	<u>3</u>
Global Dynamics		
Total General Education Hours		<u>31</u>

3. Explain whether the proposed changes to the program (as described in sections 4 to 12) involve courses offered by another department/program. **Routing Signature Log must include approval by faculty of additional department(s).**

The changes proposed include the following departments: Mathematics, Chemistry, Physics, and Computer Science.

4. Explain how satisfaction of the University Graduation Writing Requirement will be changed.

<p>Current</p> <p><input checked="" type="checkbox"/> Standard University course offering. List: <u>any approved university writing course</u></p> <p><input checked="" type="checkbox"/> Specific course – list: <u>EPE 301 or MA 330</u></p>	<p>Proposed</p> <p><input type="checkbox"/> Standard University course offering. List: _____</p> <p><input type="checkbox"/> Specific course) – list: _____</p>
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5. List any changes to college-level requirements that must be satisfied.

<p>Current</p> <p><input checked="" type="checkbox"/> Standard college requirement. List: _____</p> <p><input type="checkbox"/> Specific required course – list: _____</p>	<p>Proposed</p> <p><input type="checkbox"/> Standard college requirement. List: _____</p> <p><input type="checkbox"/> Specific course – list: _____</p>
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6. List pre-major or pre-professional course requirements that will change, including credit hours.

<p>Current</p> <p><u>SEM 110, 2 hours</u></p> <p><u>EDP 202, 3 hours</u></p> <p><u>MA 113 or 137, 4 hours</u></p> <p><u>STA 210, 3 hours</u></p> <p><u>MA 114, 4 hours</u></p> <p><u>MA 261, 3 hours (for Mathematics majors)</u></p> <p><u>PHY 231, 4 hours (for Physics)</u></p> <p><u>CHE 105, 3 hours (for Physics)</u></p>	<p>Proposed</p> <p><u>ALL areas take the following premajor courses:</u></p> <p><u>SEM 110, 2 hours</u></p> <p><input checked="" type="checkbox"/> <u>EDP 202, 3 hours</u></p> <p><input checked="" type="checkbox"/> <u>MA 113 or 137, 4 hours</u></p> <p><input checked="" type="checkbox"/> <u>STA 210, 3 hours</u></p> <p><input checked="" type="checkbox"/> <u>MA 114 or 138, 4 hours</u></p> <p><u>AND one or more of the following areas:</u></p> <p><u>Mathematics Major:</u></p> <p><input checked="" type="checkbox"/> <u>MA 261, 3 hours</u></p> <p><u>Physics Major:</u></p> <p><input checked="" type="checkbox"/> <u>PHY 231, 4 hours</u></p> <p><input checked="" type="checkbox"/> <u>CHE 105, 4 hours</u></p> <p><input checked="" type="checkbox"/> <u>CHE 107, 3 hours</u></p>
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³ Note that MA 109 is NOT approved as a Quantitative Foundations course. Students in a major requiring calculus will use a calculus course (MA 113, 123, 137 or 138) while students not requiring calculus should take MA 111, PHI 120 or another approved course.

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Earth Science Major:

PHY 231, 4 hours

PHY 241, 1 hour

CHE 105, 4 hours

CHE 111, 1 hour

Chemistry Major:

CHE 105, 4 hours

CHE 107, 3 hours

CHE 111, 1 hour

CHE 113, 2 hours

Computer Science Major:

CS 100, 1 hour

CS 115, 3 hours

CS 215, 3 hours

CS 275, 4 hours

7. List the major's course requirements that will change, including credit hours.

Current	Proposed
STEM Education primary major:	<u>STEM Education primary major:</u>
<u>EDS 516, 3 hours</u>	<input checked="" type="checkbox"/> <u>EDS 516, 3 hours</u>
<u>SEM 421, 3 hours</u>	<u>SEM 421, 3 hours</u>
<u>SEM 422, 3 hours</u>	<input checked="" type="checkbox"/> <u>SEM 422, 3 hours</u>
<u>SEM 435, 10 hours</u>	<input checked="" type="checkbox"/> <u>SEM 435, 10 hours</u>
<u>EPE 301, 3 hours</u>	<input checked="" type="checkbox"/> <u>EPE 301, 3 hours</u>
	<u>SEM 423, 2 hours</u>
AND One or more of the following areas:	<u>AND One or more of the following areas:</u>
<u>Mathematics Major:</u>	<u>Mathematics Major:</u>
<u>MA 213, 4 hours</u>	<input checked="" type="checkbox"/> <u>CS 115, 3 hours</u>
<u>MA 322, 3 hours</u>	<input checked="" type="checkbox"/> <u>MA 213, 4 hours</u>
<u>MA 361 & 362 OR MA 416G & 417G, 6 hours</u>	<input checked="" type="checkbox"/> <u>MA 322, 3 hours</u>
<u>MA 310, 3 hours</u>	<input checked="" type="checkbox"/> <u>MA 361 & 362 OR MA 416G & 417G, 6 hours</u>
<u>MA/STA 320, 3 hours</u>	<input checked="" type="checkbox"/> <u>MA 310, 3 hours</u>
<u>MA 341, 3 hours</u>	<input checked="" type="checkbox"/> <u>MA/STA 320, 3 hours</u>
<u>Physics Major:</u>	<input checked="" type="checkbox"/> <u>MA 341, 3 hours</u>
<u>CHE 107, 3 hours</u>	<input checked="" type="checkbox"/> <u>MA 330, 3 hours</u>
<u>PHY 232, 4 hours</u>	<input checked="" type="checkbox"/> <u>MA 415G, 3 hours</u>
<u>PHY 228, 3 hours</u>	<u>Upper Division Elective, 3 hours</u>
<u>PHY 306, 3 hours</u>	<u>Physics Major:</u>
<u>PHY 335, 3 hours</u>	<input checked="" type="checkbox"/> <u>PHY 232, 4 hours</u>
<u>PHY 361, 3 hours</u>	<input checked="" type="checkbox"/> <u>PHY 228, 3 hours</u>
<u>PHY 401G, 3 hours</u>	<input checked="" type="checkbox"/> <u>PHY 306, 3 hours</u>
<u>AST 310, 3 hours</u>	<input checked="" type="checkbox"/> <u>PHY 335, 3 hours</u>
<u>MA 213, 4 hours</u>	<input checked="" type="checkbox"/> <u>PHY 361, 3 hours</u>
	<input checked="" type="checkbox"/> <u>PHY 401G, 3 hours</u>
	<u>PHY 460, 4 hours</u>
	<input checked="" type="checkbox"/> <u>AST 310, 3 hours</u>
	<input checked="" type="checkbox"/> <u>MA 213, 4 hours</u>

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Chemistry Major:

- CHE 226, 3 hours
- CHE 230, 3 hours
- CHE 231, 1 hour
- CHE 232, 3 hours
- CHE 233, 1 hour
- CHE 440, 3 hours
- CHE 441, 2 hours
- CHE 572, 2 hours
- PHY 211, 5 hours
- PHY 213, 5 hours

Chemistry Upper Division Electives, 5 hours

Outside Chemistry Electives - 300-500 level with a prefix of ANA, BCH, BIO, CME, CS, GLY, MA, MI, MSE, PAT, PGY, PHA, PHY, PM, RM, or STA. Credit will not be given for both BCH 401G and CHE 550 or CHE 552, 10 hours

Earth Science Major:

- MA 213, 4 hours
- CHE 107, 3 hours
- CHE 113, 2 hours
- PHY 232, 4 hours
- PHY 242, 1 hour
- GEO 230, 3 hours
- AST 192, 3 hours
- GEO 130, 3 hours
- GLY 230, 3 hours
- GLY 235, 3 hours
- GLY 360, 4 hours
- GLY 401, 3 hours

Computer Science:

- CS 216, 3 hours
- PHY 231, 4 hours
- PHY 241, 1 hour
- PHY 232, 4 hours
- PHY 242, 1 hour
- MA 213, 4 hours
- EE 280, 3 hours
- STA 281, 3 hours
- CS 315, 3 hours
- CS/MA 321, 3 hours
- CS/EE 380, 3 hours

15 hours of electives:

- at least 1 of the following: CS 316, 335, 405, 3 hours
- at least 1 of the following: CS 470, 471, 441, or 450, 3 hours
- at least 1 of the following: CS 375, 321, 463, 3 hours
- MA 341, 3 hours

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8. Does the pgm require a minor AND does the proposed change affect the required minor? N/A Yes No
 If "Yes," indicate current courses and proposed changes below.

Current	Proposed

9. Does the proposed change affect any option(s)? N/A Yes No
 If "Yes," indicate current courses and proposed changes below, including credit hours, and also specialties and subspecialties, if any.

Current	Proposed

10. Does the change affect pgm requirements for number of credit hrs outside the major subject in a related field? Yes No
 If so, indicate current courses and proposed changes below.

Current	Proposed
<u>Student takes outside electives in STEM areas, other than their own. Student takes as many electives as needed to fulfill the 120 credit hour requirement.</u>	

11. Does the change affect pgm requirements for technical or professional support electives? Yes No
 If so, indicate current courses and proposed changes below.

Current	Proposed

12. Does the change affect a minimum number of free credit hours or support electives? Yes No
 If "Yes," indicate current courses and proposed changes below.

Current	Proposed
<u>None</u>	<u>3 hours of free electives per Senate Rule 5.4.3.4 and Undergraduate Council Rules established in March 2012</u>

13. Summary of changes in required credit hours:

	Current	Proposed
a. Credit Hours of Premajor or Preprofessional Courses:	<u>16-23</u>	<u>19-23</u>
b. Credit Hours of Major's Requirements:	<u>45-75</u>	<u>45-75</u>
c. Credit Hours for Required Minor:	<u>N/A</u>	
d. Credit Hours Needed for a Specific Option:	<u>N/A</u>	
e. Credit Hours Outside of Major Subject in Related Field:	<u>variable in STEM fields up to 120 credit hour graduation requirement</u>	<u>variable in STEM fields up to 120 credit hour graduation requirement; SEM 575 is required for math certification; an engineering course is required for every area except CS</u>

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f. Credit Hours in Technical or Professional Support Electives:	<u>N/A</u>	
		<u>variable in STEM fields up to 120 credit hour graduation requirement</u>
g. Minimum Credit Hours of Free/Supportive Electives:		<u>3 hours</u>
h. Total Credit Hours Required by Level:	100:	<u>10</u>
	200:	<u>10-13</u>
	300:	<u>18-24</u>
	400-500:	<u>21-27</u>
i. Total Credit Hours Required for Graduation:	<u>120</u>	<u>120-126</u>

14. Rationale for Change(s) – if rationale involves accreditation requirements, please include specific references to that.

Currently, mathematics and physics are the only approved certification tracts for this program. We are adding Computer Science, Earth Science, and Chemistry. In addition, the mathematics content coursework was changed to ensure students who graduate meet new and forthcoming content requirements. The special physics laboratory is going through the final approval processes and needed to be added to the curriculum.

15. List below the typical semester by semester program for the major. If multiple options are available, attach a separate sheet for each option.

YEAR 1 – FALL: (e.g. "BIO 103; 3 credits")	<u>Please see the attached sheets for the curriculum contract and for the semester-by-semester program.</u>	YEAR 1 – SPRING:	_____
YEAR 2 - FALL :	_____	YEAR 2 – SPRING:	_____
YEAR 3 - FALL:	_____	YEAR 3 - SPRING:	_____
YEAR 4 - FALL:	_____	YEAR 4 - SPRING:	_____

CHANGE UNDERGRADUATE PROGRAM FORM

Signature Routing Log

General Information:

Current Degree Title and Major Name: Bachelor of Science - STEM Education and <content area>
(Mathematics, Physics, Chemistry, Earth Science, or Computer Science)

Proposal Contact Person Name: Margaret Mohr-Schroeder Phone: 257-3073 Email: m.mohr@uky.edu

INSTRUCTIONS:

Identify the groups or individuals reviewing the proposal; note the date of approval; offer a contact person for each entry; and obtain signature of person authorized to report approval.

Internal College Approvals and Course Cross-listing Approvals:

Reviewing Group	Date Approved	Contact Person (name/phone/email)	Signature
STEM Education	04.09.2012	Jennifer Wilhelm / / jennifer.wilhelm@uky.edu	
Mathematics	Feb 2011	Carl Lee / / lee@ms.uky.edu	
Chemistry	Feb 2011	Mark Meier / / mark.meier@uky.edu	
Physics	02.02.2011	Mike Cavagnero / / mike@pa.uky.edu	
Computer Science	Feb 2011	Ken Calvert / / calvert@cs.uky.edu	
C&C	4/17/12	Doug Smith/7-1824/dcsmit1@uky.edu	
College of Education	4/17/12	Steve Parker/7-5443/spark01@uky.edu	

External-to-College Approvals:

Council	Date Approved	Signature	Approval of Revision ⁴
Undergraduate Council	10/9/12	Joanie Ett-Mims	
Graduate Council			
Health Care Colleges Council			
Senate Council Approval		University Senate Approval	

Comments:

⁴ Councils use this space to indicate approval of revisions made subsequent to that council's approval, if deemed necessary by the revising council.

Sample Degree Plan - Earth Science

Fall 1		17	Spring 1		16
✓ MA 113/137		4	✓ MA 114/138		4
Comm 1		3	✓ CHE 111		1
✓ PHY 231/241		5	✓ CHE 105		3
✓ PSY 100		4	✓ STA 210		3
✓ PHY 241		1	✓ SEM 110		2
			✓ GLY 230		3
Fall 2		15	Spring 2		17
✓ GLY 235		3	✓ PHY 232		4
✓ CHE 113		2	✓ PHY 242		1
✓ CHE 107		3	Int Inq 2		3
✓ EDP 202		3	Comm 2		3
✓ MA 213		4	✓ EPE 301W		3
			STEM Elec 1		3
Fall 3		15	Spring 3		15
✓ GLY 230		3	STEM Elec 2		3
Int Inq 3		3	✓ GEO 130		3
✓ EDS 516		3	✓ GLY 360		3
Cit 1		3	SEM 421		3
Engineering		3	✓ AST 192		3
Fall 4		13	Spring 4		12
✓ SEM 422		3	SEM 435		10
STEM Elec 3		4	SEM 423		2
✓ GLY 401		3			
Free Elective		3			
TOTAL		120			

Sample Degree Plan - Chemistry

Fall 1		16	Spring 1		17
✓ MA 113/137		4	✓ CHE 107		3
Comm 1		3	✓ CHE 113		2
✓ CHE 105		4	✓ MA 114/138		4
✓ CHE 111		1	Comm 2		3
✓ PSY 100		4	SEM 110		2
			Cit 1		3
Fall 2		16	Spring 2		16
✓ CHE 230		3	✓ CHE 226		3
✓ CHE 231		2	✓ CHE 232		3
✓ PHY 211		5	✓ CHE 233		2
✓ EDP 202		3	✓ PHY 213		5
✓ STA 210		3	✓ EPE 301		3
Fall 3		14	Spring 3		15
✓ CHE 440		3	Engineering		3
✓ CHE 441		2	Int Inq 2		3
✓ EDS 516		3	✓ CHE 572		1
Int Inq 1		3	SEM 421		3
CHE Elec 1		3	Out CHE Elec 1		2
CHE Elec 2		2	Out CHE Elec 2		3
Fall 4		14	Spring 4		12
SEM 422		3	✓ SEM 435		10
✓ CHE 572		1	SEM 423		2
Out CHE Elec 3		3			
Out CHE Elec 4		2			
STEM Elec 1		2			
Free Elective		3			
TOTAL		120			

Sample Degree Plan - Mathematics				
Fall 1	17		Spring 1	15
✓ MA 113	4		✓ MA 114	4
Comm 1	3		Comm 2	3
Int. Inq. 1	3		✓ SEM 110	2
Cit	3		✓ CS 115	3
✓ PSY 100	4		✓ STA 210	3
Fall 2	16		Spring 2	15
✓ MA 213	4		✓ MA 261	3
✓ MA 322	3		✓ MA 320	3
STEM Elec 1	3		STEM Elec 2	3
Int Inq 3	3		Int Inq 4	3
✓ EDP 202	3		✓ EPE 301W	3
Fall 3	15		Spring 3	15
MA Seq 1	3		MA Seq 2	3
✓ MA 341	3		✓ MA 310	3
✓ EDS 516	3		✓ MA 330W	3
Engineering	3		✓ SEM 421	3
STEM Elec 3	3		SEM 575	3
Fall 4	15		Spring 4	12
✓ SEM 422	3		✓ SEM 435	10
STEM Elec 4	3		SEM 423	2
✓ MA 415G	3			
MA Elec 1	3			
Free Elective	3			
TOTAL	120			

Sample Degree Plan - Physics

Fall 1		16	Spring 1		16
✓ MA 113		4	✓ MA 114		4
Comm 1		3	✓ PHY 228		3
✓ PHY 231		4	✓ CHE 105		4
✓ PHY 241		1	✓ STA 210		3
✓ PSY 100		4	✓ SEM 110		2
Fall 2		17	Spring 2		15
✓ MA 213		4	✓ PHY 306		3
✓ PHY 232		4	✓ PHY 361		3
✓ PHY 335		3	Cit 1		3
✓ CHE 107		3	Comm 2		3
✓ EDP 202		3	✓ EPE 301W		3
Fall 3		15	Spring 3		15
✓ AST 310		3	✓ PHY 401G		3
Int Inq 2		3	Int Inq 3		3
✓ EDS 516		3	STEM Elec 2		3
Engineering		3	SEM 421		3
STEM Elec 1		3	STEM Elec 3		3
Fall 4		14	Spring 4		12
✓ SEM 422		3	✓ SEM 435		10
PHY 460W		4	SEM 423		2
STEM Elect 4		4			
Free Elective		3			
TOTAL		120			

Sample Degree Plan - Computer Science

Fall 1	15	Spring 1	17
✓ MA 113	4	✓ PHY 231	4
Comm 1	3	✓ PHY 241	1
✓ CS 115	3	✓ MA 114	4
✓ CS 100	1	Comm 2	3
✓ PSY 100	4	✓ SEM 110	2
		✓ CS 215	3
Fall 2	17	Spring 2	17
✓ CS 216	3	✓ PHY 232	4
✓ MA 213	4	✓ PHY 242	1
✓ CS 275	4	✓ EE 280	3
✓ EDP 202	3	✓ STA 281	3
✓ STA 210	3	✓ EPE 301	3
		Cit 1	3
Fall 3	15	Spring 3	18
✓ CS 315	3	SEM 575	3
✓ CS 321	3	Int Inq 3	3
✓ EDS 516	3	CS Elec 1	3
Int Inq 2	3	SEM 421	3
✓ CS 380	3	CS Elec 2	3
		Free Elective	3
Fall 4	15	Spring 4	12
SEM 422	3	✓ SEM 435	10
CS Elec 3	3	SEM 423	2
✓ MA 341	3		
CS Elec 4	3		
CS Elec 5	3		
TOTAL	126		

Professional Education Unit
Department of Science, Technology, Engineering, & Mathematics Education
Curriculum Contract
Bachelor of Science in Education – STEM Education and <select content area>
KY Initial Rank III Certification – Mathematics, Chemistry, Physics, or Earth Science and
Optional Computer Science Endorsement

Please TYPE

Name				Student ID			
UK Email							
Address						State	Zip
	Street			City			
Phone					Semester of Admission to Program		
	Home	Cell/Other					

UKCore Requirements: (32 hours)
May overlap with content major requirements. May not overlap with Content Support courses.

Course	Title	Term	Grade	Credits
<i>Intellectual Inquiry</i>				
	The Nature of Inquiry in the Natural, Physical, & Mathematics Sciences			3
PSY 100	The Nature of Inquiry in the Social Sciences			4
	The Nature of Inquiry in the Humanities			3
	The Nature of Inquiry in the Arts & Creativity			3
<i>Communications</i>				
	Writing I			3
	Communication			3
<i>Quantitative Reasoning</i>				
MA 113 or MA 137	Mathematical, Logical and Statistical Foundations			4
STA 210	Statistical Reasoning			3
<i>Citizenship</i>				
EPE 301	U.S. Citizenship			3
	Global Citizenship			3

Graduation Writing Requirement

Course Used	Hours
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Foreign Language Proficiency

<input type="checkbox"/> Two Semesters of College Coursework	
<input type="checkbox"/> Two Years of Foreign Language in High School	
<input type="checkbox"/> Testing	

Required STEM Education Core:

(29 hours)

Course	Title	Term	Grade	Credits
SEM 110*^	Introduction to STEM Education			2
EDP 202* ^	Human Development and Learning			3
EDS 516*	Principles of Behavior Management and Instruction			3
SEM 421*	STEM Methods I			3
SEM 422*	STEM Methods II			3
SEM 423*	Assessment in STEM Education (concurrent with SEM 435)			2
SEM 435*	STEM Student Teaching in the Secondary School			10
EPE 301*^	Education in American Culture			3

* Requires field experience hours

^SEM 110 and EPE 301 or EDP 202 required for TEP Application

Specialization STEM Content Coursework. Choose your content area below. This will serve as your secondary major.

* Eligible to meet a Gen Ed Requirement

All content courses require a "C" or better and at least a 2.75 GPA

 Mathematics Major

(45 hours)

Course	Title	Term	Grade	Credits
<i>Mathematics Core Courses</i>				
CS 115	Introduction to Computer Programming			3
✓ MA 113*^	Calculus I			4
✓ MA 114^	Calculus II			4
✓ MA 213	Calculus III			4
✓ MA 261^	Introduction to Number Theory			3
✓ MA 322	Matrix Algebra and its Applications			3
<i>Mathematics Sequence, Choose one. May substitute a different sequence with prior faculty approval. (6 hours minimum)</i>				
✓ MA 361	Elementary Modern Algebra I AND			3
✓ MA 362	Elementary Modern Algebra II			3
✓ MA 416G	Principles of Operations Research AND			3
✓ MA 417G	Principles of Operations Research II			3
				3
				3
<i>Required Mathematics Electives (300 or above with exception of MA 241) (18 hours minimum)</i>				
✓ MA 310	Mathematics Problem Solving for Teachers			3
✓ MA/STA 320	Introduction to Probability			3
✓ MA 330	History of Mathematics			3
✓ MA 341	Topics in Geometry			3
✓ MA 415G	Combinatorics and Graph Theory			3
				3
<i>Optional Courses</i>				
✓ MA 214	Calculus IV (Recommended for AP Calculus)			3
✓ MA 471G	Advanced Calculus I (recommended for MA/MS in Mathematics)			3

^Required for TEP Application

Physics Major

(46 hours)

Course	Title	Term	Grade	Credits
CHE 105 ⁺ [^]	General Chemistry I			4
CHE 107 ⁺ [^]	General Chemistry II			3
PHY 231 [^]	General University Physics			4
PHY 232	General University Physics II			4
PHY 228	Optics, Relativity, & Thermal Physics			3
PHY 306	Theoretical Methods of Physics			3
PHY 335	Data Analysis for Physicists			3
PHY 361	Principles of Modern Physics			3
PHY 401	Special Topics in Physics and Astronomy for elementary, middle school, and high school teachers			3
PHY 460	Active Learning Laboratory for Secondary Majors			4
AST 310	Topics in Astronomy and Astrophysics			3
✓ MA 113 ⁺ [^]	Calculus I			4
✓ MA 114 [^]	Calculus II			4
✓ MA 213	Calculus III			4

[^]Required for TEP Application

 Chemistry Major

(62 hours)

Course	Title	Term	Grade	Credits
<i>Premajor Requirements</i>				
MA 113 ⁺ [^]	Calculus I			4
MA 114 [^]	Calculus II			4
CHE 105 ⁺ [^]	General College Chemistry I			4
CHE 111 ⁺ [^]	Laboratory to Accompany General Chemistry I			1
CHE 107 [^]	General College Chemistry II			3
CHE 113 [^]	Laboratory to Accompany General Chemistry II			2
<i>Major Requirements</i>				
CHE 226	Analytical Chemistry			3
CHE 230	Organic Chemistry I			3
CHE 231	Organic Chemistry Lab I			1
CHE 232	Organic Chemistry II			3
CHE 233	Organic Chemistry Laboratory II			1
CHE 440	Introductory Physical Chemistry			3
CHE 441	Physical Chemistry Laboratory			2
CHE 572	Communication in Chemistry			1
CHE 572	Communication in Chemistry			1
<i>Additional Major Requirements</i>				
PHY 211	General Physics			5
PHY 213	General Physics II			5
<i>Chemistry Electives (5 hours minimum)</i>				
<i>Outside Electives (10 hour minimum) – 300 – 500 level with a prefix of ANA, BCH, BIO, CME, CS, GLY, MA, MI, MSE, PAT, PGY, PHA, PHR, PHY, PM, RM, or STA. Credit will not be given for both BCH 401G and CHE 550 or CHE 552.</i>				

^Required for TEP Application

Earth Science Major

(34 hours)

Course	Title	Term	Grade	Credits
✓ MA 113 ⁺ ^	Calculus I			4
✓ MA 114^	Calculus II			4
✓ MA 213	Calculus III			4
CHE 105 ⁺ ^	General Chemistry I			4
CHE 111 ⁺ ^	Laboratory to Accompany General Chemistry I			1
CHE 107	General College Chemistry II			3
CHE 113	Laboratory to Accompany General Chemistry II			2
PHY 231 ⁺ ^	General University Physics			4
PHY 241 ⁺ ^	General University Physics Laboratory			1
PHY 232	General University Physics II			4
PHY 242	General University Physics Laboratory II			1
GEO 230	Weather and Climate			3
AST 192	Stars, Galaxies, & the Universe			3
GEO 130 ⁺	Earth's Physical Environment			3
GLY 230	Fundamentals of Geology I			3
GLY 235	Fundamentals of Geology II			3
GLY 360	Mineralogy			4
GLY 401	Invertebrate Paleobiology and Evolution			3

^Required for TEP Application

Computer Science Major

(75 hours)

(leads to Initial Rank III Mathematics [grades 8-12] and endorsement in Computer Science [grades 8-12])

Course	Title	Term	Grade	Credits
<i>Premajor Requirements</i>				
✓ MA 113 ⁺ ^	Calculus I			4
✓ MA 114^	Calculus II			4
CS 100^	The Computer Science Profession			1
CS 115^	Introduction to Computer Programming			3
CS 215^	Introduction to Program Design, Abstraction, and Problem Solving			3
CS 216	Introduction to Software Engineering			3
CS 275^	Discrete Mathematics			4
PHY 231	General University Physics			4
PHY 241	General University Physics Laboratory			1
<i>Major Requirements</i>				
PHY 232	General University Physics			4
PHY 242	General University Physics Laboratory			1
✓ MA 213	Calculus III			4
EE 280	Design of Logic Circuits			3
STA 281	Probability and Statistics using Interactive Computer Techniques			3
CS 315	Algorithm Design and Analysis			3
CS/MA 321	Introduction to Numerical Methods			3
CS/EE 380	Microcomputer Organization			3
<i>Computer Science Electives (15 hrs total; at least 1 from each group)</i>				
CS 316	Web Programming			3
CS 335	Graphics and Multimedia			3

CS 405	Introduction to Database Systems			3
<i>Choose at least 1</i>				
CS 470	Introduction to Operating Systems			3
CS 471	Networking and Distributed Operating Systems			
CS 441	Compilers for Algorithmic Languages			3
CS 450	Fundamentals of Programming Languages			3
<i>Choose at least 1</i>				
CS 375	Logic and Theory of Computing			3
CS 321	Introduction to Numerical Methods			
CS 463	Introduction to Artificial Intelligence			3
<i>Additional Courses needed to gain certification in Mathematics (grades 8-12)</i>				
MA 341	Fundamentals of Geometry			3

[^]Required for TEP Application

Computer Science Endorsement only (add on to any content major)
(leads to endorsement in Computer Science [grades 8-12])

(46 hours)

Course	Title	Term	Grade	Credits
✓ MA 113*	Calculus I			4
✓ MA 114	Calculus II			4
CS 100	The Computer Science Profession			1
CS 115	Introduction to Computer Programming			3
CS 215	Introduction to Program Design, Abstraction, and Problem Solving			3
CS 216	Introduction to Software Engineering			3
CS 275	Discrete Mathematics			4
EE 280	Design of Logic Circuits			3
CS 315	Algorithm Design and Analysis			3
CS/EE 380	Microcomputer Organization			3
<i>Computer Science Electives (15 hrs total; at least 1 from each group)</i>				
CS 316	Web Programming			3
CS 335	Graphics and Multimedia			3
CS 405	Introduction to Database Systems			3
<i>Choose at least 1</i>				
CS 470	Introduction to Operating Systems			3
CS 471	Networking and Distributed Operating Systems			
CS 441	Compilers for Algorithmic Languages			3
CS 450	Fundamentals of Programming Languages			3
<i>Choose at least 1</i>				
CS 375	Logic and Theory of Computing			3
CS 321	Introduction to Numerical Methods			3
CS 463	Introduction to Artificial Intelligence			3

Free Electives – 3 hours

Select 3 hours of your choice. You may not double count these courses with your major content course requirements or UK Core requirements or your STEM content support courses. All courses should be approved by advisor prior to taking.

Course	Title	Term	Grade	Credits

STEM Content Support Courses – take up to 120 hours required for graduation

Select from each area of interest - you must choose at least 3 hours from Engineering unless you are a computer science major. You may not double count these courses with your major content course requirements or UK Core requirements. This list is not inclusive. All courses should be approved by advisor prior to taking. SEM 575 is required for mathematics and computer science majors. It is highly encouraged for other majors.

Course	Title	Term	Grade	Credits
<i>Mathematics/Statistics</i>				
FIN 350	Personal Investing and Financial Planning			3
STA 291	Statistical Method			3
STA 281	Probability and Statistics Using Interactive Computer Techniques			3
STA 292	Descriptive Statistics			3
MA 501/502	Seminar in Selected Topics			3
OR/STA 524	Probability			3
EDC/EDP/EPE 522	Educational Tests and Measurements			3
SEM 575	See Blue Mathematics Clinic <i>(Required for Math Certification)</i>			3
<i>Engineering</i>				
ME 599	Systems Thinking for Sustainability			3
EGR 101	Introduction to Engineering			4
EGR 199	Technology and Society			3
EGR 199	Global Energy Issues			3
<i>Technology</i>				
CS 115	Introduction to Computer Programming			3
TEL 201	Communication Technologies and Society			3
INF 401G	Informatics Fundamentals			3
EDC 543	Digital Game Based Learning and Instruction			3
EDC 544	Use and Integration of Instructional Media			3
CS 215	Introduction to Program Design, Abstraction, and Problem Solving			3
CS 221	First course in computer science for engineers			2
CS 316	Web Programming			3
<i>Science</i>				
CHE 105	General College Chemistry I			4
CHE 111	General College Chemistry Lab I			1
BIO 150	Principles of Biology I			3
BIO 151	Principles of Biology Laboratory I			2
PHY 231/241	General University Physics			4
PHY 241	General University Physics Laboratory			1
GLY 220	Principles of Physical Geology			4

Total Credit Hours

Minimum 120 credit hours required for graduation and Rank III certification

Basic Skills Testing (Successful testing required on one of the following exams)

PRAXIS I	Reading (173) _____	Math (173) _____	Writing (172) _____	Date of Test _____
-----------------	---------------------	------------------	---------------------	-----------------------

Required GPAs (minimum 2.75 in each area)

Note: A minimum grade of "C" is required for all STEM Education Core and Content Major courses. In addition, a minimum GPA of 2.75 is required overall, as well as in the STEM education core, Content Major Courses, and STEM Content Support Courses.

Pre-TEP Content Major	_____
Pre-TEP Overall	_____
STEM Education Core	_____
STEM Content Support Courses	_____
Content Major	_____
Overall	_____

Continuous Assessment Checklist

Checkpoint	Date
Admission to TEP	_____
Satisfactory Mid-point Review	_____
Admission to Student Teaching	_____
Satisfactory Exit TPA/Review	_____

Required PRAXIS II Testing

Kentucky educator certification requirements are subject to change. Before registering for the test(s), please check the Education Professional Standards Board website at www.kyepsb.net for current test requirements and current cut scores. You may also contact an EPSB certification specialist at 502.564.4606 or toll free at 888.598.7667. To receive a UK recommendation that you are eligible for a state educator certificate, you must have taken the Kentucky EPSB required examinations and met the Kentucky EPSB cut score requirements.

Required for all students	
Principles of Learning and Teaching: Grades 7-12 (Code 0524; 161 min)	_____ ; Date of test: _____
Choose Content Area Test	
Chemistry: Content Knowledge (Code 0245; 147 min)	_____ ; Date of test: _____
Earth and Space Sciences: Content Knowledge (Code 0571; 147 min)	_____ ; Date of test: _____
Mathematics: Content Knowledge (Code 0061; 125 min)	_____ ; Date of test: _____
Mathematics: Proofs, Models and Problems, Part 1 (Code 0063; 141 min)	_____ ; Date of test: _____
Physics: Content Knowledge (Code 0265; 133 min)	_____ ; Date of test: _____

Certification Checklist:

- Application filed with 166 TEB (with \$30.00 check for 166 TEB processing fee)
- Appropriate Praxis II and PLT exams completed and passed

By signing this form, I verify the above information is accurate. I verify that all aspects of this program have been reviewed and are understood.

Student Signature

Date

To be filled out by the advisor:

By signing this form, I agree this student has completed all coursework requirements needed to obtain a Bachelor of Science in Education.

Advisor Signature

Date

To be filled out by the Program Chair:

By signing this form, I agree:

- 1) This student has met EPSB and NCATE standards for teacher certification.
- 2) This student should be recommended for certification.

Program Faculty Chair Signature

Date

To be filled out by Certification Officer:

I verify that all aspects of this program have been reviewed and are understood.

Certification Officer

Date

Rationale for STEM PLUS Program

In Spring 2011, the STEM Education Faculty will submit an innovative undergraduate secondary certification program (called *STEM PLUS – Preparing Leaders for rUral/Urban Schools*). STEM PLUS program participants will earn a Bachelors of Science in Education with a double major in STEM Education and their content major (i.e., mathematics, physics, chemistry, biology, earth science, physical science, computer science) with secondary teaching certification (grades 8-12) in one or more state-certifiable STEM subjects in just 4 years. In addition, a proposal for a STEM Education major will be submitted that will allow College of Arts and Sciences and College of Engineering students to add on secondary mathematics, science, and/or computer science certification to their current degree program (see attached support letters). The STEM Education major will serve as the secondary major within their Arts and Sciences or Engineering degree program. There currently does not exist an undergraduate certification option for secondary mathematics, science or computer science students at UK. This degree program and major will allow for greater flexibility and multiple pathways towards becoming a STEM teacher.

There will be two undergraduate secondary education programs transferred to the proposed STEM Education Department in science and mathematics. Although these are Bachelor Degree programs, they do not lead to certification. A student who is within this program must continue on to the Master's with Initial Certification (MIC) program in order to be certified. However, data from the past 10 years of these two undergraduate programs have revealed that over 60% of the graduates do not go on to the MIC program. A majority of graduates decide to pursue alternative certification routes from other colleges or universities such as Eastern Kentucky University, Morehead State University, Georgetown College, and Northern Kentucky University. The main reason for these students pursuing their certification elsewhere is the financial burden of an intensive, full-time, one calendar year, Master's degree program such as the MIC. The STEM PLUS program will replace the existing secondary mathematics and science undergraduate programs. Current students in the undergraduate mathematics and science education programs (99 total) will have the option of transferring into the STEM PLUS program or finishing out their current program which does not lead to certification. If they choose to finish out their current program, we will continue to advise and foster them into the MIC Mathematics and Science Program. In early discussions with students, juniors and seniors (approximately 35) were interested in finishing out their current programs and the remaining students were interested in transferring to the new program when it became available. Future STEM PLUS students will be the result of recruiting high school students to become STEM teachers and choose UK to pursue their bachelor's degree and certification. We will utilize an Introduction to STEM Education Course, UK Admissions Office, websites, brochures, and other additional media means to recruit for the STEM PLUS Program and STEM Education Major Option. Figure 3 below represents graduation rates for the current programs and projected graduation rates (highlighted in yellow) for the STEM PLUS program.

Secondary Undergraduate Program Graduation Data

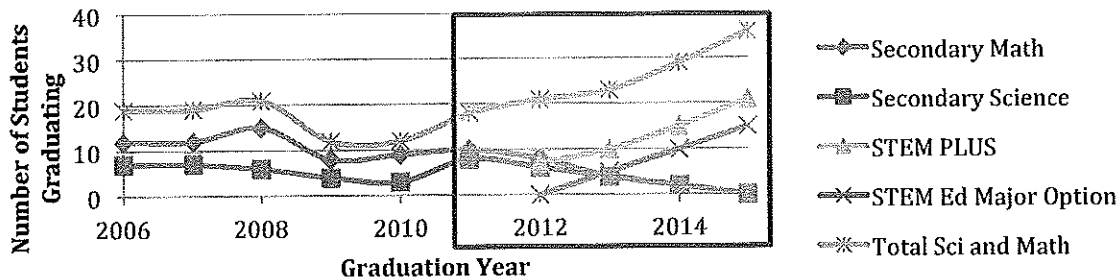


Figure 3. *Current and Projected Secondary Undergraduate Program Graduation Data*

UK is a member of the *Science and Mathematics Teacher Imperative* (SMTI) and *The Learning Collaborative* (TLC), initiated by President Lee Todd and sponsored by the Association of Public and Land-Grant Universities (APLU). SMTI/TLC commits to “transform middle and high school science, technology, engineering and mathematics (STEM) education by preparing a new generation of world-class science and mathematics teachers.” The SMTI Initiative includes 125 public research universities—including 12 university systems. As part of the initiative, UK had to commit to increasing the number of STEM teachers the university produces. President Todd and College of Education Dean Mary John O’Hair committed to tripling the number of secondary STEM teachers produced by 2014. Figure 4 below shows the current number of certified middle school and high school mathematics and science teachers graduating from UK. The highlighted yellow section represents the projected growth as a result of our undergraduate STEM Education Initiatives within our proposed new STEM Education Department. This tripling of numbers will help to meet the demand for highly qualified STEM teachers in secondary classrooms.

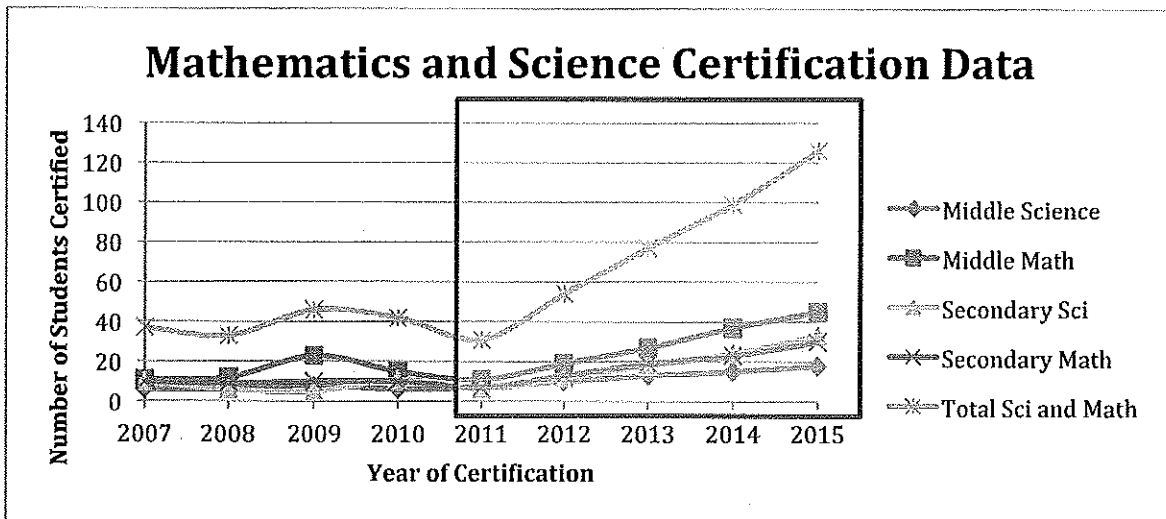


Figure 4. *Current and Projected Mathematics and Science Certification Data*

The lack of highly qualified mathematics and science teachers in middle and high school classrooms in the United States is a crisis that is well established. For example, unqualified teachers (i.e., out-of-field teachers) teach about 56% of high school students taking physical science and 27% taking mathematics. These percentages are magnified in high-poverty areas. Students enrolled in high minority schools have less than a 50% chance of having a science or mathematics teacher who has both a degree and license in the discipline taught (Darling-Hammond, 1999). Judy Jeffrey, a leader in the National Council of Chief State School Officers and the director of the Iowa State Department of Education, says, "In any given year, I have more openings for physics teachers than I can fill because I can't find highly qualified teachers in this field." This is compounded with the attrition of K - 12 teachers. Over the coming decade, approximately two-thirds of K - 12 teachers will either retire or leave the workforce. Of that, about 200,000 are secondary mathematics and science teachers (COSEPUP, 2007). The shortage of science and mathematics teachers is evident in the American Association for Employment in Education (AAEE) 2007 report, *Educator Supply and Demand in the United States* (see Figure 5 below).

AEE Estimates of Relative Demand for Teachers by Subject Area on a Five Point Scale in 2007 (1=Considerable Surplus, 5=Considerable Shortage)

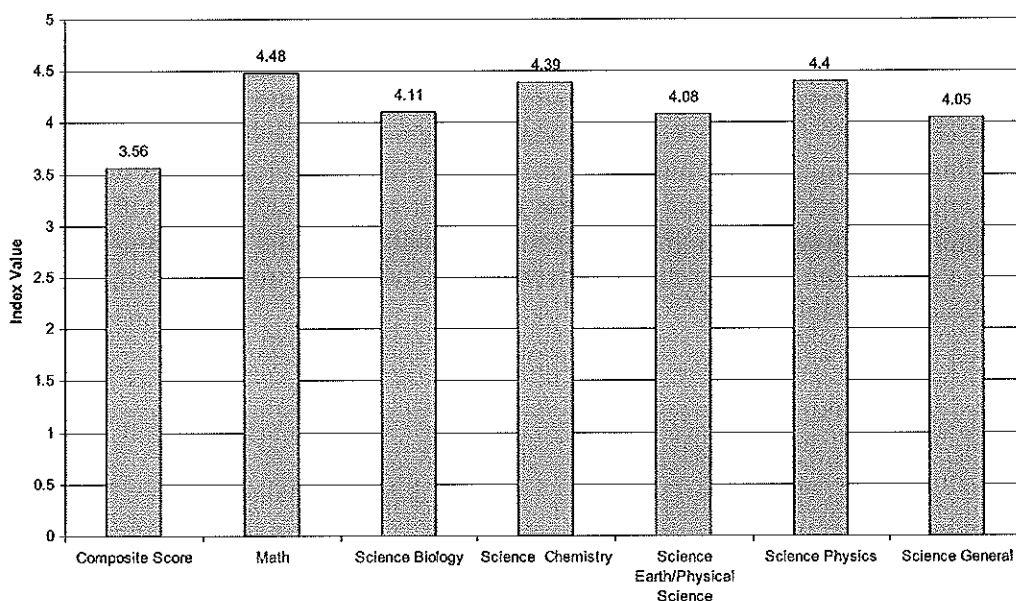


Figure 5. Relative Demand for STEM Teachers by Subject Area

At the state level, the Kentucky Department of Education annually compiles a list of certification shortage areas based on data provided by the Education Professional Standards Board (EPSB). Mathematics and science certification areas have been on the list since its inception in the 1990's. A review of the emergency issuances during the 2009-2010 school year indicates the reason for this inclusion. During this school year, the last for which there is a full year's set of data, the EPSB issued a total of 461 emergency certificates to districts in Kentucky. Of that number, 123 certificates were in the areas of biology, chemistry, physics, earth/space science (all grades 8-12), mathematics (grades 8-12), middle school science (grades 5-9), and middle school mathematics (grades 5-9). (see Executive Director Phil Rogers' letter of support)

The shortage and lack of qualified mathematics and science teachers has had a detrimental effect on the job market. A 2007 *Jobs for the Future* report remarks that three-quarters of students in America are not prepared for college studies in mathematics, science, engineering, and technology. Thus, employers are left to remediate gaps in knowledge and skills, as students are unable to apply their science education in a STEM work environment. Furthermore, according to a National Association of Manufacturers survey, 51% of employers state their graduates are "deficient in math and science" (Foster, 2010). If the U.S. is to be a leader in engineering, technology, and innovation in the global market, the state of science and mathematics education must be reversed.

We believe the addition of the STEM PLUS undergraduate degree program and the STEM Education Major Option will help to address state and national STEM teacher shortages. These two options, in addition to the current MIC Mathematics and Science Programs, will help to meet the SMTI/TLC commitment of tripling our STEM teachers and help meet the demand for more STEM teachers in the Commonwealth. The current draft of the STEM PLUS program has been vetted through the following departments: Mathematics, Biology, Physics, Chemistry, Civil Engineering, Mechanical Engineering, Chemical Engineering, Electrical Engineering, and Computer Sciences. All of the department chairs wholeheartedly embraced and approved the STEM PLUS initiative and the option of adding a second major to their current degree programs. In addition, Deans Lester and Kornbluh, Colleges of Engineering and Arts and Sciences, respectively, are supportive of the proposed programs and pathways.



Dr. Margaret Mohr-Schroeder
Department of STEM Education
109 Taylor Education Building
University of Kentucky
Lexington, KY 40506-0017

Dr. David Royster
Outreach Professor of Mathematics
Department of Mathematics
759 Patterson Office Tower
Lexington, KY 40506-0047

859-257-1258, (FAX: 859-257-4078)
david.royster@uky.edu
<http://www.ms.uky.edu/~droyster>

Dear Dr. Schroeder,

I am writing to extend my support as the Director of Undergraduate Studies in the Department of Mathematics in support of the STEM Education undergraduate program in your department.

We are always interested in creating better teachers of mathematics for the state of Kentucky and we would like to do everything that we can to support these students in their preparation for the classroom. We feel that the options put forth below will be advantageous for the students and will work hard to make certain that these future teachers get the best that the Mathematics Department has to offer. We feel that option of a double major in Mathematics and STEM Education would be very helpful for these students and would offer us the opportunity to more closely align courses to the necessary pedagogical content knowledge for teaching secondary mathematics.

The creation of a STEM Education option for students majoring in Mathematics to add certification to teach in the state of Kentucky by adding the 29-hour STEM Education major is a nice model with which I have had experience at other universities. It tends to work very well and seamlessly for the students. The creation of a Bachelor of Science in Education in STEM Education with specific content areas is a new idea that will serve students well. Either of these options would help to prepare teachers of mathematics for their classrooms. I anticipate the opportunity for undergraduate students to work seamlessly between our two departments, and it will be very good to have the opportunity for our interested faculty to be able to work seamlessly with both departments.

Again, I support and commend the creation of the STEM Education undergraduate program in your department and look forward to working with you and the department in the future.

A handwritten signature in cursive script that reads "droyster".

Dr. David C. Royster,
Outreach Professor of Mathematics
University of Kentucky

Department of Mathematics
721 Patterson Office Tower
Lexington, Kentucky 40506-0027
(859) 257-6794, FAX (859) 257-4078
lee@ms.uky.edu

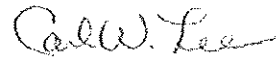
March 1, 2012

Dr. Margaret Mohr-Schroeder,
Department of STEM Education
University of Kentucky
Campus

Dear Dr. Mohr-Schroeder,

The Department of Mathematics at the University of Kentucky strongly endorses the MSP proposal to focus on the new transdisciplinary program to develop and train STEM-Ed teachers. We recognize the critical need to increase both the quality and quantity of such teachers, particularly in the context of the new Common Core State Standards for Mathematics, the Next Generation Science Standards, and the ever-increasing presence of Engineering in K-12. The proposed project offers a significant and timely opportunity to analyze, assess, and improve the effectiveness of the new program. Our department enjoys a strong working relationship with the newly formed STEM-Ed Department, having several faculty members from each department with secondary appointments in the other. We are pleased to support the involvement of our faculty members in the grant.

Sincerely,



Carl W. Lee
Chair



College of Arts and Sciences

Department of Chemistry
Chemistry-Physics Building
Lexington, KY 40506-0055

859 257-4741
fax 859 323-1069

www.chem.uky.edu

March 1, 2012

National Science Foundation
Directorate for Education & Human Resources

Dear Program Officers,

I am writing to reiterate my support for the STEM PLUS program for future high school chemistry teachers. We are always interested in creating better teachers of biology for the state of Kentucky and would like to do everything we can to support these students in preparation for the classroom. We feel the option of a double major in Chemistry and STEM Education would be very helpful for these students and would offer us the opportunity to more closely align courses to the necessary pedagogical content knowledge for teaching biology.

Specifically I will support STEM PLUS by

- Working with the Department of STEM Education to ensure our future secondary teachers are receiving high quality content coursework that are complemented by the STEM education coursework;
- Helping to recruit students and speaking with them about the importance of a major in the content area they will be teaching in; and
- Encouraging my faculty to engage in the outreach aspects of the program in order to help them bridge what is happening in high schools with what they are doing in their classrooms and laboratories.

Two of our faculty members, Stephen Testa in particular (Director of General Chemistry), have appointments with the STEM Education program, and all departmental faculty look forward to working with the Department of STEM Education and the STEM PLUS program to continue pressing this agenda.

Sincerely,

A handwritten signature in black ink, appearing to read "Mark Meier". The signature is fluid and cursive, with a long horizontal stroke at the end.

Mark Meier
Professor and Chair

S

blue



Department of Physics & Astronomy
177 Chemistry-Physics Building
Lexington, KY 40506-0055

(859) 257-6722 (office)
(859) 323-2846 (fax)

mike@pa.uky.edu

March 1, 2012

National Science Foundation
Directorate for Education & Human Resources

To whom it may concern:

I am writing to express my strong support for the STEM PLUS program for future high school physics teachers. The scarcity of qualified high school physics teachers in Kentucky is tragic, and needs to be addressed as soon as possible. It is obvious that UK should be making degree options in science teaching as flexible as possible in order to attract students from both the core sciences and from education. A certification option for our physics majors, complemented by a core-content major for education majors should attract qualified students from both worlds.

Specifically I will continue to support STEM PLUS by:

- Working with the Department of STEM Education to ensure our future secondary teachers are receiving high quality content coursework that are complemented by the STEM education coursework;
- Helping to recruit students and speaking with them about the importance of a major in the content area they will be teaching in; and
- Encouraging my faculty to engage in the outreach aspects of the program in order to help them bridge what is happening in high schools with what they are doing in their classrooms and laboratories.

Our departmental faculty look forward to working with the Department of STEM Education and the STEM PLUS program to address this longstanding and important problem.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Cavagnero". The signature is fluid and cursive.

Michael Cavagnero, Chair

seeblue



UNIVERSITY OF KENTUCKY

College of Arts and Sciences

*Office of the Dean
213 Patterson Office Tower
Lexington, KY 40506-0027
Phone: (859) 257-8354
Fax: (859) 323-1073
www.as.uky.edu*

July 22, 2009

To Whom It May Concern,

Please accept this letter as an endorsement of the approach to prospective STEM teacher education offered by the STEM PLUS program, proposed by Dr. Margaret Mohr-Schroeder and her team of co-principal investigators, including three members from UK's College of Arts and Sciences. I feel that innovative and ambitious efforts – such as the one outlined in this proposal – will have a demonstrable and beneficial impact, and as a result I wish to commit my full support to the faculty involved in order to help ensure the project's success and longevity.

As Dean of UK's College of Arts and Sciences, I am very much aware of the need for highly effective STEM teachers in K-12 education and the potential impact they have on increasing the number of STEM majors in postsecondary education. I am also increasingly concerned about declining enrollments in and attrition from STEM fields; the dearth of STEM teachers being produced at UK; and the Commonwealth's K-12 system and its need for help in promoting the importance of STEM and preparing its students to achieve in STEM disciplines at the secondary level and beyond. I am convinced that to do this correctly our students (at the University of Kentucky and throughout the Commonwealth) must be taught through pioneering interdisciplinary and multidisciplinary efforts, like the ones outlined in this project.

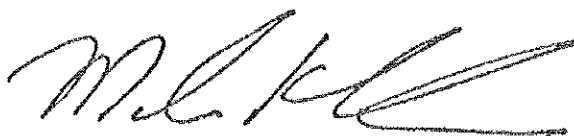
Furthermore, I firmly believe in a connection between the country's competitiveness and its innovation in the global marketplace and a strong STEM populace. We need a rededication to enticing our young people to major, graduate, and work in the STEM fields and/or STEM education. New approaches – that expose students to interdisciplinary and multidisciplinary curricula – must be part of the solution in order to prepare our students for the realities of the 21st century workplace and world. Such approaches – which serve as the basis of the STEM PLUS program – engage and strengthen students' problem solving skills, their ability to use technology effectively, and their facility with teamwork.

In short, I am pleased to be invited to join the STEM PLUS project's management team; I am happy to offer input and feedback throughout the project's design, assessment, and

implementation phases; and I plan to continue serving as part of the management team when STEM PLUS is scaled up and extended into new areas and with new partnerships, specifically with high-needs rural school districts.

Please do not hesitate to contact me if you have any further questions.

Sincerely,

A handwritten signature in black ink, appearing to read 'MLK', with a long horizontal flourish extending to the right.

Mark Lawrence Kornbluh
Dean

MLK:jkt

October 5, 2009



Office of the Dean
103 Dickey Hall
Lexington, KY 40506-0017

859 257-2813
fax 859 323-1046

www.uky.edu/Education

U.S. Department of Education
Teacher Quality Partnership Grants Program

To Whom It May Concern:

I fully endorse the approach and objectives of UK's STEM PLUS – Providing Leaders for Rural Schools – program and will commit resources to help sustain the program for continued success beyond grant funding. Our students, as well as the Commonwealth of Kentucky, are in need of pioneering interdisciplinary efforts such as this one.

I am increasingly concerned about declining enrollments in and attrition from science, technology, engineering, and mathematics (STEM) fields at UK and especially within Kentucky's P-12 system. I believe strongly that Kentucky's efforts to improve the lives of its citizens will not be successful unless we succeed in increasing educational attainment levels, especially in the area of college degrees, and in encouraging our young people to major in and graduate from STEM fields, include STEM Education. As a strong advocate for promising new approaches to preparing students for 21st Century classrooms and workplace, I support participation of our pre-service STEM teachers in vigorous, multi- and transdisciplinary STEM programs such as STEM PLUS and continuing our work with UK's colleges of Engineering and Arts and Sciences through current pre-service teacher programs, Project Lead the Way, the UK BEST Program, and various other STEM programs.

I am committed to ensuring STEM PLUS continues beyond the life of the grant. President Todd recently gave us funding to hire five additional faculty, two at the senior level, in mathematics, science, and engineering education. A majority of these new faculty will be involved in STEM PLUS and will help ensure the continued success of this new program. To ensure additional sustainability of STEM PLUS, I will

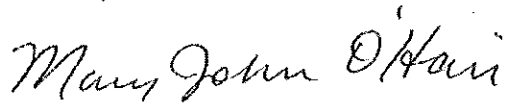
- Connect STEM PLUS to the College's new P-20 school-university leadership network to ensure school and district leaders understand and support STEM education efforts
- Host a half-day, annual meeting for community and university leaders interested in learning more about STEM PLUS and ways to contribute
- Serve on the management team to offer input and feedback throughout the program design, assessment, and implementation phases, as well as when program is scaled up and extended to new areas of UK's curriculum and partnerships

A stylized logo consisting of the letters "ee" in a large, rounded, sans-serif font, positioned above the word "blue" in a smaller, lowercase, sans-serif font. The "ee" and "blue" are connected at the top.

- Work with the Department of Curriculum and Instruction to provide a graduate student for STEM PLUS to help with advising, teaching of courses, and research assistance.

In short, I fully support Dr. Margaret Mohr-Schroeder and her team. Innovative, transformative, and interdisciplinary efforts like STEM PLUS will have demonstrable and beneficial impacts for the Commonwealth of Kentucky and the nation.

Sincerely,

A handwritten signature in cursive script that reads "Mary John O'Hair".

Mary John O'Hair
Dean



EDUCATION PROFESSIONAL STANDARDS BOARD

Steven L. Beshear
Governor

100 Airport Road, 3rd Floor, Frankfort, Kentucky 40601
Phone: 502-564-4606 Fax: 502-564-7080
www.kyepsb.ky.gov

Phillip S. Rogers, Ed.D.
Executive Director

November 16, 2010

Academic Organization and Structure Committee
College of Education
University of Kentucky
166 Taylor Education Building
Lexington, KY 40506-0001

Dear Committee Members:

We have been contacted by the university to comment on the need for mathematics and science teachers across the Commonwealth. As the authorized agency for the certification of Kentucky's educators, we have first-hand knowledge regarding the shortage areas for educator certification. This belief is based on our issuance each year of emergency certifications for all content areas in K-12 education.

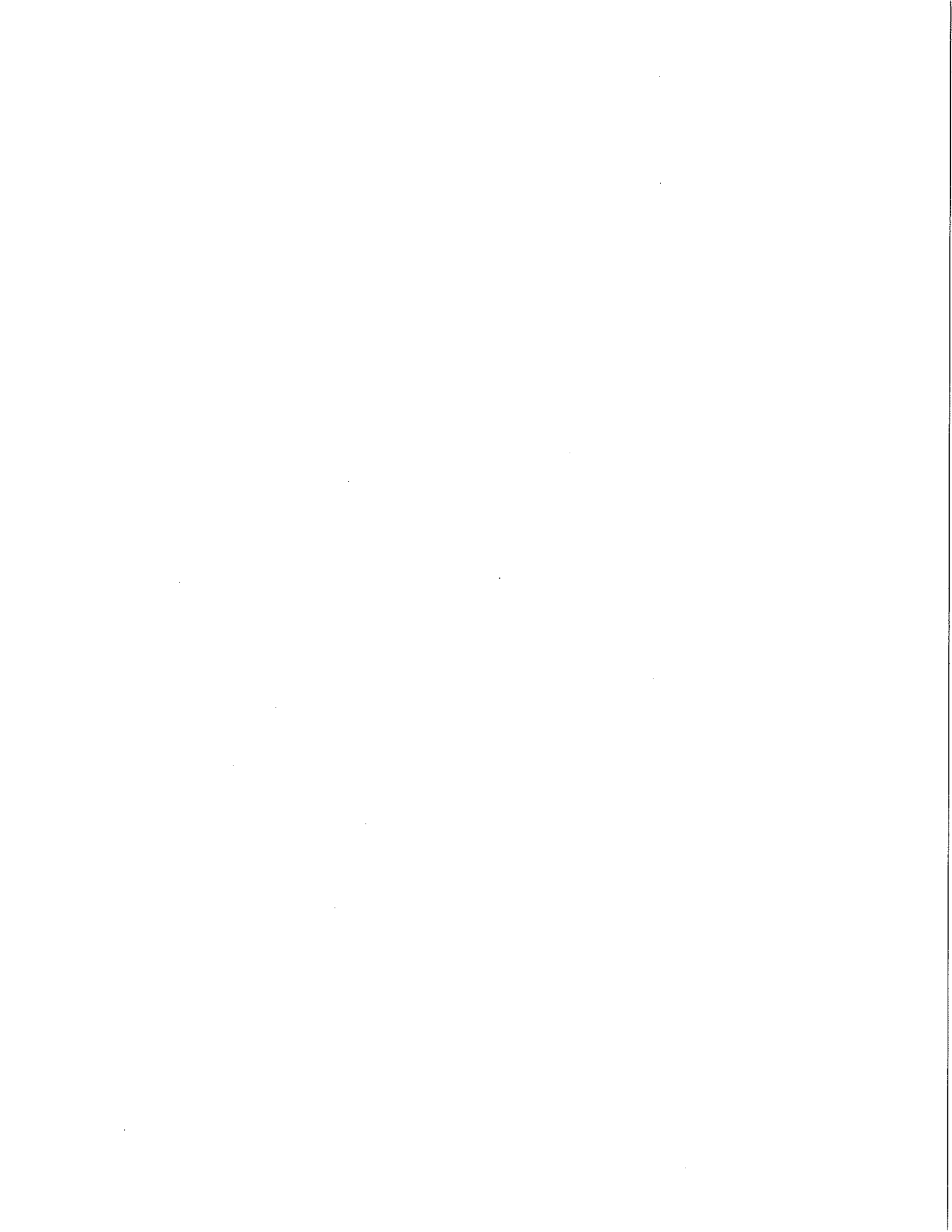
The Kentucky Department of Education annually compiles a list of certification shortage areas and this list is based on data provided by the EPSB. Mathematics and science certification areas have been on that list since its inception in the 1990's. A review of the emergency issuances during the 2009-2010 school year indicates the reason for this inclusion. During this school year, the last for which we have a full year's set of data, the EPSB issued a total of 461 emergency certificates to districts in Kentucky. Of that number, 123 of these certificates were in the areas of biology, chemistry, physics, earth/space science (all grades 8-12), mathematics (grades 8-12), middle school science (grades 5-9), and middle school mathematics (grades 5-9).

We believe that these data, illustrating that 27% of all emergency issuances last school year were in science and mathematics, make a strong case for the need for new and expanded programs in our state institutions for these teaching disciplines. Without going into data from previous school years, we can verify that a similar situation has existed for many years in Kentucky.

We would support any efforts to expand teacher preparation programs in the areas of science and mathematics, and we welcome any requests you may have for more information regarding this area.

Sincerely,

Phillip S. Rogers
Executive Director



Ellis, Janie

From: Ett, Joanie M
Sent: Wednesday, November 14, 2012 12:34 PM
To: Ellis, Janie
Cc: Brothers, Sheila C
Subject: STEM PLUS program-change
Attachments: STEM PLUS Program-Change.pdf

Janie,

The Undergraduate Council has reviewed and recommends approval of changes to the STEM PLUS program. There are two courses currently in review with this proposal: SEM 423DL (which I just approved in eCATS and should come to you), and SEM 575 (which I just approved in eCATS and should go to Graduate Council).

Thanks,
Joanie

Joanie Ett-Mims
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University of Kentucky
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Lexington, KY 40506-0059
(859)257-9039 Phone
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joanie.ett-mims@uky.edu



Ellis, Janie

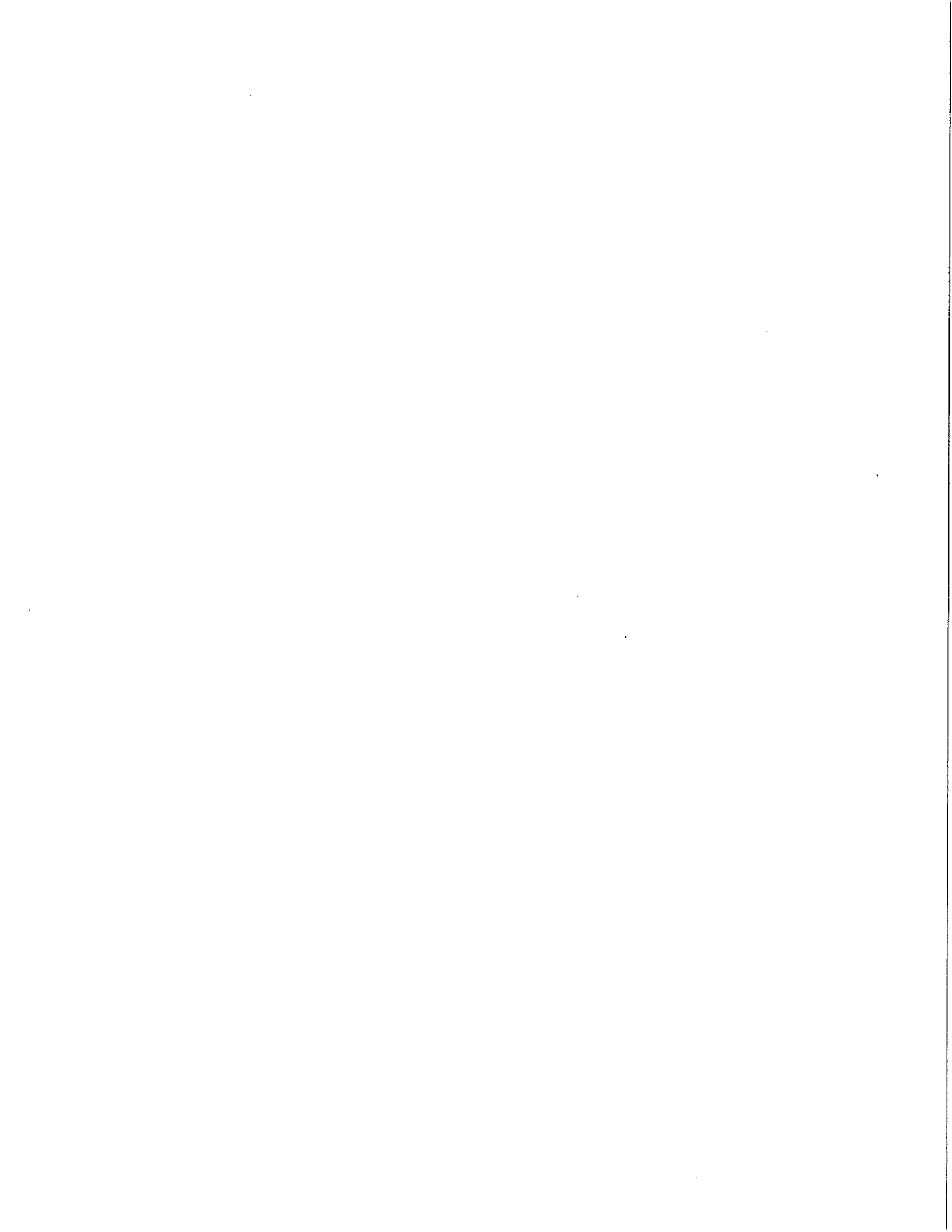
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Ellis, Janie

From: Schroeder, Margaret
Sent: Tuesday, March 12, 2013 10:24 AM
To: Ellis, Janie
Subject: Re: STEM Plus Program

Hi Janie-

Last time we talked about this course, I sent you the link to the course listed in the bulletin and you were going to check to see if this course was still being offered by the department.

I am OK with deleting the course from the proposal.

Thank you!
Margaret

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Margaret J. Mohr-Schroeder, PhD | Associate Professor of Mathematics Education | Secondary Mathematics Program Chair | [Department of STEM Education](#) | University of Kentucky

On Mar 12, 2013, at 10:20 AM, "Ellis, Janie" <janie.ellis@uky.edu> wrote:

We are only lacking GEO 230 to send this program to committee. If you still want to include GEO 230, please let me know the status as I am unable to find this course anywhere.

If you want to delete it from the requirements, send an email indicating that and I will attach to the proposal and forward to committee.

Thanks

Janie Ellis
Office of the Senate Council
257-5871

