NATIONAL RECOGNITION REPORT
Initial Preparation of Mathematics Education Teachers at the Secondary Level

NCATE recognition of this program is dependent on the review of the program by representatives of the National Council of Teachers of Mathematics (NCTM).

COVER PAGE

Name of institution

Millikin University

Date of review

MM DD YYYY

02 / 01 / 2009

This report is in response to a(n):

- Initial Review
- Revised Report
- Response to Conditions Report

Program Covered by this Review

Secondary Mathematics Education

Program Type

Initial Teaching License

Award or Degree Level

- Baccalaureate
- Post Baccalaureate
- Master's

PART A - RECOGNITION DECISION

SPA Decision on NCATE Recognition of the Program(s):

- Nationally recognized
- Nationally recognized with conditions
- Further development required **OR** Nationally recognized with probation [See Part G]
- Not nationally recognized

Test Results (from information supplied in Assessment #1, if applicable)

The program meets or exceeds an 80% pass rate on state licensure exams:

- Yes
- No
- Not applicable
- Not able to determine

Comment:

Test results are very strong for these candidates. The institution has been studying the results carefully and has made program changes to better prepare the students for the tests.

Summary of Strengths:

The institution has worked very hard in the revised report to attend specifically to the mathematics education students' preparation both in new, extensive rubrics, new instructional tasks, and the assurance that the mathematics education faculty are providing the instructional feedback and the supervision. The clarifications from the previous report show further evidence of the faculty's commitment to improvement and a standards-based program.

PART B - STATUS OF MEETING SPA STANDARDS

Standard 1. Knowledge of Problem Solving. Candidates know, understand and apply the process of mathematical problem solving.

Indicators:

1.1 Apply and adapt a variety of appropriate strategies to solve problems.

Met	Not Met

1.2 Solve problems that arise in mathematics and those involving mathematics in other contexts

Met	Not Met

1.3 Build new mathematical knowledge through problem solving.

Met	Not Met

1.4 Monitor and reflect on the process of mathematical problem solving.

Met	Not Met

Standard 1 comments:

Further confirmation of this standard now appears in Assessment 6.

Standard 2. Knowledge of Reasoning and Proof. Candidates reason, construct, and evaluate

mathematical arguments and develop an appreciation for mathematical rigor and inquiry.

Indicators:

2.1 Recognize reasoning and proof as fundamentals aspects of mathematics.

Met Not Met

2.2 Make and investigate mathematical conjectures

Met Not Met

2.3 Develop and evaluate mathematical arguments and proofs.

Met Not Met

2.4 Select and use various types of reasoning and methods of proof.

Met Not Met

Standard 2 comments:

Mathematics course descriptions further confirm the richness of the coursework.

Standard 3. Knowledge of Mathematical Communication. Candidates communicate their mathematical thinking orally and in writing to peers, faculty and others.

Indicators:

3.1 Communicate their mathematical thinking coherently and clearly to peers, faculty, and others.

Met Not Met

3.2 Use the language of mathematics to express ideas precisely.

Met Not Met

3.3 Organize mathematical thinking through communication

Met Not Met

3.4 Analyze and evaluate the mathematical thinking and strategies of others.

Met Not Met

Met Not Met

Standard 3 comments:

Assessments 3,4, 5, and 6, because they are evaluated by mathematics education faculty, help candidates demonstrate their ability to communicate about mathematics clearly and comprehensively. The previous evaluator's concerns about using assessment 1 for this standard remain.

Standard 4. Knowledge of Mathematical Connections. Candidates recognize, use, and make connections between and among mathematical ideas and in contexts outside mathematics to build mathematical understanding.

Indicators:
4.1 Recognize and use connections among mathematical ideas.

Met Not Met

4.2 Recognize and apply mathematics in contexts outside of mathematics.

Met Not Met

4.3 Demonstrate how mathematical ideas interconnect and build on one another to produce a coherent whole.

Met Not Met

Standard 4 comments:

The addition and implementation of the math-specific portion of the student teaching rubric as well as some of the tasks from Assessment 6 are the clearest examples. Coursework provides additional documentation.

Standard 5. Knowledge of Mathematical Representation. Candidates use varied representations of mathematical ideas to support and deepen students' mathematical understanding.

Indicators:

5.1 Use representations to model and interpret physical, social, and mathematical phenomena.

Met Not Met

5.2 Create and use representations to organize, record, and communicate mathematical ideas

Met Not Met

5.3 Select, apply, and translate among mathematical representations to solve problems

Met Not Met

Standard 5 comments:

Standard 6. Knowledge of Technology. Candidates embrace technology as an essential tool for teaching and learning mathematics.

Indicators:

6.1 Use knowledge of mathematics to select and use appropriate technological tools, such as but not limited to, spreadsheets, dynamic graphing tools, computer algebra systems, dynamic statistical packages, graphing calculators, data-collection devices, and presentation software.

Met Not Met

Standard 6 comments:

Standard 7. Dispositions. Candidates support a positive disposition toward mathematical processes and mathematical learning.

Indicators:

7.1 Attention to equity

Met Not Met

7.2 Use of stimulating curricula

Met Not Met

7.3 Effective teaching

Met Not Met

7.4 Commitment to learning with understanding

Met Not Met

7.5 Use of various assessments

Met Not Met

Met Not Met

7.6 Use of various teaching tools including technology

Met Not Met

Standard 7 comments:

Clarification with regard to who evaluates and supervises these assessments now demonstrates how the unit is ensuring that feedback specific to teaching mathematics is occurring.

Standard 8. Knowledge of Mathematics Pedagogy. Candidates possess a deep understanding of how students learn mathematics and of the pedagogical knowledge specific to mathematics teaching and learning.

Indicators:

8.1 Select, use, and determine suitability of the wide variety of available mathematics curricula and teaching materials for all students, including those with special needs such as the gifted, challenged and speakers of other languages.

Met Not Met

8.2 Select and use appropriate concrete materials for learning mathematics.

Met Not Met

8.3 Use multiple strategies, including listening to and understanding the ways students think about mathematics, to assess students' mathematical knowledge.

Met Not Met

8.4 Plan lessons, units and courses that address appropriate learning goals, including those that address local, state, and national mathematics standards and legislative mandates.

Met Not Met

8.5 Participate in professional mathematics organizations and uses their print and on-line resources.

Met Not Met

8.6 Demonstrate knowledge of research results in the teaching and learning of mathematics

Met Not Met

8.7 Use knowledge of different types of instructional strategies in planning mathematics lessons.

Met Not Met

8.8 Demonstrate the ability to lead classes in mathematical problem solving and in developing in-depth conceptual understanding, and help students develop and test generalizations

Met Not Met

8.9 Develop lessons that use technology's potential for building understanding of mathematical concepts and developing important mathematical ideas.

Met Not Met

Standard 8 comments:

Clarification of tasks in Assessment 6 and implementation of the second part of assessment 4 provide sufficient evidence of attention to every indicator of this standard.

Standard 9. Knowledge of Number and Operations. Candidates demonstrate computational proficiency, including a conceptual understanding of numbers, ways of representing number, relationships among number and number systems, and meanings of operations.

Indicators:

9.1 Analyze and explain the mathematics that underlies the prcedures used for operations invloving integers, rational, real and complex numbers.

Met Not Met

9.2 Use properties involving number and operations, mental computation, and computational estimation.

Met Not Met

9.3 Provide equivalent representations of fractions, decimals, and percents.

Met Not Met

9.4 Create, solve, and apply proportions.

Met Not Met

9.5 Apply the fundamental ideas of number theory.

Met Not Met

9.6 Makes sense of large and small number and number systems.

Met Not Met

9.7 Compare and contrast properties of numbers and number systems.

Met Not Met

9.8 Represent, use and apply complex numbers

Met Not Met

9.9 Recognize matrices and vectors as systems that have some of the properties of the real number system.

Met Not Met

9.10 Demonstrate knowledge of the historical development of number and number systems including contributions from diverse cultures.

Met Not Met

Standard 9 comments:

While course descriptions reflect upon content presented, the emphases of these courses would suggest that the indicators above are also assessed.

Standard 10. Knowledge of Different Perspectives on Algebra. Candidates emphasize relationships among quantities including functions, ways of representing mathematical relationships, and the analysis of change.

Indicators:

10.1 Analyze patterns, relations, and functions of one and two variables.

Met Not Met

10.2 Apply fundamental ideas of linear algebra.

Met Not Met

10.3 Apply the major concepts of abstract algebra to justify algebraic operations and formally

analyze algebraic structures.

Met Not Met

10.4 Use mathematical models to represent and understand quantitative relationships.

Met Not Met

10.5 Use technological tools to explore algebraic ideas and representations of information and in solving problems.

Met Not Met

10.6 Demonstrate knowledge of the historical development of algebra including contributions from diverse cultures.

Met Not Met

Standard 10 comments:

Further detail in the course descriptions now indicate that all indicators in this standard are met.

Standard 11. Knowledge of Geometries. Candidates use spatial visualization and geometric modeling to explore and analyze geometric shapes, structures, and their properties.

Indicators:

11.1 Demonstrate knowledge of core concepts and principles of Euclidean and non-Euclidean geometry in two- and three-dimensions from both formal and informal perspectives.

Met Not Met

11.2 Exhibit knowledge of the role of axiomatic systems and proof in geometry.

Met Not Met

11.3 Analyze characteristics and relationships of geometric shapes and structures.

Met Not Met

11.4 Build and manipulate representations of two- and three-dimensional objects and visual objects from different perspectives.

Met Not Met

11.5 Specify locations and describe spatial relationships using coordinate geometry, vectors and other representational systems.

Met Not Met

11.6 Apply transformation and use symmetry, similarity, and congruence to analyze mathematical situations.

Met Not Met

11.7 Use concrete models, drawings, and dynamic geometric software to explore geometric ideas and their applications in real-world contexts.

Met Not Met

11.8 Demonstrate knowledge of the historical development of Euclidean and non-Euclidean geometries including contributions from diverse cultures.

Met Not Met

Standard 11 comments:

Standard 12. Knowledge of Calculus. Candidates demonstrate a conceptual understanding of limit, continuity, differentiation, and integration and a thorough background in techniques and application of calculus.

Indicators:

12.1 Demonstrate a conceptual understanding of and procedural facility with basic calculus concepts.

Met Not Met

12.2 Apply concepts of function, geometry, and trionometry in solving problems involoving calculus.

Met Not Met

12.3 Use the concepts of calculus and mathematical modleing to represent and solve problems taken from real-world context.

Met Not Met

12.4 Use technological tools to explore and represent fundamental concepts of calculus.

Met Not Met

12.5 Demonstrate knowledge of the historical development of calculus including contributions from diverse cultures.

Met Not Met

Standard 12 comments:

There was nothing specifically referenced related to the use of technology in the calculus sequence.

Standard 13. Knowledge of Discrete Mathematics. Candidates apply the fundamental ideas of discrete mathematics in the formulation and solution of problems.

Indicators:

13.1 Demonstrate knowledge of basic elements of discrete mathematics such as graph theory, recurrence relations, finite difference approaches, linear programming, and combinatronics.

Met Not Met

13.2 Apply the fundamental ideas of discrete mathematics in the formulation and solution of problems arising from real-world situations.

Met Not Met

13.3 Use technological tools to solve problems involving the use of discrete structures and application of algorithms.

Met Not Met

13.4 Demonstrate knowledge of the historical develpment of discrete mathematics including contributions from diverse cultures.

Met Not Met

Standard 13 comments:

Course descriptions clarified which indicators were met.

Standard 14. Knowledge of Data Analysis, Statistics, and Probability. Candidates demonstrate an understanding of concepts and practices related to data analysis, statistics, and probability.

Indicators:

14.1 Design investigations, collect data, and use a variety of ways to display the data and interpret data representations that may include bivariate data, conditional probability and geometric probability.

Met Not Met

14.2 Use appropriate methods such as random sampling or random assignment of treatments to estimate population characteristics, test conjectured relationships among variables, and analyze data.

Met Not Met

14.3 Use appropriate statistical methods and technological tools to describe shape and analyze spread and center.

Met Not Met

14.4 Use statistical inference to draw conclusions from data.

Met Not Met

14.5 Identify misuses of statistics and invalid conclusions from probability

Met Not Met

14.6 Draw conclusions involving uncertainty by using hands-on and computer-based simulation for estimating probabilities and gathering data to make inferences and conclusions.

Met Not Met

14.7 Determine and interpret confidence intervals.

Met Not Met

14.8 Demonstrates knowledge of the historical development of probability and statistics including contributions from diverse cultures.

Met Not Met

Standard 14 comments:

See Standard 13.

Standard 15. Knowledge of Measurement. Candidates apply and use measurement tools.

Indicators:

15.1 Recognize the common representations and uses of measurement and choose tools and units for measuring.

Met Not Met

15.2 Apply appropriate techniques, tools, and formulas to determine measurements and their application in a variety of contexts.

Met Not Met

15.3 Complete error analysis through determining the reliability of the numbers obtained from measures.

Met Not Met

15.4 Demonstrate knowledge of the historical development of measurement and measurement systems including contributions from diverse cultures.

Met Not Met

Standard 15 comments:

See Standard 13.

Standard 16. Field-Based Experiences. Candidates complete field-based experiences in mathematics classrooms.

Indicators:

16.1 Engage in a sequence of planned opportunities prior to student teaching that includes observing and participating in both middle and secondary mathematics classrooms under the supervision of experienced and highly qualified teachers.

Met Not Met

16.2 Experience full-time student teaching in secondary mathematics that is supervised by a highly qualified teacher and a university or college supervisor with secondary mathematics teaching experience.

Met Not Met

16.3 Demonstrate the ability to increase students' knowledge of mathematics.

Met Not Met

Standard 16 comments:

The report's clarifications and further detail for Assessments 3-6 provide much stronger evidence for this standard, particularly since mathematics educators supervise, provide feedback, and show evidence of how they have used these standards to change assignments and strengthen programs.

PART C - EVALUATION OF PROGRAM REPORT EVIDENCE

C.1. Candidates' knowledge of content

Candidates' evidence from test scores, coursework, and assessments in field experience show their ability to demonstrate mathematical knowledge. The program's course sequence has been changed and strengthened based upon analysis of data.

C.2. Candidates' ability to understand and apply pedagogical and professional content knowledge, skills, and dispositions

Carefully structured, meaningful assessments in the mathematics methods course and in the student teaching experience provide ample evidence that candidates are expected to be knowledgeable of the standards and use them. Feedback is provided from professors and supervisors who are mathematics educators.

C.3. Candidate effects on P-12 student learning

The TeacherWork Sample as well as the student teaching assessment provide indication of specific analysis of student learning. The faculty are collecting and using data. They are discriminating in the assessment of candidates.

PART D - EVALUATION OF THE USE OF ASSESSMENT RESULTS

Evidence that assessment results are evaluated and applied to the improvement of candidate performance and strengthening of the program (as discussed in Section V of the program report)

Additional data provided showed how faculty are using data. The additional trend data of the next few years should be valuable to the institution.

PART E - AREAS FOR CONSIDERATION

Areas for consideration

Since candidates are doing so well, it is curious that the GPA was actually lowered to a level lower than most institutions and states. Continued assessment of the adequacy of preparation might indicate a need to reconsider that decision.

PART F - ADDITIONAL COMMENTS

F.1. Comments on Section I (Context) and other topics not covered in Parts B-E:

The institution is to be commended for the serious and careful response to the first review.

F.2. Concerns for possible follow-up by the Board of Examiners:

PART G - DECISIONS

Please select final decision:

- [ ] Program is nationally recognized. The program is recognized through the semester and year of the institution's next NCATE accreditation decision in 5-7 years. To retain recognition, another program report must be submitted before that review. The program will be listed as nationally recognized through the semester of the next NCATE accreditation decision on websites and/or other publications of the SPA and NCATE. The institution may designate its program as nationally recognized by NCATE, through the semester of the next NCATE accreditation decision, in its published materials. National recognition is dependent upon NCATE accreditation.

Please click "Next"

This is the end of the report. Please click "Next" to proceed.