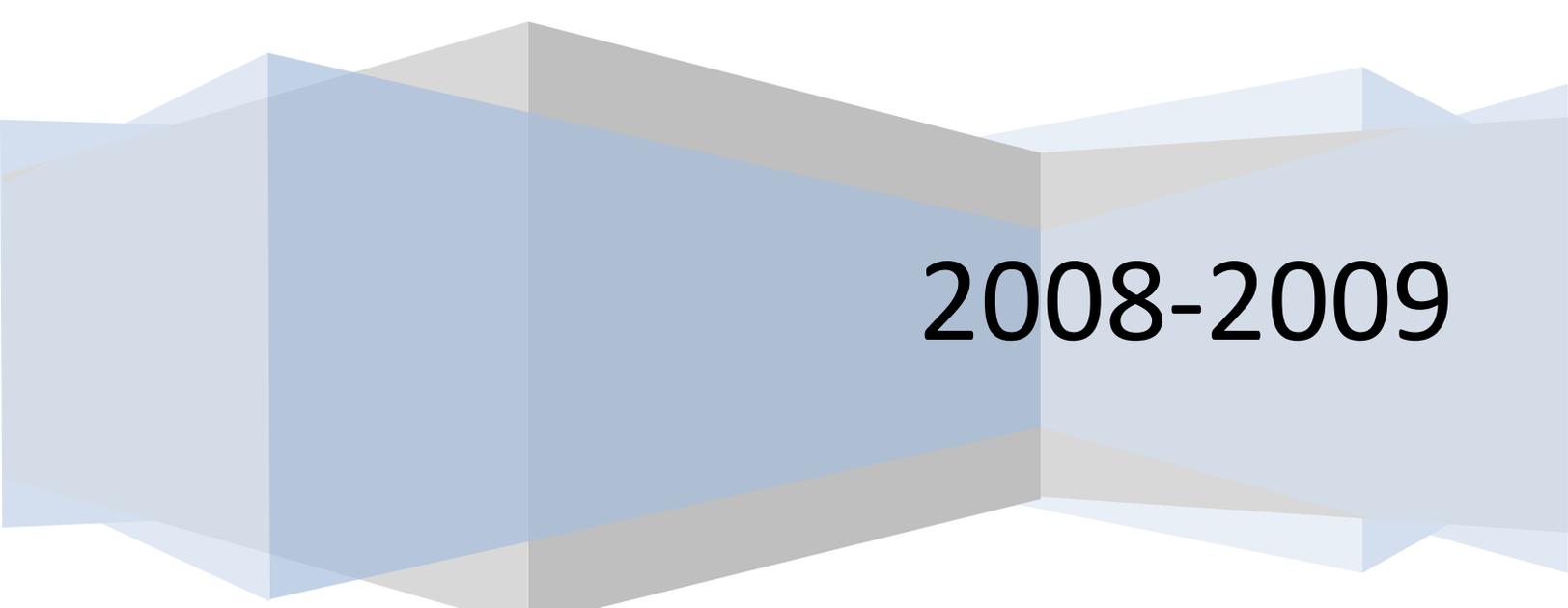


B.A. in Mathematics

Program Review Report

Department of Natural, Information, and Mathematical
Sciences, School of Arts and Sciences



2008-2009

I. Introduction

The Bachelor of Arts (B.A.) degree in mathematics is housed in the department of Natural, Information, and Mathematical Sciences (NIMS) in the School of Arts and Sciences at Indiana University Kokomo. It is designed to prepare individuals to understand the nature of truth and the concept of proof in the discipline of mathematics, to understand the application of mathematical techniques to other fields, and to formulate and solve problems mathematically. Students may select courses to enter graduate school in mathematics, to enter business or industry, or to teach mathematics at the secondary level. The B.A. in Mathematics serves primarily mathematics and mathematics education majors and students preparing for direct job-entry careers after graduation. It serves students preparing for graduate programs. The curriculum for the major is outlined in the table below.

Calculus I	MATH-M 215	5 cr.
Calculus II	MATH-M 216	5 cr.
Calculus III	MATH-M 311	4 cr.
Linear Algebra for Undergraduates	MATH-M 303	3 cr.
<i>Choose 1 course from Group A and 2 sequences from Group B OR 3 courses from Group A and 1 sequence from Group B</i>		
Group A		
Elementary Differential Equations with Applications	MATH-M 313	3 cr.
Topics in Euclidean Geometry	MATH-T 336	3 cr.
Discrete Mathematics	MATH-M 347	3 cr.
Elements of Probability	MATH-M 360	3 cr.
Elements of Statistical Inference	MATH-M 366	3 cr.
Elementary Complex Variables with Applications	MATH-M 415	3 cr.
Group B		
Introduction to Modern Algebra I & II	MATH-M 403/404	6 cr.
Introduction to Analysis I & II	MATH-M 413/414	6 cr.
Mathematical Models and Applications I & II	MATH-M 447/448	6 cr.
Numerical Analysis I & II	MATH-M 471/472	6 cr.
<i>Additional Requirement</i>		
General Examination in Mathematics (prior to graduation)		

There are currently three tenured faculty members in mathematics (all three at the associate professor level) who teach all the courses in the B.A. program including the upper-level mathematics courses required for the mathematics teaching option of the B.S. in secondary education. There was a fourth tenured position, which was not renewed after a resignation in 2005. In addition, there are three full-

time lecturers and several adjunct faculty members, who teach service courses and developmental courses in mathematics. The lecturers also teach 100-level courses in mathematics to elementary education majors.

The last program review for the B.A. degree in mathematics took place in 2002. The self study report was submitted by NIMS on March 6, 2002. The current review thus covers the period since March 2002. Data presented in this self study were gathered from a variety of sources including Indiana University's SIS (academic and administrative system), IU Kokomo's Registrar's Office, and IU Kokomo's Student Services.

II. Review Criteria

A. Program Role and Mission and Consistency with University Mission.

1. *Describe the ways in which the program advances the Campus' mission, vision, values, and strategic goals.*

IU Kokomo's current Mission Statement is the following:

The mission of Indiana University Kokomo, a regional campus of Indiana University, is to enhance the educational and professional attainment of the residents of north central Indiana by providing a wide range of bachelor's degrees, and a limited number of master's and associate degrees. Indiana University Kokomo is further dedicated to enhancing research, creative work, and other scholarly activity, promoting diversity, and strengthening the economic and cultural vitality of the region and the state through a variety of partnerships and programs.

IU Kokomo's current Vision Statement is the following:

Indiana University Kokomo aspires to become a regional institution of first choice recognized for providing critical opportunities for student success; acknowledged as a primary and engaged community resource; and valued as a campus where there are faculty, students, and professional staff active in research, creative work, and other scholarly activity.

NIMS' current Mission Statement is the following:

The mission of the Department of Natural, Information and Mathematical Sciences is to prepare students academically for entry into graduate programs and professional schools. Additionally, the department's mission is to provide a biology, chemistry, or mathematics baccalaureate education to enable students to be certified to teach these subjects at the secondary school level. Further, it is the unit's mission to prepare students for entry level employment opportunities in Mathematics, Information Systems, and the Biological and Physical sciences, and to provide science, mathematics and information systems courses to fulfill the core and programmatic requirements of all other academic units on campus, including Purdue University programs.

More specifically, the Mathematics Degree Goals, since the program was implemented, are:

- i. To understand the nature of truth in mathematics.
- ii. To understand the concept of proof in the discipline of mathematics.
- iii. To understand the application of mathematical techniques to other fields.

- iv. To formulate and solve problems mathematically.

There are several key relationships between the Mathematics Degree Goals and the overall Campus Mission and Vision. They are the following:

- i. To enhance education by contributing to critical thinking to give students the ability to reason quantitatively.
- ii. To prepare students for professional careers. Recent graduates in mathematics work as high school mathematics teachers as well as in accounting as quantitative analysts.
- iii. To enhance the educational and professional attainment of the residents of north central Indiana. Of the 11 graduates in mathematics since 2002, six are currently teaching high school mathematics in North Central and Central Indiana. Others are employed in accounting or in computing services.
- iv. To enhance education by equipping students with the skills needed to compete and stay current in the workplace, and by enabling students to apply quantitative tools creatively to the needs of society.
- v. To meet the state's shortage of qualified high school mathematics teachers.

2. List key relationships between the programs and external constituencies such as collaborations, partnerships with regional, community, state organizations, and/or businesses.

- i. Relation with the Indiana Council of Teachers of Mathematics (ICTM)

The mathematics faculty members have been organizing the Indiana State Mathematics Contest at IU Kokomo since its beginning in 1983. This annual contest is sponsored by the Indiana Council of Teachers of Mathematics (ICTM) and governed by policies approved by ICTM. There are several sites throughout the state where the contest is held including in Kokomo. The contest is open to any middle school, junior high school or senior high school student in the state of Indiana. Each participant receives a Certificate of Participation. Each student answering 75% or more of the test questions correctly is designated a Scholar and receives a certificate. The top three students in each category at each site are to be honored. Each student who scores among the top 5% throughout the state is to be designated an Outstanding Scholar and receives both a medal and a certificate. The top two students in each subject area on the state level are also to be recognized. This contest is really an effort to reach to the community and to encourage students to excel in mathematics. In 2004, 156 high school students participated in the contest at Indiana University Kokomo, in 2005, 39 participated, in 2007, 30 participated, and in 2008, 24 participated. The decline in participation has occurred throughout the state and reflects a change from using a mailing to using the internet to inform teachers about the contest. The mathematics faculty hopes to reverse the local decline in participation in 2009 by making the contest known to local superintendents and urging them to have mathematics teachers check the internet for contest information.

- ii. One of the mathematics faculty was ICTM treasurer from 1982 to 2000 and was responsible for all accounting and budgetary issues for ICTM. Even though this faculty member is not ICTM treasurer anymore, he remains active in the organization.

iii. In 2008, NIMS established a Board of Advisors, which consists of eight professionals in the community who will advise the department in its outreach activities and interactions with the community. One of the board members is a high school mathematics teacher at Taylor High School in Howard County.

iv. One faculty member (Symonds) has done mathematics consulting work with regional businesses, such as with Delphi in 2007, assisting them with mathematics problems.

v. One faculty (Carl Widland) has been very active in recent years (2007-2008) tutoring for the Literacy Coalition of Howard County for 1-3 hours per week to help prepare people for mathematics portion of Indiana’s GED Examination.

B. External and Internal Demand

Table 1. Internal Demand (newly admitted “mathematics” students at IU Kokomo)

	Spring 2005	Fall 2005	Spring 2006	Fall 2006	Spring 2007	Fall 2007	Spring 2008	Fall 2008
Internal transfers to major	0	0	0	0	0	0	0	0
New to campus	4	5	2	6	2	2	0	2
Total number of new Math B.A. majors	4	5	2	6	2	2	0	2
Total number of Sec. Ed. majors (Math Option)	NA	NA	NA	NA	NA	NA	6	10
Total number new admits	4	5	2	6	2	2	6	14

Table 1 shows what the demand for the B.A. degree in mathematics was all from new students to IU Kokomo from 2005 to 2008. It also includes data for the total number of new students admitted to the mathematics teaching option of the B.S. in secondary education for 2008 (data from the IU Kokomo’s School of Education). These data show that, in 2008, 16 newly admitted secondary education students had declared their intention to follow the mathematics teaching option, indicating that there will be a continuing demand from education students for these upper-level mathematics courses.

Table 2. List grants and contracts received by the program.

Fiscal Year	\$	\$
2005	0	0
2006	0	0
2007	0	0

None of the mathematics faculty members is active in research. Thus, they have full-time teaching loads and no release time for research (with the exception of Dr. Raghu Gompa who left in 2005, who had release time for research). Therefore, they did not apply for research grants or contracts during this time period (Table 2).

Table 3. List other financial resources generated by the program.

Fiscal Year	\$	\$
2005	0	0
2006	0	0
2007	0	0

No other financial resources were generated by the program (Table 3).

Table 4. Fall to fall retention data (data obtained Student Services), number of low enrolled classes (less than 10 students per section, number of cancelled classes, and number of graduates in mathematics.

Year	Fall to fall retention rate	Number of low enrolled classes	Number of cancelled classes	Number of graduates
2005	42.9 %	4	0	2
2006	46.1 %	3	1	4
2007	33.3 %	3	1	0
2008	-	3	1	1

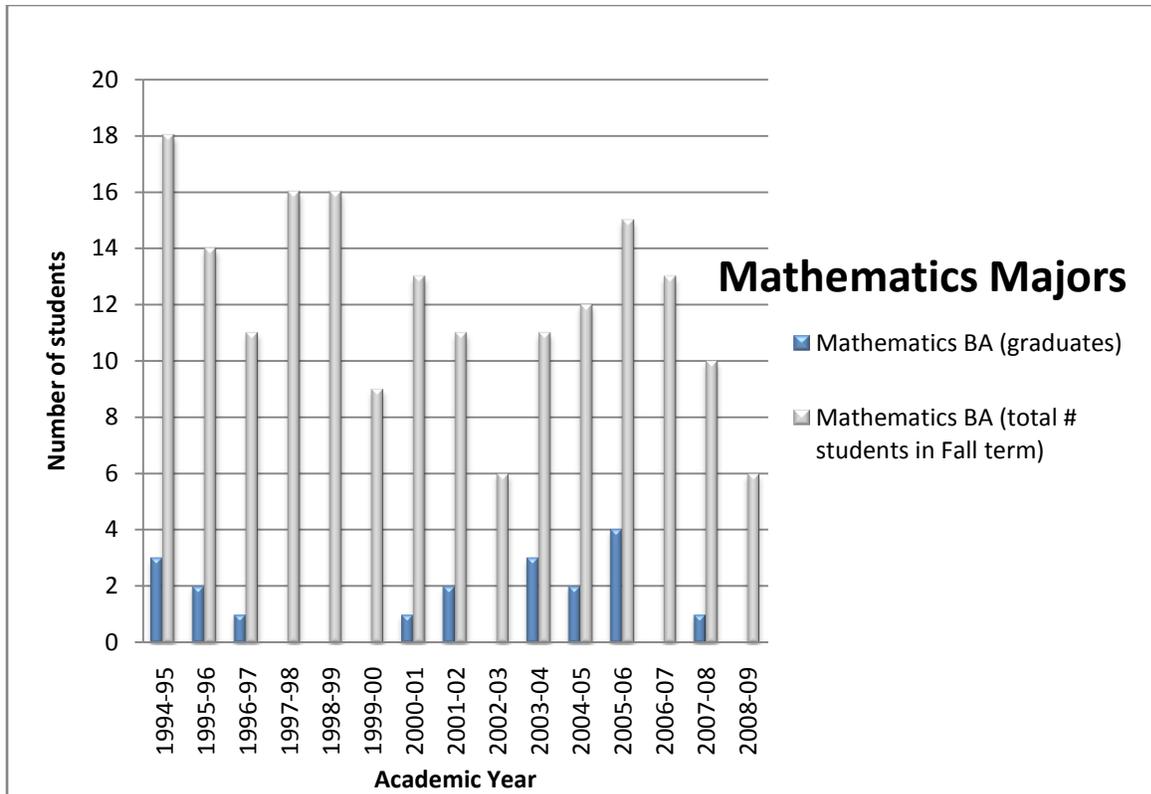


Figure 1. Number of majors and graduates in the B.A. in mathematics between 1994-95 and 2008.

Since the last program review was submitted by the mathematics faculty (March 6, 2002), 11 students have graduated at IU Kokomo with a B.A. in mathematics (Figure 1 and Table 5). During the seven academic years prior to March 6, 2002 (1994-95 to 2000-01), eight IU Kokomo students graduated with a B.A. in mathematics (Figure 1). The enrollment peaked in 2005-06, however it should be noted that students interested in teaching mathematics in high school are strongly encouraged to enroll in the mathematics teaching option of the B.S. in secondary education starting in 2006-07. This explains the decline in overall enrollment in the major.

Table 5. List of B.A. in mathematics graduates since March 6, 2002.

Student	Degree	Major	Graduation Date	Present Occupation
A	Bachelor of Arts	MATHBA	05/14/2002	H.S. Teacher
B	Bachelor of Arts	MATHBA	05/11/2004	H.S. Teacher
C	Bachelor of Arts	MATHBA	05/11/2004	H.S. Teacher
D	Bachelor of Arts	MATHBA	08/31/2004	Quantitative Analyst in Accounting
E	Bachelor of Arts	MATHBA	12/31/2004	Home maker and volunteer worker at her church
F	Bachelor of Arts	MATHBA	05/10/2005	Solutions Programming Engineer (computing) at Baker Hill, an Experian Company
G	Bachelor of Arts	MATHBA	06/30/2006	Unknown
H	Bachelor of Arts	MATHBA	06/30/2006	H.S. Teacher
I	Bachelor of Arts	MATHBA	08/31/2006	H.S. Teacher
J	Bachelor of Arts	MATHBA	08/31/2006	H.S. Teacher
K	Bachelor of Arts	MATHBA	05/06/2008	Program Administrator, Family Services, Indianapolis

In Table 5, all six of the high school teachers teach mathematics. Five of them work in North Central Indiana, whereas the sixth one works in Indianapolis (Indianapolis Public Schools). This clearly indicates that the mathematics program fulfills IU Kokomo’s mission by preparing high school teachers who work in North Central Indiana. The program also addresses the urgent need for Indiana to prepare more mathematic teachers for K-12 education. The Indiana Commission for Higher Education in “Reaching Higher with College Preparation – Preparing K-12 Teachers...” (June 2008) clearly states that there is a shortage of mathematics and science teachers in Indiana. The following is a quote from this document:

Shortage of Math and Science Teachers

As partners in the student preparation for success agenda, one of the most important contributions higher education can make is to help make sure there is sufficient supply of teachers qualified to teach all students to high levels of performance. Shortages of teachers in key content areas — mathematics, science, world languages and special education — challenge schools in their work to ensure that all students get the rigorous coursework that higher education and the global economy demand.

Table 6. Credit Hour and FTE Productivity by Major.

	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005	Fall 2005	Spring 2006	Fall 2006	Spring 2007	Fall 2007	Spring 2008
Student Credit Hours											
100- 200 credit hours*	65	85	50	125	35	155	70	90	75	115	25
300- 400 credit hour	36	30	33	48	48	33	12	23	15	27	48
Total credit hours	101	115	83	173	83	188	82	113	90	142	73

*100-200 credit-hours = MATH 215/216, which are also taken by other majors.

Table 7. Enrollment in mathematics courses at the 200-, 300-, and 400-level. The courses that are shaded are the ones that are specifically required by the mathematics B.A. and secondary education majors.

	M 215	M 216	M 311	M 303	M 313	M 347	T 336	M 360	M 366	M 415	M 403/ 404	M 413/ 414	M 447/ 448	M 471/ 472
Spring 2002		7		4			4				1			
Fall 2002	10							4						
Spring 2003		13			3		5		4					
Summer 2003				2										
Fall 2003	17		5								5			
Spring 2004		10		6							5			
Summer 2004					2									
Fall 2004	25		6					10			4			
Spring 2005		7		5			6		5					
Fall 2005	31		7								4			
Spring 2006		14									4			
Summer 2006					2									
Fall 2006	18		2					5						
Spring 2007		15					3		2					
Fall 2007	23		6								3			
Spring 2008		7		6		5					5			

In general, four or five mathematics B.A. courses have been offered on an annual basis (Table 7). This does not include courses taught either as an unpaid overload or as an independent study. Since 2007-2008, mathematics faculty members teach annually a total of five courses beyond MATH-M 215/M 216 which are offered as part of the B.A. in Mathematics and B.S. in Secondary Education degrees. These courses beyond MATH-M 215/M 216 total 16 credit hours or 2/3 FTE.

Table 8. Non-Major Credit Hour Productivity (all at the 100-level).

	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005	Fall 2005	Spring 2006	Fall 2006	Spring 2007	Fall 2007
Student Credit Hours										
100-200 credit hours										
300-400 credit hour										
Total credit hours*	2090	2802	2387	2997	2367	3106	2323	2608	1921	2515

*These data include Purdue enrollment data in cross-listed courses.

Table 9. Faculty FTE Productivity Based on Total Major and Non-Major Credit (from Tables 6 and 8). The total FTE was calculated for resident faculty (including lecturers when applicable) and adjunct faculty.

	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005	Fall 2005	Spring 2006	Fall 2006	Spring 2007	Fall 2007
Majors (credit hours)	101	115	83	173	83	188	82	113	90	142
Non-majors (credit hours)	1989	2687	2304	2824	2284	2918	2241	2495	1831	2373
Total Credit Hours	2090	2802	2387	2997	2367	3106	2323	2608	1921	2515
Total FTE (math major faculty, lecturers, & adjunct faculty)	8.98	10.6	8.74	10.24	8.56	10	8.8	10.24	8.32	8.56
Credit Hours per FTE	232.74	264.34	273.11	292.68	276.52	310.60	263.98	254.69	230.89	293.81
Full Time FTE										
Total FTE (resident "full time" faculty only)	6.58	6.52	5.86	5.92	4.96	5.68	4.96	4.96	4.72	4.96
Credit Hours per Full Time FTE	317.63	429.75	407.34	506.25	477.22	546.83	468.35	525.81	406.99	507.06

According to the IU 2007-2008 Fact Book, the IU Kokomo “Student Credit Hours per Full-Time Academic Appointment” ranged from 281 to 313 for the 2003-04 to 2007-08 period. During the same period, the student credit hours per full-time academic appointment in mathematics ranged from 317 to 547, which indicates a very high level of productivity by the mathematics faculty.

D. Program Quality

Describe activities of the program that lead to high program quality and provide documentation of how that quality is measured.

1. Provide evidence of the students' successful achievement of the program's learning outcomes.

The mathematics faculty members have been conducting assessment since 2004. As part of this process, an assessment plan and an assessment report are prepared annually. As an example, in 2007-2008, the Mathematics faculty assessed two student learning outcomes from Goal 3 of the Mathematics Assessment Plan concerning learning to formulate and solve problems mathematically.

Goal 3, Outcome 1. Students will be able to perform algorithmic and logical procedures to solve computational problems. This was assessed by evaluating coursework in M 215 (Fall 2007), M 311 (Fall 2007), and M 216 (Spring 2008).

Goal 3, Outcome 2. Students will be able to perform algorithmic and logical procedures to construct proofs. This was assessed by evaluating coursework in M 303 (Spring 2008), M 347 (Spring 2008), M 403 (Fall 2007), and M 404 (Spring 2008).

Student performance with regard to the outcomes being assessed was evaluated by reviewing a selection of relevant problems taken from the final exams of MATH-M 215, M 216, M 311, M 303, M 347, M 403 and M 404. In addition one student took the Mathematics General Examination, and that exam was carefully reviewed as part of the assessment process.

When reviewing a student's ability to perform algorithmic and logical procedures to solve computational problems, their work was judged to be at an acceptable level in this regard if they did not make many or serious errors performing algorithmic computations.

When reviewing a student's ability to perform algorithmic and logical procedures to write proofs, their work was judged to be at an acceptable level in this regard if as a minimum they could write some less simple proofs, but may have had difficulty with some more complex proofs.

The benchmark for student performance for courses with an enrollment of 10 or more students is that, using the performance criteria for the assessed outcome, 90% of students who earn a grade of C- or better in the course are judged to be working at an acceptable level. This benchmark of student performance was achieved in MATH-M 215. The benchmark for courses with less than 10 students enrolled is that at least 80% of the students who earn a grade of C- or better are judged to be working at an acceptable level. This was achieved in MATH-M 216, M 311, M 303, M 347, M 403, M 404, and the mathematics general exam.

The assessment results and performance levels achieved were in line with what is to be expected, and at this time the assessment results for the learning outcomes assessed do not indicate that any curriculum changes are necessary.

In the course of the 2007-2008 assessment of the Mathematics Major the Mathematics faculty discussed the Mathematics General Examination dating back nearly twenty years. Our experience has been that students take the four week open book take-home examination very seriously and prepare carefully for it. Since 2002, all potential mathematics graduates (100%) did pass the Mathematics General Examination and thus graduated from the program. We are confident that it is accomplishing what it set out to do, by providing a capstone experience which requires students to draw on the

mathematics learned over the course of their entire degree program and giving students the opportunity to demonstrate that they have acquired broad range of mathematical knowledge.

2. Provide outcome information on graduates as available, in particular, employment and enrollment in graduate programs. Information on exit exams, licensure, and other tests and exams should also be provided, especially when comparative results are available.

Students seeking a secondary school teaching license in mathematics in Indiana must take the ETS Praxis II Test: Mathematics: Content Knowledge. This is a two hour multiple choice exam. The ETS describes this exam as follows.

The Praxis Content Knowledge Test in Mathematics is designed to assess the mathematical knowledge and competencies necessary for a beginning teacher of secondary school mathematics. Examinees have typically completed a bachelor's program in mathematics or mathematics education. The examinee will be required to understand and work with mathematical concepts, to reason mathematically, to make conjectures, to see patterns, to justify statements using informal logical arguments, and to construct simple proofs. Additionally, the examinee will be expected to solve problems by integrating knowledge from different areas of mathematics, to use various representations of concepts, to solve problems that have several solution paths, and to develop mathematical models and use them to solve real-world problems.

All the prospective teachers pursuing the B.A. in Mathematics at Indiana University Kokomo have passed this exam on their first try. Many have taken the examination well before completing the degree program.

Six of the 11 graduates (64%) with a B.A. in mathematics since Spring 2002 work as high school teachers of mathematics in Central Indiana (Table 5). Three additional graduates work in the private sector as a programming engineer, a quantitative analyst in accounting, and a program Director with Family Services in Indianapolis. Thus they are using their mathematics expertise. Therefore, nine out of eleven recent graduates (82%) are employed as mathematicians or in a closely related field (Table 5). One graduate is a stay-at-home mother, and we do not have employment information regarding the eleventh graduate.

The fact that the mathematics program produces mathematics high school teachers clearly indicates that this program fulfills IU Kokomo's mission by preparing high school teachers who work in North Central Indiana. The program also addresses the urgent need for Indiana to produce more mathematic teachers for K-12 education as outlined by the Indiana Commission for Higher Education in 2008.

3. What steps has the program taken to develop pedagogical innovation and forward-looking curricula?

We have used the personal computer for many years to perform tedious calculations in MATH-M 303 and to solve differential equations numerically in MATH-M 313. More recently we have used the graphing calculator for the tedious calculations in MATH-M 303 and to replace tables for probability distributions in MATH-M 360-M 366.

Much of the mathematics credit hours are generated in courses satisfying the general education requirements of the campus or in preparing students to take the courses satisfying the general education requirements. We have introduced the graphing calculator and a computerized homework package called MyMathLab to address the poor preparation of admitted students and the lack of effort

in mathematics courses. This has demanded much curriculum development effort on the part of all the full-time mathematics faculty.

4. Provide evidence of advising effectiveness.

Mathematics courses and the mathematics degree program is arguably the most structured discipline and degree program with regard to knowledge prerequisites for courses. Students advised by the mathematics faculty were prepared for the courses in which they registered. Since the introduction of the B.S. in Secondary Education, many prospective high school mathematics teachers are admitted into the Division of Education, and there has been an increasing number of students registering for mathematics courses for which they have not met the prerequisites.

5. Describe specific efforts aimed at student success and retention; if possible, include the numbers of students, faculty, and staff involved in these initiatives, and provide evidence of the effects of these activities quantitatively and qualitatively.

The mathematics faculty members regularly teach classes either as an unpaid overload or and as an independent study course in order to facilitate student progress toward graduation (Table 12). For example, Robin Symonds taught MATH-M 404 in Spring 2004 so that three students could graduate that semester, MATH-M 313 in Summer 2004 so that one student could fulfill the mathematics course requirements for secondary school mathematics teacher certification and another student could graduate at the end of the summer term. He also taught MATH-M 313 in Summer 2006 so that two students could fulfill the mathematics course requirements for secondary school mathematics teacher certification (Table 10). This shows a strong commitment to the degree program and to student success.

Table 10. Mathematics faculty teaching overload since 2002.

Faculty	Semester	Course	Number of Students
Robin Symonds	Spring 2002	MATH-T 336*	4
Robin Symonds & Carl Widland	Summer 2003	MATH-M 303*	2
Robin Symonds	Spring 2004	MATH-M 404*	5
Robin Symonds	Summer 2004	MATH-M 313*	2
Robin Symonds	Summer 2006	MATH-M 313*	2
Mary Hansen	Fall 2003	MATH-M 311	5

*unpaid overload

One secretary (half-time effective Fall 2008) in the department is specifically assigned to both the mathematics and informatics programs. In addition to working with mathematics faculty on a day-to-day basis, this secretary performs the following important tasks that are related to student success:

- She contacts students every semester prior to registration period to remind them to make an advising appointment.

- She arranges advising appointments and files student dossiers.
- She contacts students during the registration period to follow up with them and remind them to register.
- She processes student evaluations of teaching for the entire department.

7. Provide evidence of faculty engagement in scholarship and service in the tables below.

Table 11. Faculty Extramural Research Awards

Year	Number	Amount
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0

As previously mentioned, none of the mathematics faculty members is active in research and thus have full-time teaching loads and no release time for research (with the exception of Dr. Raghu Gompa who left in 2005, who had release time for research). Therefore, there is no research expectation.

Table 12. Faculty Scholarly Publications.

Year	Books	Chapters	Refereed Journal Articles	Refereed or Invited Presentation
2003	0	0	1	0
2004	0	0	1	0
2005	0	0	0	0
2006	0	0	0	0
2007	0	0	0	0

As previously stated, none of the mathematics faculty members is active in research and thus have full-time teaching loads and no release time for research (with the exception of Dr. Raghu Gompa who left in 2005, who had release time for research). Therefore, there is no research expectation. Dr. Gompa is the author of the two publications in 2003 and 2004.

Faculty Service and Engagement

Raghu Gompa

2003

Service and Engagement

University, IUK, division

- Parliamentarian for Faculty Senate, 2003-2004
- Retention Action Plan Committee, 2002-2003
- Chair, Mathematics Program Review, 2001-2003
- Faculty Affairs Committee, UFC, 2002-2003, 2003-2004
- Agenda Committee, IUK Faculty Senate, 2003-2004
- Claude Rich Selection Committee, IUK, 2002-2003
- FACET campus selection committee, IUK, 2003-2004
- Faculty Advisor, Mathematics Club at Indiana University Kokomo, 2002-2003
- Department Liaison to Mathematical Association of America, 2003
- Women Studies Council, IUK, 2002-2003
- Peer Review for Dr. Kasem Kasem for induction to FACET
- Peer Review for Dr. John Ross for promotion to full professor
- Helped Dr. Carl Widland with search for literature on topics related to his research interest
- Participated in Undergraduate Research/Mentoring Meeting, IUPUI, January 17, 2003

Professional Associations

- Reviewer for Mathematical Reviews, American Mathematical Society
- Department Liaison to Mathematical Association of America
- Faculty Advisor to Mathematical Association of America Student Chapter at IUK
- Serving on Conference Committee for 5th WSEAS (World Scientific and Engineering Academy and Society) International Conference on Applied Mathematics, Miami, FL, April 2004
- Serving on Technology Committee for Northwestern School Corporation, 2002-2003

2004

Service and Engagement

University, IUK, division

- Parliamentarian for Faculty Senate, 2003-2004
- Faculty Affairs Committee, UFC, 2003-2004

- Agenda Committee, IUK Faculty Senate, 2003-2004
- FACET campus selection committee, IUK, 2003-2004
- Faculty Advisor, Mathematics Club at Indiana University Kokomo, 2003-2004
- Department Liaison to Mathematical Association of America, 2004
- Women Studies Council, IUK, 2003-2004
- Helped Dr. Carl Widland with search for literature on topics related to his research interest
- Volunteered to organized a speaker for local high school students

Professional Associations

- Reviewer for Mathematical Reviews, American Mathematical Society
- Department Liaison to Mathematical Association of America
- Faculty Advisor to Mathematical Association of America Student Chapter at IUK
- Serving on Conference Committee for 5th WSEAS (World Scientific and Engineering Academy and Society) International Conference on Applied Mathematics, Miami, FL, April 2004
- Serving on Conference Committee for 5th WSEAS (World Scientific and Engineering Academy and Society) International Conference on Automation & Information, Venice, Italy, November 2004
- Serving on Technology Committee for Northwestern School Corporation, 2003-2004

2003-2004

Faculty Awards

- NA

Professional recognition outside University

- NA

Awards and special recognition of students

- NA

Robin Symonds

2003

Service and Engagement

University, IUK, division

- Mathematics liaison for the Advanced College Project at IUK
- NIMS representative on Continuing Studies Life Experiences Evaluation Advisory Committee
- IUK representative on University Intercampus Transfer of Credit Adjudication Committee
- NIMS representative on Arts and Sciences Dean's Advisory Group
- Served on Arts and Sciences General Education Review Task Force
- Chaired IUK Faculty Senate Calendar Committee
- IUK site coordinator for State Mathematics Contest, April 2003

Professional associations

- Co-Chaired Materials Sales Committee for National Council of Teachers of Mathematics Meeting, Indianapolis, January 2003

2004

Service and Engagement

University, IUK, division

- Mathematics liaison for the Advanced College Project at IUK
- NIMS representative on Continuing Studies Life Experiences Evaluation Advisory Committee
- IUK representative on University Intercampus Transfer of Credit Adjudication Committee
- Served on Arts and Sciences General Education Review Task Force
- Chaired IUK Faculty Senate Calendar Committee
- IUK site coordinator for State Mathematics Contest, April 2004

2005

Service and Engagement

University, IUK, division

- Mathematics liaison for the Advanced College Project at IUK
- IUK representative on University Intercampus Transfer of Credit Adjudication Committee
- IUK site coordinator for State Mathematics Contest, April 2005
- Led IUK mathematics faculty in writing Comprehensive Test for 2005 State High School Mathematics Contest
- Served on NIMS Committee reviewing performance of chairperson of the department

2006

Service and Engagement

University, IUK, division

- Mathematics liaison for the Advanced College Project at IUK
- IUK representative on University Intercampus Transfer of Credit Adjudication Committee
- IUK site coordinator for State Mathematics Contest, April 2006
- Led IUK mathematics faculty in writing Comprehensive Test for 2006 State High School Mathematics Contest
- Served on NIMS Committee reviewing performance of chairperson of the department
- Chaired Arts and Sciences Committee reviewing performance of the Dean
- Parliamentarian of Faculty Senate

2007

Service and Engagement

University, IUK, division

- Mathematics liaison for the Advanced College Project at IUK
- IUK representative on University Intercampus Transfer of Credit Adjudication Committee
- IUK site coordinator for State Mathematics Contest, April 2007
- Led IUK mathematics faculty in writing Algebra I Test for 2007 State High School Mathematics Contest
- Served on Search & Screen Committee for two Lecturer in Mathematics positions
- Serving as mentor for one of the two new Lecturers in Mathematics
- Member of Arts and Sciences General Education Committee
- Parliamentarian of Faculty Senate

2003-2007

Faculty Awards

- NA

Professional recognition outside University

- NA

Awards and special recognition of students

- NA

Mary Hansen

2003

Service and Engagement

University, IUK, division

- NIMS P&T Committee
- Assessment Committee

Professional associations

- Assisted with State High School Mathematics Contest

2004

Service and Engagement

University, IUK, division

- Faculty Senate Assessment Committee, 2003-2004
- NIMS P&T Committee, 2004-2005
- Faculty Senate Assessment Committee, 2004-2005
- Assessment Council, 2004-2005
- Joint Committee on Indiana Professional Standards, 2004-2005

2005

Service and Engagement

University, IUK, division

- Faculty Senate Assessment Committee, Chairperson, 2004-2005
- Assessment Council, 2004-2005
- Joint Committee on Indiana Professional Standards, 2004-2005
- Strategic Planning Committee (Mission Statement subcommittee), 2004-2005
- Assessment Council, 2005-2006
- Joint Committee on Indiana Professional Standards, 2005-2006

2006

Service and Engagement

University, IUK, division

- Joint Committee on Indiana Professional Standards, 2005-2006
- Joint Committee on Indiana Professional Standards, 2006-2007

2007

Service and Engagement

University, IUK, division

- Assessment Council, 2006-2007
- Joint Committee on Indiana Professional Standards, 2006-2007
- Search and Screen Committee for Lecturer in Mathematics positions
- Assessment Council, 2007-2008
- Joint Committee on Indiana Professional Standards, 2007-2008

Professional associations

- Helped proctor Indiana State High School Mathematics Contest

2003-2007

Faculty Awards

- NA

Professional recognition outside University

- NA

Awards and special recognition of students

- NA

Carl Widland

2003

Service and Engagement

University, IUK, division

- Member of Educational Policies Committee

Professional associations

- Participated in State High School Mathematics Contest

2004

Service and Engagement

University, IUK, division

- Member of Educational Policies Committee

Professional associations

- Participated in State High School Mathematics Contest

2005

Service and Engagement

University, IUK, division

- Served on All Campus Promotion and Tenure Committee'

Professional associations

- Helped write Comprehensive Examination for State High School Mathematics Contest

2006

Service and Engagement

University, IUK, division

- Served on All Campus Promotion and Tenure Committee
- Served on Trustees Teaching Award Committee

Professional associations

- Proctored exam for State High School Mathematics Contest

2007

Service and Engagement

University, IUK, division

- Served on All Campus Promotion and Tenure Committee
- Served on Trustees Teaching Award Committee

Professional associations

- Proctored State High School Mathematics Contest
- Tutored for Literacy Coalition of Howard County for 1-3 hours per week to help prepare people for mathematics portion of Indiana's GED Examination.

2003-2007

Faculty Awards

- NA

Professional recognition outside University

- NA

Awards and special recognition of students

- NA

E. Potential

Describe the relationship between current resources and program capacity. Support your responses with substantive explanations and forecasts based on measurable trends and other data.

- 1. What is the program's maximum capacity for majors and minors with current resources? What is the maximum for service courses? In the last five years, what steps have been taken to strengthen the program and increase enrollment, and eliminate underused capacity?**

With current resources and course offerings the mathematics program could handle up to 15 majors graduating each year. This is based on courses having a maximum enrollment of 30 students, and takes into account that most upper level courses are currently offered only every other year, with juniors and seniors taking the classes together. There is capacity for another 15 students to minor in mathematics. Note that this maximum capacity includes both those students pursuing a B.A. in Mathematics and those working towards the B.S. in Secondary Education with the aim of becoming high school mathematics teachers. All the courses in the program are taught by the three Ph.D. mathematics faculty members. On an annual basis these faculty teach a total of five courses beyond MATH-M 215/M 216 which are offered as part of the B.A. in Mathematics and B.S. in Secondary Education degrees. These courses beyond MATH-M 215/M 216 total 16 credit hours or 2/3 FTE.

The six full time members of the mathematics faculty typically teach a total of 22 to 23 sections of the service courses MATH-M 007, M 117, M 125/MA 153, M 126/MA 154, M 118, M 119/MA 221, M 120/MA 222, T 109, T 110, K 310/S 301 and I 201 during the spring and fall semesters. An additional 25 to 26 sections of MATH-M 007, M 117, M 125/MA 153, T 109 and T 110 are taught by adjunct faculty. Each of these sections of service courses has a capacity of 30 to 35 students. A further 8 sections of MATH-M 007, M 117, M 125/MA 153, M 126/MA 154, M 118 and M 119/MA 221 are offered during the two summer sessions. The total capacity of all the service courses each year is 1625 students (4876 credit hours).

One step that has been taken to strengthen the B.A. in mathematics program is the introduction of a new course, MATH-M 347, Discrete Mathematics (in Spring 2008). The addition of this course to the mathematics curriculum serves two purposes. Firstly, it provides a course in discrete mathematics which is a requirement for the mathematics B.S. in Secondary Education degree. Secondly, while covering topics in discrete mathematics, MATH-M 347 emphasizes a thorough introduction to proof techniques and, with MATH-M 303, serves as a bridge between the computational coursework of calculus and the more abstract concepts of senior level mathematics courses.

- 2. Has the program implemented any measures to increase efficiency in the last five years? Describe any reallocations of greater efficiency within the program or department. How might the program improve productivity through consolidation or through internal/external partnerships?**

Following the resignation of one tenured faculty member and the retirement of two senior lecturers, two mathematics lecturers were hired in August 2007. As a result the program now has one fewer tenure-track faculty member than before (prior to 2005), and is currently staffed with three tenured associate professors, one senior lecturer, and two lecturers in mathematics. Since all the majors courses are taught by tenure-track faculty, the program is operating with the minimum possible number of tenure-track faculty. Of the service courses, all sections of MATH-M 118, M 119/MA 221, M 120/MA 222, and K 310/S 301 are taught by full time

mathematics faculty. To improve efficiency in the teaching of the service courses, the number of sections taught each year has been reduced due to declining enrollment.

3. Goals for the future.

I. Student enrollment in mathematics.

The mathematics faculty members understand that there is a need to attract good students to the mathematics B.A. program in order to continue to grow the program. To reach that goal, the mathematics faculty members propose that (and with collaboration from the campus) grant proposals be written to various agencies to raise funding for student scholarships in mathematics. We propose to submit at least three such proposals per year starting in 2009. We will also solicit funding from private donors in the community. The following funding agencies have been preliminarily identified for this endeavor:

- i. The National Science Foundation through the NSF Scholarships in Science, Technology, Engineering, and Mathematics (S-STEM). This program specifically “makes grants to institutions of higher education to support scholarships for academically talented, financially need students...”
- ii. The Lilly Endowment Foundation.
- iii. Other private foundations that support higher education (e.g., the HP Foundation, the DuPont Foundation, the Texas Instruments Foundation). The Texas Instruments Foundation, in particular, has a scholarship program for students seeking a college degree in mathematics.

The goal is to receive one grant by the end of 2010 and to be able to start offering scholarship(s) to freshman students in 2011.

II. Program Growth through Synergy with other Degree Programs in NIMS

The mathematics program can gain enrollment in upper-level courses from a closer collaboration with other NIMS faculty members and degree programs. Examples of that include the following.

- i. The mathematics faculty members have initiated a discussion with other faculty members in NIMS in order to develop a one-year freshman learning community course for all NIMS students. This would be a way to nurture science and mathematics students and to further develop a sense of community among these students. The goal is that such a course could be offered as a pilot in 2009-2010. Another goal is for NIMS majors (other than in mathematics) to be encouraged to take more advanced mathematics courses as part of their curriculum.
- ii. The NIMS Pre-Professional Club was created in 2008. The club is for all NIMS students and its membership includes several mathematics majors. The club’s goals are to increase opportunity for social activities, for learning about future professions, for interacting with professionals (through workshops and guest speakers), and for building a better resume. Working with the students, we will continue to strongly encourage mathematics majors to participate in the activities of the club. The goal is that some mathematics majors are club members every year and that at least one club activity per year relates directly to the mathematics program.
- iii. Currently, the informatics B.S. program has several “cognate areas”, one of which in mathematics. We will closely collaborate with the informatics faculty to better promote the mathematics cognate area and attract students to it.

III. Faculty Retirement and Replacement

Two mathematics faculty members are planning to retire within the next three years. The mathematics faculty members propose that both positions be renewed. One position should be used to hire a mathematical analyst (e.g., numerical analyst). Such a hiring would make it easier to offer available courses in applied mathematics. In fact, Dr. Gompa (who resigned in 2005) was hired as an analyst in 1987 to provide a breadth of expertise within mathematics. Recently the only 400-level sequence that has been offered has been MATH-M 403-M 404, Introduction to Modern Algebra I – II, because that is required for secondary mathematics teachers and most of the students were seeking to become secondary mathematics teachers. Restoring the breadth of expertise in mathematics would make it easier to offer MATH-M 413-414, Introduction to Analysis I-II, MATH-M 447-448, Mathematical Models and Applications I-II, and MATH-M473-M 474, Numerical to Analysis I-II more often. These are better choices for students seeking employment upon graduation, and offering these sequences more often would allow IU Kokomo to promote this option (applied mathematics) for degree program graduates more extensively. This would allow the B.A. in mathematics to be further differentiated from the Secondary Education option.

We anticipate that there is an opportunity for growth in the area of applied mathematics. Greater synergies with biology, chemistry, and informatics programs would increase demand for applied mathematics. IU South Bend and IUPUI both offer B.S. programs in Applied Mathematics. This option would need to be properly marketed and promoted for it to be successful in the region. This is an excellent option for students who would want to consider a career in business, statistics (including biostatistics), engineering, and other closely related fields.

F. Additional Information

1. Cost

The B.A. in Mathematics course offerings include only five courses per year that are specific to this program: MATH-M 311, MATH-M 303, MATH-M 347 or MATH-T 336, MATH M 360-M 366 or MATH M 403-M 404. When a mathematic faculty member teaches one of these upper-level courses, he/she needs to be replaced in a lower-level course (e.g., MATH-M 125) by an adjunct faculty member. Therefore, the cost of the mathematics B.A. program is only five adjunct course salaries annually.

2. The Mathematics Teaching Option of the B.S. Secondary Education is a high priority

The courses regularly offered to complete the mathematics degree are also required for the mathematics teaching option of the B.S. in Secondary Education. The mathematics courses regularly offered to complete the mathematics degree also permit Indiana University Kokomo students to pursue middle school mathematics teaching certification and certification in mathematics as a minor teaching area. Currently certified high school mathematics are in short supply nationally and particularly in Indiana. Retirements among Indiana high school mathematics teachers will increase as those entering the profession under special programs initiated after Sputnik reach retirement age.

As previously mentioned, the Indiana Commission for Higher Education in “Reaching Higher with College Preparation – Preparing K-12 Teachers...” (June 2008) clearly stated that there is presently a shortage of mathematics and science teachers in Indiana. In response to this need,

the Lilly Foundation and Governor Daniels are offering or proposing special programs to increase the supply of fully certified high school mathematics teachers in Indiana.

In addition, a national initiative to address science and mathematics teacher shortages has recently been announced by the National Association of State Universities and Land-Grant Colleges (NASULGC).

President Obama has also promised to make mathematics and science education a national priority.

“Make Math and Science Education a National Priority: Obama and Biden will recruit math and science degree graduates to the teaching profession and will support efforts to help these teachers learn from professionals in the field. They will also work to ensure that all children have access to a strong science curriculum at all grade levels.”

[\(http://www.whitehouse.gov/agenda/education/\)](http://www.whitehouse.gov/agenda/education/)

President Obama has plans to create a teaching scholarship program (“Teacher Service Scholarships”) to recruit graduates with backgrounds in mathematics and science to teach in K-12 classrooms.

This is a time when it is particularly important to support such programs, and although in the future, fewer graduates in the B.A. mathematics program are likely to pursue careers as high school teachers, it is the existence of the B.A. in mathematics program that makes it possible for the mathematics B.S. in Secondary Education to be offered on the IU Kokomo campus.

Further it is well known that regional campus graduates are more likely to take positions in the region. Five of the six program graduates who have become high school mathematics teachers are employed in the Indiana University Kokomo service region and the sixth is employed in the Indianapolis public schools.

3. Diversity

More than 90% of new admits to Indiana University Kokomo are unprepared for college level mathematics courses upon admission and underperform in developmental courses largely for lack of appropriate effort. Freshmen enrolled in MATH-M215-M216, students enrolled in 300- and 400-level mathematics courses, and students completing a degree in mathematics offer role models of effort and success in challenging courses. A vast proportion of our society is quantitatively illiterate, our society accepts mathematical ignorance, and that is affecting our economy. The presence of students pursuing and succeeding in advanced mathematics courses provides evidence that quantitative illiteracy is not inevitable and ought not be accepted.

4. Degree Expectation

An article in the New York Times (October 13, 2008) spotlighted some of the serious problems that have emerged in the No Child Left Behind law. Among the law's unintended consequences, as Sam Dillon reported, has been its tendency to "punish" states that "have high academic standards and rigorous tests, which have contributed to an increasing pileup of failed schools."

(From The New York Times, October 14, 2008; Bob Herbert, Op-Ed Columnist)

The B.A. in Mathematics offers a rewarding and challenging option for the small minority of Indiana University Kokomo students who are well prepared for college and who accept rather than avoid high expectations. Such degree programs should be exalted.

5. Mathematics-Related Careers

The IU Kokomo B.A. in mathematics and the secondary education program will continue to produce high quality mathematics teachers. In addition to this important area, there are additional needs in the workforce for mathematicians and statisticians. According to the National Institute of Health (NIH) Office of Science Education (<http://science.education.nih.gov>), the “median annual wage-and-salary earnings of statisticians were \$65,720 in May 2006. The middle 50 percent earned between \$48,480 and \$87,850. The lowest 10 percent earned less than \$37,010, while the highest 10 percent earned more than \$108,630. The average annual salary for statisticians in the Federal Government was \$85,690 in 2007, while mathematical statisticians averaged \$96,121.” The NIH further adds that “... growth is expected in employment of statisticians over the 2006-16 period. Biostatisticians should experience employment growth, primarily because of the booming pharmaceuticals business”. Graduates with strong background in biology or computer science should have excellent prospects of finding jobs. This nation-wide trend suggests that there is a potential for an excellent synergy between the B.S. in informatics degree and the B.A. in mathematics degree at IU Kokomo (especially with a focus on applied mathematics). The informatics degree offers a cognate area in mathematics, which needs to be better promoted. Talented students would benefit enormously from an education that combines both mathematics and informatics.

In a January, 2009 press release, CareerCast.com listed the ten best jobs. The top six were (in order) mathematician, actuary, statistician, biologist, software engineer, and systems analyst. The top three are part of mathematics, and undergraduate mathematics majors are often recruited for positions as software engineers or systems analysts. The Ohio State University recently announced a new master’s degree program in mathematical biology; applicants are required to have significant undergraduate mathematics coursework but no courses in biology are required.

6. Distinguishing Feature

At a time when Indiana University Kokomo seeks to distinguish itself from IVY Tech, the presence of a B.A. degree program in mathematics is a major distinguishing feature.

**Outside Reviewer's Report
For the Mathematics Program
At Indiana University Kokomo
Spring Semester 2009**

**Dr David W. Kinsey
University of Southern Indiana**

Introduction

In January of 2009 I was contacted by Dr. Christian Chauret, Chairperson of the Department of Natural, Information and Mathematical Sciences at IU Kokomo who extended the formal invitation to serve in this capacity. Dr. Chauret indicated that the formal review document was in the construction process and would be forwarded to me well in advance of my on campus visit. The construction of this written document closely follows the Program Review Report Template created and issued by the University's Administration. I received this completed document well before the scheduled on site visit.

The on-campus visit occurred on March 9 and the morning of March 10. I met with Stuart Green, Interim Chancellor, Dr. Steven Saratore, Interim Vice Chancellor, Sue Giesecke, Dean of Arts & Sciences and Dr. Christian Chauret, Chairperson of Natural, Informant and Mathematical Sciences. And I also met individually with the senior mathematics faculty, Dr. Robin Symonds, Dr. Mary Hansen and Dr. Carl Widland and collectively with the Lecturers Barbara Sehr, Linda Krause and Joshua Gottemoller. Dr. Symonds gave me a tour of the Math Lab and tutor area, the dedicated and most frequently used mathematics classrooms, office area and a brief tour of campus. The comments that follow come from conversations with the administrators, faculty and staff members and from examination of the Bulletin and other information found on the IUK web site. The following remarks are structured to adhere to the format that can be found in section III of the Program Review Report Template.

Program Role

In this report the phrase 'Mathematics Program' is taken in its broadest context and refers to all of the courses offered by the program, the faculty who teach these many and varied courses and the majors in mathematics and secondary mathematics teaching. It is recognized that prospective secondary mathematics teachers and mathematics majors enroll in virtually all of the same courses. Hence there will be frequent couplings of these two majors, even though the prospective teachers are advised in the Department of Education.

The Mathematics Program has a precise, minimal set of goals that are quite understandable. The report shows how these concise goals are compatible and supportive of the University's mission and vision. Certainly students from the geographic area served by the IU Kokomo campus who successfully complete their majors in

mathematics or mathematics teaching will be prepared for employment opportunities within and outside of this geographic area. Overall course offerings within the program are traditional. They appear to be well organized and follow the guidelines of the three major professional organizations within the mathematics community, the National Council of Teachers of Mathematics (NCTM) for the teacher education (T) courses, the Mathematical Association of America (MAA) and the American Mathematical Society (AMS) for courses in the major. These courses, many of which lie outside of entry level algebra offerings are quite varied in content and serve large numbers of students.

The strong qualifications of the senior faculty, the well qualified lectures and a veteran group of adjunct teachers contribute to uniformity in content coverage and performance expectations from semester to semester and year to year. Nearly all Mathematics Programs in this country are service oriented and this Program follows in that vein. This role is quite challenging since individuals in other disciplines, both faculty and students frequently bring different content and performance standard expectations than the faculty teaching these courses. If departmentalization, which was addressed at length in the 2002 review report is not to be a reality then there needs to be a designated spokesperson, perhaps titled "Mathematics Coordinator", for the Mathematics Program. This individual needs to be thoroughly grounded in mathematics and be taking an active part in the teaching of mathematics classes. This position is essentially a chairperson with a different title who reports and works closely with the NIMSS chairperson. Several of the problem areas discussed during the site visit and addressed in this report are directly related to the absence of such a "Program Coordinator". This position will become even more important as senior faculty retires and replacement faculty enters the program. There was clear evidence while on site that the senior faculty and lecturers are a compatible group and work together, however, it is difficult to lead a program by committee.

Internal Demands

The list of courses appearing in the catalogue and on the semester schedules numbered below Math 215, Calculus I, are evidence that this Program is oriented toward service. Professional programs, such as Business and Teacher Education provide large numbers of students who need special topics found in specialized mathematics courses. The coordinator of the semester schedules, currently Dr. Hansen, has the unenviable task of dealing with the predominately service area of the program. Consequently she, and others who have held this position in the past, knows more about this internal demand than any other individual on campus. The addition of Math-M 347, Discrete Mathematics shows awareness on the part of the faculty to keep their intermediate level offerings current. This course provides an opportunity to bring in new enrollees from several majors on campus. The expressed need for a course whose content is selected primarily to meet the needs of students majoring primarily in the Humanities should be addressed as soon as possible. Such "Liberal Arts" mathematics courses have been around for decades and can provide those students an alternative to the traditional algebra sequence. It is also a course that helps distinguish the IUK Mathematics Program from IVY TECH Community College's (ITCC) offerings.

Student placement and class size for entry level mathematics classes is frequently an issue on many campuses. The use of a nationally normed placement test is prudent and its results are revealing. It is unfortunate, however not surprising, to find large numbers of entering students who are poorly prepared for university mathematics courses. The program appears to be dealing fairly well with this difficult issue. This mathematics program has been able to hold nearly all class enrollments to below thirty students. That has obvious benefits for students and faculty. The computer lab was excellent and needs more usage. A similar remark holds for the tutoring area. Prospective secondary teachers should be strongly encouraged to tutor in small groups. It was good to hear that several persons from off campus come in to assist with this activity. Classroom teachers need to advertise its availability and encourage its use. This clearly generates a **win-win** situation for the students and the teaching faculty.

External demand

Aside from the ICTM Math Contest there is minimal evidence of the Program's reaching out into the IUK region in a professional manner. The declining number of math contest participants point to just how difficult it is to generate successful outreach activities. Dr. Widland's tutoring activities is highly commendable and speaks volumes about him, unfortunately in the academic community service doesn't rank with scholarship and professional productivity.

The one area that is apt to be most fertile in the next five years is in providing special activities such as seminars, workshops, etc. for middle and secondary school mathematics teachers. This will not be an easy sell for some very obvious reasons but it does provide an opportunity to engage both senior faculty and lecturers in professional development. It helps to improve the knowledge base of mathematics teachers in the region which in turn should help improve the mathematical skills of their students. This in turn improves the quality of IUK's incoming students who currently have documented low math capabilities. Professional development of area mathematics teachers can also raise awareness of career opportunities for majors served by the department, both in and out of mathematics teaching and could ultimately help reduce the problem of low enrollments in upper level math courses. This is a huge task and one that is apt to be quite frustrating; however, the rewards are great for the participating teachers and their students, the Mathematics Program and IU K. The fact that IUK is the dominate educational leader in this region lends support for the potential success of such in-service teacher training activities.

Another avenue for recruitment of potential majors may lie in the upgrade to the NIMS's web-site. This issue was addressed in the 2002 report and it appears that there has been little activity addressed to this area. Dr. Chauret is currently working to improve the site's image. The number of students from within the region who are attracted by such a tool needs to be examined. A good web-site would undoubtedly yield greater returns were IUK recruiting students from outside the geographic region.

Program quality

The Program Review Document provides evidence that attempts began in 2004 to measure students' attainment of program goals, specifically parts one and two of goal three. The findings from seven different courses in the major indicate that current teaching practices are working and that students are learning. Current low enrollments make this a "do-able" activity, but as enrollments hopefully grow in these courses it will require more time and effort on someone's part. A senior faculty member with a statistical background can be a significant asset both within and outside of the mathematics program.

A distinguishing feature of this program is its comprehensive senior exam. This Liberal Arts tradition is indeed an unusual requirement for a campus of this size. It can (and has) served as a motivational goal for students as they work toward completion of their upper level courses. Majors' performances on this exam and the prospective teachers' performances on the Praxis exam have been truly *outstanding*. This one hundred percent success rate speaks volumes about the quality and standards of instruction these students have been receiving from the senior faculty. It is highly unlikely any other state supported campus in Indiana can make this claim.

Low enrollment in upper level classes leading to the major is an obvious problem. Table 10 indicates that this has been addressed by the senior faculty and at least seventy five percent of these credit hours were generated at no instructional cost to the University. Possible remedies for this problem have already been cited and need to be addressed immediately since it will be more difficult for new faculty to function as the current senior faculty have. While this problem is clearly viewed as a negative by some it should be noted that there are colleges and universities who value such student faculty interaction within small group settings. Those students and Dr's Symonds and Hansen have participated in an unusual activity. Although it wasn't student research, it was students learning mathematical content in a small group setting and helps explain why their students do well on the comprehensive exam.

Productivity, Cost, Efficiency

This area will be divided into two parts; economic and academic. The numbers that appear across the bottom line of table 9 (Credit hours per Full time FTE), with the exception of Spring 2003's, differ significantly (between twenty four and sixty seven percent) from the high end range number published in the IUK Student Fact book. Either their computations are in error, the reporting is in error or some of the mathematics teaching faculty are carrying a heavier teaching load than the average faculty member on campus.

A key item missing in the program review document is the cost per credit hour generated. This is an important number and an indicator of whether a program is "paying its way". Another such line is the "Total credit hours per semester" line which shows over the past four academic years (excluding any summer credit hours); the program has generated at

least 4,500 credit hours per academic year. It would appear that unless there are some unusual salaries the Mathematics Program is a positive contributor to the overall budget and this contribution should increase when replacement faculty arrive on campus.

Two items of concern arise at this point. First, there was a sixteen percent decline in the total credit hours per semester from the 06-07 to 07-08 academic years. These lost credit hours were very likely at the remedial entry level. Remedial courses are a huge source of revenue and their loss to ITCC is a financial one. Second, as senior faculty retire there may be pressure to not replace them with new tenure tract faculty. This has already occurred once, however, once the senior faculty drop to two (or even one) it will be extremely difficult to maintain a credible major. At that point in time students will be forced to leave the region for their preparation in mathematics and mathematics teaching and IUK will have lost one of its distinguishing features from ITCC.

The Service and Engagement profiles for senior faculty indicate that they are engaged in meaningful activities within the mathematics program and the university community. However, there has been a marked decline in scholarly production and professional activity since the 2002 report. It appears that the presence of Dr. Gompa motivated the other members to engage in scholarly productivity, professional activity and teaching excellence. While the senior faculty members have elected the twelve hour teaching load in place of the nine hour one with a scholarship expectation the former option does not permit letting their professional activities drop to near zero. Even though they may not be delivering many more papers they can be attending professional meetings and conferences as early as the 2009 Fall Semester. They should be encouraging the lectures and their upper level majors and prospective mathematics teachers to participate in the opportunities that exist within the ICTM and the IMAA. An absence of scholarly productivity and professional activity will also make external grants acquisitions more difficult to obtain. Replacement faculty members will need to reinstate scholarly productivity to be promoted and tenured.

Potential and Additional Information

Certainly the demand nationally for mathematics (and science) teachers is well known and documented in this report. The fact that the federal government is very likely going to provide monies through a variety of initiatives, such as STEM and others, should help with one of the program's current weaknesses, i.e. low enrollment in upper level courses leading to the majors in mathematics and mathematics teaching. The two courses cited in an earlier section coupled with the upper level elective courses in the major clearly *distinguish* the Mathematics Program from ITCC offerings. Another positive is the presence of ample capacity in these upper level courses so growth can occur at *minimal* instructional cost. A concern is that while the variety of upper level courses is in place and is quite broad, the availability of these course offerings to students is quite limited due to small numbers of majors in the program. The problem is how to attract more students in to mathematics and mathematics teaching.

Summary remarks

It was quite clear after six hours of interviews on Monday there are some individuals with very strong personalities who for whatever reasons are not working well together at this time. It is quite likely that a number of supporting reasons can be compiled by both parties, however, that only adds to the problems and delays their possible solution. Both groups need the support of the other. Some of the possible activities mentioned may involve requests for release time and small amounts of funding from the administration. On the other hand, a University of this size needs a senior mathematics faculty who can prepare well qualified mathematics majors and secondary mathematics teachers. Hence the immediate problem is to see how these two groups can provide positive acts of support for each other.

Several of the problems are obvious and their solutions may only come with time. However, low levels of professional activity on the part of senior faculty can be addressed before the 2009 year is over and their activities can help those around them. The problem of low enrollments in upper level classes will take longer to turn around but some positive signs have been cited. A definite plus is there are no start up costs since such increases can be accommodated with current faculty and course offerings. Addressing the problem of preparedness levels in mathematics of entering students from this region is clearly the most difficult of these problems but it does offer opportunities for professional development of senior faculty and lecturers. A growing public awareness should help address both problems.

Throughout this document the reviewer held to a broad view of the meaning of 'Mathematics Program'. Clearly the program's goals do support the IUK mission as a regional campus. The program is definitely a *service program* with nearly all entry level courses below Math 215 meeting needs of various student groups.

The external demand is more difficult to assess since certainly large numbers of students in the region are not entering the university as declared mathematics majors. This is not unique to IUK. There are signs, namely economic rewards and employment opportunities that make one optimistic this is going to soon change. The old adage, "We are here so they will come to us." clearly hasn't worked. Several ways were discussed in the narrative that may product a positive turn around. Very likely the program has met external demand which has been low. A definitive answer would depend upon the number of mathematics teaching (and non-teaching) employment opportunities available in the IUK region.

The program's course offerings are highly traditional and the background of the senior faculty indicates they know this curriculum, its content and how to teach it. Students who have studied in their classes have demonstrated quite well their understandings of what they have been taught.

The question of productivity was divided into two parts, E (for economic productivity) and F (for faculty productivity). It is apparent, although the actual dollar values do not

appear anywhere in the report, that from an economic point of view this program is producing a positive economic return which will become even greater when replacement salaries go into effect. The issue of faculty productive was addressed and is currently not acceptable; however, professional activity can be addressed almost immediately.

The enrollment in upper level courses leading to the two majors is very likely going to increase due to local economic conditions and increased opportunities for mathematics teachers. Certainly current capacity exists to meet such needs. The ability to prepare teachers is a distinguishing feature from ITCC. The real concerns are two fold; how to attract more majors and how to increase the numbers of such distinguishing activities in this program.

The additional information focused primarily on the possibilities for improving growth in numbers of majors, prospective teachers and providing opportunities for professional growth. Time will tell whether such activities are significant.

Table 10 External Reviewer Feedback

Criterion	Yes	No
Does the program demonstrate significant Alignment with campus Mission, Values, and Strategic Plans?	*	
Does the program demonstrate substantial internal demand?	*	
Does the program demonstrate substantial external demand?	*	
Compared to other similar programs at similar institutions, is it of high quality?	*	
Does the program demonstrate significant overall productivity?	Economic Faculty	*
Do program trends suggest potential for further program growth?	*	
Did the additional information provided suggest that the program demonstrates significant contributions to the campus, region?	*	

Submitted by: **Dr. David W. Kinsey**
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To: Dean Susan Sciame-Giesecke, Arts and Sciences

From: Dr. Christian Chauret, Chairperson of NIMS; Dr. Mary Hansen, Mathematics Coordinator, Dr. Robin Symonds, Dr. Carl Widland, Mr. Joshua Gottemoller, Ms. Linda Krause, Mrs. Barbara Sehr (IU Kokomo Mathematics Faculty Members)

Date: April 10, 2009

Subject: Response and Comments to the “Outside Reviewer’s Report for the Mathematics Program at IU Kokomo”

We wish to make the following comments regarding the reviewer’s report:

1. Program Role (page 1): We were asked by IU Kokomo to write a review report of the Mathematics B.A program. We followed the template provided by the IU Kokomo Office of Academic Affairs. The scope of our report was not to review the entire “mathematics program”, which includes, among other things, developmental courses and courses offered for the general education curriculum. The reviewer took a broader view of the mathematics program than what was reported.
2. Program Role (pages 1 & 2): We note that the reviewer stated that “students ... who successfully complete their majors in mathematics ... will be prepared for employment opportunities... [The courses] appear to be well organized and follow the guidelines of three major professional organizations within the mathematics community...”
3. Program Role and Internal Demand (page 2): The reviewer did not apparently understand the role of the current mathematics coordinator (Dr. Mary Hansen). Dr. Hansen plays a significant role in the administration of the entire mathematics program (hiring of adjuncts, scheduling, curricular issues, new course development, etc.). In this capacity, she reports to (and collaborates with) the NIMS chairperson. We propose that the program review template be amended to include how specific programs are administered and managed.
4. Internal Demands (page 3): The reviewer stated that the “computer lab” (i.e., Math Lab) needs to be advertized and its use encouraged. The mathematics faculty routinely encourages students in developmental courses (plus MATH-M 118/119) to use this facility. Students enrolled in the developmental courses (M007, M117, M125) are using the MyMathLab website for all of their homework assignments. The lab coordinator customizes the announcements area

of the website to include information about lab hours and services. All students in the developmental classes are brought to the lab on the first day of class to complete the MyMathLab registration procedure, and during this process, they are all encouraged to use the lab services throughout the semester. Furthermore, information about the lab is included in the policy form that the students sign on the first day of class.

5. External Demand (page 3): The reviewer is encouraging us to provide more outreach activities for area mathematics teachers to raise their awareness of career opportunity for majors as well as to provide more workshops and seminars. We agree that these activities could be beneficial in serving the long-term needs of the mathematics B.A. We propose four possible outreach activities to meet this demand:

- a. We (under the leadership of Mrs. Sehr) recently submitted (March 2009) a proposal to the IU Kokomo's Degree of Excellence Program. This proposal calls for close collaboration with Kokomo High School to develop the College Math Readiness Program (CMRP) and the IU Kokomo Math Challenge Partnership. The goal of this program is to provide students with an opportunity to refresh their algebra skills prior to enrolling in a mathematics class at Indiana University Kokomo, thereby allowing them to enroll in a college mathematics class (precalculus, finite math or calculus) rather than a developmental mathematics course. The program will target two groups of students: High school seniors who completed their Core 40 Math classes (algebra 1, geometry and algebra 2) in their sophomore or junior year and who are not taking mathematics during their last year of high school; and new admits to Indiana University Kokomo who have placed into introductory or intermediate algebra even though they completed two or more years of high school algebra.
- b. We propose to develop a few half-day workshops for high school mathematics teachers. For example, these workshops might include the guest speakers who will be professionals who use mathematics in their job (e.g., engineers, accountants, etc.). These workshops would likely take place in the summer and be used to meet continuing education requirements.
- c. We propose to seek grant money to offer an advanced calculus sequence for mathematics teachers who wish to develop their skills to teach AP calculus. The mathematics faculty members believe that calculus teachers should have completed courses equivalent to MATH-M413-M414, Introduction to Analysis I-II at Indiana

University. This is a very challenging course sequence, and few students pursuing the B.S. in Secondary Education to become mathematics teachers take it. The sequence was part of the curriculum for a master's degree for mathematics teachers, but with the master's degree requirement no longer in place fewer high school mathematics teachers have completed this coursework and fewer mathematics teachers are well-prepared to teach calculus in high school. With the current emphasis on increasing the preparation level of mathematics and science teachers, we propose to seek a grant to pay for tuition, textbooks, travel, and a stipend to high school teachers in the IU Kokomo service region to take MATH-M413-M414 at Indiana University Kokomo. We hope that at least one mathematics teacher in each high school in our service region would participate. The teachers could use the course credit toward meeting their continuing education requirement, the teachers would be better prepared to teach calculus, high school calculus offerings would improve, there would be improved connection between Indiana University Kokomo and the high schools, more high schools would have faculty qualified to participate in the ACP program in mathematics, and MATH-M 413-M414 would be available to IU Kokomo mathematics students.

- d. Database of Middle, High School Teachers & IUK Mathematics Faculty: We plan to develop and maintain a database of middle and high schools mathematics teachers in the IU Kokomo service region to increase communication among middle school, high school, and IU Kokomo mathematics faculty in the IU Kokomo service region.
6. External Demand (page 3): The reviewer encourages us to update the website. We will make some additions to the mathematics pages of the NIMS website in the short-term. However, we are restricted to a large extent by the IU Kokomo website template and overall organization.
7. Program Quality (page 4): We note that the reviewer praised the quality of the degree program and that he stated that a distinguishing feature of the program is its comprehensive exam. The reviewer also stated that “[majors’ performance on this exam and the prospective teachers’ performance on the Praxis exam have been truly outstanding.”
8. Productivity, Cost, Efficiency (page 4): The reviewer stated that a key item missing from the document is the cost per credit hour generated. These data are not in the program review template and we suggest their inclusion for future reviews.
9. Potential and Additional Information (page 5): We agree with the reviewer that “[t]he problem is how to attract more students in mathematics and mathematics teaching.” This is a difficult

situation nationwide. In NIMS, we have recently created a NIMS Advisory Board, whose main role is to help us with outreach activities. One of the board members is a local area high-school mathematics teacher. We are also increasing outreach activities in NIMS and proposing specific new ones for “mathematics-related” activities (see above). On page 26 of the program review document, we also proposed to submit at least three proposals per year to raise scholarship funding to attract potential students to mathematics. This is a viable option since there are programs and funding agencies whose purpose it is to support such scholarships. We also propose more synergies between mathematics majors and other NIMS majors through the NIMS pre-professional club and various courses (see page 26 of the review document).

- 10.** Summary Remarks (page 6): The reviewer stated that there are (unnamed) individuals who “are not working well together at this time”. However, he also stated on page 2 that “senior faculty and lecturers are a compatible and work together...” The mathematics faculty and lecturers wish to respond to these two statements in the following way: “Mathematics faculty members work very well together and address problems and challenges (when they arise) as a group. When there are differences, they are worked out in a collegial manner.”
- 11.** Summary Remarks (page 7): We note that the reviewer stated (as we did on page 14 of the review document) that “[t]he enrollment in upper level courses ... is very likely going to increase due to local economic conditions and increased opportunities for mathematic teachers.... The ability to prepare teachers is a distinguishing feature from ITCC”. As we stated in the review document, the Indiana Commission for Higher Education stated in 2008 that there was an urgent need for Indiana to produce more mathematics teachers for K-12 education. The mathematics B.A. program fulfills this role in North-Central Indiana.