

Annual Assessment Summary

MATHEMATICS AND MATHEMATICS TEACHING FIELDS

**Department of Mathematics, Computer
Science, and Economics**

January 2006

Mathematics

Part 1: Objectives

1. Educate students to be lifelong learners who will advance knowledge and serve the world through the application of humanistic values and scientific principles. (College Objective)
2.
 - a) Prepare mathematics teachers for positions in secondary and elementary schools in Kansas and the nation, and/or
 - b) Prepare students for positions in organizations, which require a strong mathematics, computer science or economics background, and/or
 - c) Prepare qualified students for graduate school. (Departmental and Mathematics Program Goals)
3. Mathematics graduates should have a solid grounding in basic mathematical skills. (Mathematics Program Goal)
4. Mathematics graduates should have a knowledge and understanding of fundamental concepts and methods in various areas of mathematics, including Calculus/ Analysis, Linear Algebra, Abstract Algebra, Probability, Statistics and Geometry. (Mathematics Program Goal)
5. Mathematics graduates should be able to read and understand proofs at the BA/BS level, to evaluate proofs on correctness, completeness and clarity and to construct correct proofs in a well-organized, logical, accurate and clear way. (Mathematics Program Goal)
6. Mathematics graduates should be able to solve problems in a wide variety of mathematical fields at the BA/BS level, demonstrating knowledge of these areas, creative thinking, problem solving skills and teamwork, as well as being able to use appropriate technology. (Mathematics Program Goal)
7. Mathematics graduates should be able to communicate mathematical ideas and arguments in a well-organized, clear, efficient and precise way both orally and in writing, using appropriate mathematical terminology. (Mathematics Program Goal)

Part 2: Assessment Planning Charts

A. Direct measures

Objective	Assessment(s)	Type	Data/Results	Actions/Recommendations
2,3,4	Gateway exams (Calc I,II) [Pass/fail tests to evaluate basic differentiation and integration skills]	1	A score of 9 out of 10 (Calc I), and 7 out of 8 (Calc II) is needed to pass). Most students pass, but most students need multiple attempts.	
2,3,4	Cal I, II Tests [MA 161, 262]	1	Final tests are used as indicators of mastery of the material.	In the near future the assessment committee may address the assessment of the computer lab component (using Maple) of the calculus sequence.
2,4,5,6,7	Lin Alg Test(s) [MA 322]	1	Final tests are used as indicators of mastery of the material.	The assessment committee is considering to also collect a sample of representative work (a proof or solution of a challenging problem)
2,4,5,6,7	Abst Alg Test(s) [MA 425]	1	Final tests are used as indicators of mastery of the material.	The assessment committee is considering to also collect a sample of representative work (a proof or solution of a challenging problem)
2,4,5,6,7	Geometry Test(s) [MA 421]	1	Incoming students are weak in HS geometry: they lack basic understanding and intuition. This course aims to both remediate their HS geometry and introduce the students to college level geometry.	Course has been restructured over the years to improve basic knowledge and understanding of HS geometry. A computer component has been added (Geometer's Sketchpad) to help them develop their understanding, intuition, and problems solving skills.

Objective	Assessment(s)	Type	Data/Results	Actions/Recommendations
5,6,7	Geometry Proofs/Solutions [MA 421] a) Critiques of proofs & solutions to problems b) Representative work is collected (a proof or solution of a challenging problem).	1	Students present their work (proofs, solutions etc) frequently. Their work is continually critiqued for completeness, accuracy etc. (by both professor and fellow students using a rubric). They seem to make substantial progress in their understanding of what a proof is, and their abilities in constructing proofs, as well as assessing proofs of others. Simultaneously they seem to become better problems solvers and more skilled in presenting their results.	
2,4,5,6,7	Prob/Stat Test(s)	1	Final tests are used as indicators of mastery of the material.	
3,4,5,6,7	MA 125 pre-Test. Students are given a pre-test to assess their level of mathematics knowledge and maturity. This data will be compared to data (e.g. post tests etc.) of students around graduation. Also representative work (homework and solutions of problems) is collected.	1	Data has been gathered the last 4 years and for the first time we can close the pre/post assessment loop this semester. Students hand in work (solutions/proofs etc). It is easy to see that our incoming students, in general, are weak in mathematical knowledge, and problem solving abilities, and have almost no skills in doing 'proofs'.	The assessment committee has to determine how to deal with the data gathered, in a useful and practical way.

Objective	Assessment	Type	Data/Results	Actions/Recommendations
3	Basic Competency [Algebra/geometry/numbers sense/Data]	1	Data has been collected for many years. This tests very basic skills for high school math and middle school math majors	
3	Basic Skills Test	1	This is a preliminary test which is still in development, and has been used the last few semesters. It seems that our students forget some of the basic knowledge and skills.	The department is considering how to reinforce basic knowledge. One idea is introducing a senior seminar. Another thought is having review of basics be part of a final (capstone) project.
3	Praxis Test [ACT scores]	3	Various scores maybe compared to gauge progress of students.	

B. Indirect measures

Objective	Assessment	Type	Data/Result	Actions/Recommendations
1,2	Exit interview	12	Administered during final semester. Due to off-campus student teaching, these interviews can be hard to organize, and as a result have been held infrequently in the last few years	A new exit interview form has been made. The exit interview will be done by on a regular basis (end of semester), by a member of the departmental assessment committee. It might be good to make them mandatory
1,2,6,7	Alumni Survey	11	These surveys will not be conducted on a yearly basis, but when deemed appropriate. No current data is available.	The assessment committee will evaluate on a yearly basis if an alumni survey is desired.
1,2	Focus group	10	Students are in general happy with the math program, the support of the faculty, and advisors. Students find professors are accessible and willing to help. They appreciate the rigor of the program (though they didn't quite expect it to be at this high a level). They seem satisfied with the quality of the program and the teaching, and the high standards (though they feel not all professors share the same level of expectations).	Focus groups are held either annually or semi-annually. Topics may change to target special questions/concerns. etc.
1,2	Placement of graduates	13	Our students have no problems finding employment (in education or business) or getting accepted into grad school.	

Part 4: Summary

Factors	Rubric Score	Evidence/Rationale
Level A		
Professional standards and student learning outcomes	3	Most of our standards are derived from professional experience and information provided by professional organizations like the MAA (Mathematical Association of America) and AMS (American Mathematical society).
Faculty involvement	3	The core of the assessment work is done by our assessment committee who reports to and seeks frequent input from the faculty. All faculty are involved with assessment in one form or another and support our assessment efforts.
Assessment alignment	2,3	Most assessment instruments are clearly linked to departmental goals and objectives.
Level B		
Assessment structure	3	Assessment is done at many levels. Assessment takes place continually through course work and tests, and through gathering key data regularly.
Data management	3	A physical filing cabinet is allocated to store all necessary data.
Data collection points	3	Data is collected from multiple data points, and is strongly correlated to departmental goals for student success.
Data collection sources	2	Data is collected from students, faculty and graduates
Program improvement	3	Ongoing, systematic, objective based evaluation and improvement of our programs have been part of our department for years.
Level C		
Comprehensive & integrated measures	2	Multiple measures are in place. Not all measures have clear cut scoring criteria. (not always needed, possible or appropriate.)
Monitoring student progress, & managing & improving operations & programs.	3	Measures are routinely used to monitor, adjust and improve programs, as evidenced by changes in courses, lab components, curriculum, requirements etc.
Assessment data usage by faculty	2	All faculty have access to the data gathered and filed by the assessment committee.
Assessment data shared with students	1	Assessment data is currently no shared with student.
Fairness, accuracy & consistency of assessments	3	Mathematics has always been one of the most objective, accurate and consistent fields of science. Objectivity naturally results in fairness and impartiality. Our department probably has the best chance of any department to be fair, accurate and consistent with respect to assessments.

B. General Findings

Overall the Math BS program seems to fulfill its purpose as set out by our departmental goals. To resolve some of the weaknesses found by our assessment efforts (e.g. through the basic skills test we have administered over several semesters) the faculty is considering adding a senior project or capstone experience to the program. This might help insure retention and strengthening of basic math skills of our students in key areas, as well as integrating various different areas of math. The core sequence discrete math, linear algebra, and abstract algebra (as well as geometry, which most students take) seems to do a good job insuring our students learn the fundamentals of mathematical proofs (one of our main goals). The math skills, problem solving skills and analytical skills we cultivate in our students bear fruit in their future career opportunities. Our students have no problems finding employment in education, business and industry, or getting accepted at grad schools to continue their education.

C. Future Goals

In the near future the assessment committee will analyze our assessment efforts when after 4 years the assessment loop of pre and post testing will be closed. This semester is the first time students will be graduating who took the pre-test in our MA 125 intro to math course; this allows us to complete an assessment cycle. The department will also make a decision with respect to adding a senior project or capstone experience to the program. Although it might be a desirable addition to our program it is hard to add hours to a program that is already full.

D. Resources needed to implement assessment system

One of the main resources we need is man power. At this moment we are already stretched beyond what can reasonably be expected of a small department when it comes to teaching, research and service. A serious assessment effort stretches the resources of the department even more. To insure a successful assessment effort we need the man power to refine, re-adjust, implement and evaluate our assessment program.

Mathematics Teaching Fields

Annual Assessment Data Summary

**Middle School
(5-8)**

Followed by

**Middle School/Secondary
(6-12)**

Mathematics Assessments - Middle School (5 - 8)

Name of Assessment	Type of Assessment	When Administered	ESU Decision Point	Answer Yes or No to each		
				Assessment is Ready to Use	Scoring Guide/Criteria are Ready	Data can be collected Fall 05
1. Praxis II Test PLT	Content Test	During Phase II or before completion of program (recommendation for licensure)	4	Yes	Yes	Yes
	Pedagogical Knowledge/Skills Test	During Phase II or before completion of program (recommendation for licensure)	4	Yes	Yes	Yes
2. Teacher Work Sample, Factors 1-3	Planning Instruction Checklist and Rubric	During Phase II but is a program completion requirement not a student teacher requirement	4	Yes	Yes	Yes
3. Student Teacher Evaluations	Content and Pedagogical Knowledge/Skills, Rating Scale	During Phase II	3	Yes	Yes	Yes
4. Teacher Work Sample, Factors 5-7	Student Learning Checklist and Rubric	During Phase II but is a program completion requirement	4	Yes	Yes	Yes
5. Base 10 Block Assessment	Content / Performance Assessment	During MA 307	2	Yes	Yes	Yes
6. Knowledge Standards Assessment	Content / Performance Assessment	During MA 308	2	Yes	Yes	Yes
7. Teaching Intermediate Algebra	Pedagogical Knowledge/Skills and Performance Assessment	During MA 470 Teaching Middle/Secondary Mathematics (usually second semester junior year)	2	Yes	Yes	Yes
8. Kansas Mathematics Curriculum Area Tests	Content Tests	During MA 470 Teaching Middle/Secondary Mathematics (usually second semester junior year)	2	Yes	Yes	Yes
9. Mathematics Standards Portfolio	Portfolio	After Phase I and MA 470 have been completed	2	Yes	Yes	Yes
10. Geometry Proof	Content and Performance Assessment Rubric	While enrolled in MA 313 Geometry for Elem /MS	2	Yes	Yes	Yes
11. Teachers College Follow-up Survey	Program Evaluation Survey	2 years after completion of program	5	Yes	Yes	Yes

Decision Point 1: (Phase I): Candidates applying for admission to teacher education must submit a completed secondary education Phase I application by the date specified and provide the following evidence (listed in the assessment plan):

Decision Point 2: (Phase II): Candidates applying for admission to student teaching must submit a completed Phase II (student teaching) application for by the date specified and provide the following evidence (listed in the assessment plan):

Decision Point 3: Completion of student teaching (Phase II) requires that candidates demonstrate acceptable knowledge, skills and dispositions by the end of Phase II. The major assessments used are (listed in the assessment plan):

Decision Point 4: At this time all performance and outcome data have been collected and recommendation for teacher licensure (program completion) is granted if the following requirements are completed successfully (listed in the assessment plan):

Decision Pointe 5: Candidate and program follow-up data are collected and reviewed by the Council on Teacher Education.

Mathematics
Alignment of Assessments with KSDE Standards
Middle School (5-8)

Assessments	Praxis II/ PLT	Teacher Work Sample Factors 1-4	Student Teacher Evaluations	Teacher Work Sample Factors 5-7	Base 10 Block Assessment	Knowledge Standards Assessment	Teaching Intermediate Algebra	Kansas Mathematics Curriculum Area Tests	Mathematics Standards Portfolio	Geometry Proof	Teachers College Follow-up Survey
Assessment Type	Content Test & Pedagogical/ Skills Test	Planning Instruction Checklist and Rubric	Pedagogical Knowledge/ Skills Rating Scale	Student Learning Checklist and Rubric	Content/ Performance Assessment	Content/ Performance Assessment	Pedagogical Knowledge/ Skills and Performance Assessment	Content Tests	Portfolio	Content and Performance Assessment Rubric	Program Evaluation Survey
Decision Points	4	4	3	4	2	2	2	5	2	2	5
Standards	K/P	K/P	K/P	K/P	K/P	K/P	K/P	K/P	K/P	K/P	K/P
Standard 1 The teacher of mathematics has conceptual and procedural understanding of mathematics.	X/na		X		X	X	X	X	X	X	X
Standard 2 The teacher of mathematics can demonstrate conceptual and procedural understanding of number and number systems and is able to identify and apply these understandings within a real world context.	X/na				X	X		X	X		
Standard 3 The teacher of mathematics can demonstrate the need for, uses of, and conceptual and procedural understanding of patterns, functions, and algebra from both concrete and abstract perspectives, and are able to identify and apply these relationships in the real world context, including the use of appropriate technology.	X/na					X	X	X	X		
Standard 4 The teacher of mathematics can demonstrate the need for, uses of, and conceptual and procedural understanding of geometry, measurement, and spatial visualization from both concrete and abstract perspectives, and are able to identify and apply these relationships in the real world context, including the use of technology.	X/na							X	X	X	

Standard 5 The teacher of mathematics can demonstrate conceptual and procedural understanding of concepts of data, statistics and probability and is able to identify and apply these relationships within a real world context including the use of appropriate technology.	X/na							X	X		
Standard 6 The teacher of mathematics can demonstrate conceptual and procedural understanding of concepts of calculus and is able to identify and apply these relationships within a real world context, including the use of appropriate technology.	X/na				X	X		X	X		
Standard 7 The teacher of mathematics can demonstrate conceptual and procedural understanding of discrete processes and is able to identify and apply these understandings within a real world context including the use of appropriate technology.	X/na				X	X		X	X		
Standard 8 The teacher of mathematics can demonstrate knowledge of the history of mathematics.	X/na				X			X	X		
Standard 9 The teacher of mathematics has a foundational knowledge of students as learners and of pedagogical strategies.	na/X	X	X	X			X		X		X

**Mathematics Assessments
Middle/Secondary (6-12)**

Name of Assessment	Type of Assessment	When Administered	ESU Decision Point	Answer Yes or No to each		
				Assessment is Ready to Use	Scoring Guide/Criteria are Ready	Data can be collected Fall 05
1. Praxis II Test	Content Test	During Phase II or before completion of program (recommendation for licensure)	4	Yes	Yes	Yes
PLT	Pedagogical Knowledge/Skills Test	During Phase II or before completion of program (recommendation for licensure)	4	Yes	Yes	Yes
2. Teacher Work Sample, Factors 1-3	Planning Instruction Checklist and Rubric	During Phase II but is a program completion requirement not a student teacher requirement	4	Yes	Yes	Yes
3. Student Teacher Evaluations	Content and Pedagogical Knowledge/Skills, Rating Scale	During Phase II	3	Yes	Yes	Yes
4. Teacher Work Sample, Factors 5-7	Student Learning Checklist and Rubric	During Phase II but is a program completion requirement	4	Yes	Yes	Yes
5. Calculus Gateway Exam	Content Test	During Calculus I	2	Yes	Yes	Yes
6. Mathematical Modeling Project	Content and Application Project Rubric	During MA291 Mathematical Modeling prior to Phase I	2	Yes	Yes	Yes
7. Teaching Trigonometry	Pedagogical Knowledge/Skills and Performance Assessment	During MA 470 Teaching Middle/Secondary Mathematics (usually second semester junior year)	2	Yes	Yes	Yes
8. Kansas Mathematics Curriculum Area Tests	Content Tests	During MA 470 Teaching Middle/Secondary Mathematics (usually second semester junior year)	2	Yes	Yes	Yes
9. Mathematics Standards Portfolio	Portfolio	After Phase I and MA 470 have been completed	2	Yes	Yes	Yes
10. Geometry Proof	Content and Performance Assessment Rubric	While enrolled in MA 421 College Geometry	2	Yes	Yes	Yes
11. Teachers College Follow-up Survey	Program Evaluation Survey	2 years after completion of program	5	Yes	Yes	Yes

Decision Point 1: (Phase I): Candidates applying for admission to teacher education must submit a completed secondary education Phase I application by the date specified and provide the following evidence (listed in the assessment plan):

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Decision Point 4: At this time all performance and outcome data have been collected and recommendation for teacher licensure (program completion) is granted if the following requirements are completed successfully (listed in the assessment plan):

Decision Pointe 5: Candidate and program follow-up data are collected and reviewed by the Council on Teacher Education.

Mathematics
Alignment of Assessments with KSDE Standards
Middle/Secondary (6-12)

Assessments	Praxis II/ PLT	Teacher Work Sample Factors 1-4	Student Teacher Evaluations	Teacher Work Sample Factors 5-7	Gateway Calculus Exam	Mathematical Modeling Project	Teaching Trigonometry	Kansas Mathematics Curriculum Area Tests	Mathematics Standards Portfolio	Geometry Proof	Teachers College Follow-up Survey
Assessment Type	Content Test & Pedagogical/ Skills Test	Planning Instruction Checklist and Rubric	Pedagogical Knowledge/ Skills Rating Scale	Student Learning Checklist and Rubric	Content Test	Content and Application Project Rubric	Pedagogical Knowledge/ Skills and Performance Assessment	Content Tests	Portfolio	Content and Performance Assessment Rubric	Program Evaluation Survey
Decision Points	4	4	3	4	2	2	2	5	2	2	5
Standards	K/P	K/P	K/P	K/P	K/P	K/P	K/P	K/P	K/P	K/P	K/P
Standard 1 The teacher of mathematics has conceptual and procedural understanding of mathematics.	X/na		X		X	X	X	X	X	X	X
Standard 2 The teacher of mathematics can demonstrate conceptual and procedural understanding of number and number systems and is able to identify and apply these understandings within a real world context.	X/na				X	X		X	X		
Standard 3 The teacher of mathematics can demonstrate the need for, uses of, and conceptual and procedural understanding of patterns, functions, and algebra from both concrete and abstract perspectives, and are able to identify and apply these relationships in the real world context, including the use of appropriate technology.	X/na					X	X	X	X		
Standard 4 The teacher of mathematics can demonstrate the need for, uses of, and conceptual and procedural understanding of geometry, measurement, and spatial visualization from both concrete and abstract perspectives, and are able to identify and apply these relationships in the real world context, including the use of technology.	X/na							X	X	X	

Standard 5 The teacher of mathematics can demonstrate conceptual and procedural understanding of concepts of data, statistics and probability and is able to identify and apply these relationships within a real world context including the use of appropriate technology.	X/na							X	X		
Standard 6 The teacher of mathematics can demonstrate conceptual and procedural understanding of concepts of calculus and is able to identify and apply these relationships within a real world context, including the use of appropriate technology.	X/na				X	X		X	X		
Standard 7 The teacher of mathematics can demonstrate conceptual and procedural understanding of discrete processes and is able to identify and apply these understandings within a real world context including the use of appropriate technology.	X/na					X		X	X		
Standard 8 The teacher of mathematics can demonstrate knowledge of the history of mathematics.	X/na							X	X		
Standard 9 The teacher of mathematics has a foundational knowledge of students as learners and of pedagogical strategies.	Na/X	X	X	X			X		X		X