Central Washington University
Assessment of Student Learning
Teaching Secondary Mathematics Program

Academic Year of Report: 2009-2010
College or Support Area: College of the Sciences
Department or Program: Teaching Secondary Mathematics
Check here if your assessment report covers all undergraduate degree programs: [ X ]

Overview of the program:
The Teaching Secondary Mathematics major and minor both meet the Washington State Secondary Mathematics endorsement standards. Both the major and minor are offered at both the Ellensburg and Lynnwood campuses. The major has three courses that the minor does not: Number Theory, Continuous Modeling, and Discrete Modeling. The rationale behind having both a major and minor leading to an endorsement is the minor is the minimum program needed to ensure mastery in content, pedagogy, and teaching experience. The major adds more depth in content for those students who are focusing on only teaching mathematics only. The students who take the minor are students who major in physics, chemistry, or who already have a math based degree or endorsement.

1. What student learning outcomes were assessed this year, and why?
Teaching Secondary Mathematics Program has a formative and summative assessment system comprised of several elements: 1) a performance-based, standards-aligned electronic portfolio, 2) entry and exit surveys, 3) WEST-E content examination, 4) common course assessments in all required 300 and 400 level courses for the Teaching Secondary Mathematics Program, 5) Graduating Senior Survey, 6) Alumni Survey, 7) National Survey of Student Engagement, and 8) Student Teaching Feedback interviews.

Program Goals
The following program are related to college and university goals I, II, and IV. Each goal is assessed multiple times for each student to monitor their progress and improve the program.

<table>
<thead>
<tr>
<th>Program Goals and Student Learning Outcomes</th>
<th>College Goals</th>
<th>Univ. Goals</th>
<th>Reason Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Experiences in Learning Mathematics</td>
<td>I&amp;II</td>
<td>I&amp;II</td>
<td>Math content is key to being a successful math teaching and is required by the program, state, and national standards.</td>
</tr>
<tr>
<td>Students will be able to apply and explain the concepts, methods, and applications in the following six broad math content areas: Mathematics of the Continuous, Mathematics of the Discrete, Algebra, Geometry.</td>
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<tr>
<td>2. Use of Technology</td>
<td>I&amp;II</td>
<td>I&amp;II</td>
<td>Appropriate use of technology to both do and teach mathematics is key to being a successful math teaching and is required by the program, state, and national standards.</td>
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<tr>
<td>Students will be able to appropriately use technology to investigate and teach concepts, methods, and applications of mathematical problems.</td>
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<tr>
<td>3. Mathematical Thinking</td>
<td>I&amp;II</td>
<td>I&amp;II</td>
<td>Mathematical thinking is the key component to all mathematical instruction and is required by the program, state, and national standards.</td>
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<td>Students will be able to use principles of mathematical thinking to solve and prove mathematical problems.</td>
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<tr>
<td>4. Historical and Cultural Perspectives</td>
<td>I, II, &amp;IV</td>
<td>I, II, &amp;IV</td>
<td>In order to make mathematics relevant to their students a math teacher must know how to make historical and cultural connections; also, it is required by the program, state, and national standards.</td>
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<tr>
<td>Students will be able to use their knowledge of the historical and cultural roots of mathematical ideas and practices to teach and assess understanding of mathematical concepts from these different historical and cultural perspectives.</td>
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<tr>
<td>5. Mathematical Pedagogy, Curriculum, and Students</td>
<td>I, II, &amp;IV</td>
<td>I, II, &amp;IV</td>
<td>It is obvious that a prospective mathematic teacher must understand how to plan, teach, and assess mathematics lessons that are developmentally appropriate for their students.</td>
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<tr>
<td>Students will be able to use mathematics pedagogy and learning theory to plan, teach, and assess lessons that are developmentally appropriate, culturally responsive, and aligned with the state curriculum standards.</td>
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2. How were they assessed?
Teaching Secondary Mathematics Program is a data driven system for: 1) Improvement of the mathematics education programs; 2) Curriculum changes to meet the ever changing needs of secondary mathematics teachers; 3) Alignment with the new state endorsement criteria; and 4) Align with the West-E content exam for secondary mathematic; and 5) Consistency in the curriculum for mathematical thinking (problem solving and reasoning), writing, and use of technology. Below is an overview of the assessment system that is revised at the yearly meeting each fall and spring by the mathematics education faculty.

Assessment and Improvement Structure

Mathematics Content Assessment System
(This system is organized around the orientation and senior seminar courses.)

Base-line data for mathematics content and pedagogy knowledge program assessment and improvement will start with Pre-Admission requirements and activities in the Orientation Seminar and ends with the Senior Seminar, Math Methods Course, and the West-E scores. Data is collected on each of the program objectives.

MATH 299E, Orientation Seminar: Secondary Mathematics (2 cr.), winter quarter:
- Introduction to the program survey
- Creation of a cohort
- Baseline evaluation of written, oral, and mathematical skills
- Introduction to technology in the classroom (electronic portfolio, graphing calculators, Minitab, Mathematica, Geometer’s Sketchpad, etc.)
- Introduction to Problem Solving and Mathematical Models

MATH 499E, Senior Seminar: Secondary Mathematics (3 cr.), fall quarter:
The processes problem Solving, communication, reasoning, making connections, technology, and teaching are assessed with a clear focus on mastery of the seven math content areas: Algebra, Number theory, Discrete Math, Calculus, Geometry, Measurement, and Probability and Statistics. Individualized projects using written projects, oral presentations, teaching lessons, content tests, and electronic portfolios are used to assess the student exit performances.

Pedagogy and Teaching Experience Assessment System
(This system is organized around Math299E, Math324, and Student Teaching)

Base-line pedagogy knowledge and teaching ability is collected in Math 299E and concluded in Math 324 in an entrance and exit survey collected on the electronic portfolio. Other formative data is collected about field experiences, and student teaching, which is summarized in the exit survey.

MATH 299E, Orientation Seminar: Secondary Mathematics (2 cr.), winter quarter:
- Introduction to the program survey
- Development of a professional identity
- Introduction to technology in the classroom (electronic portfolio, graphing calculators, Minitab, Mathematica, Geometer’s Sketchpad, etc.)
- Introduction to Problem Solving and Mathematical Models

MATH 324, Methods and Material in Teaching Secondary Mathematics (2 cr.), winter quarter:
- Exit program survey
- Curriculum development
- Clinical Teaching
- Field Experience Teaching
- Assessment of mathematics teaching dispositions
- Introduction mathematics professional community

Each student must is assessed informally in MATH 299E on the NCTM dispositions and formally in MATH 324: Equity, effective teaching, teaching for understanding, assessment, stimulating curriculum. Each student is assessed
informally in MATH 299E and then formally in MATH 324 on their ability to connect research and own experiences. The assessment methods that are used include: 1. Candidate self-assessment; 2. Field supervisor assessment of candidate; and 3. Cooperating Teacher assessment of candidate. Each of these assessment components is collected for review in the students’ Mathematics Teaching Portfolio.

<table>
<thead>
<tr>
<th>Department/Program Goals</th>
<th>Method of Assessment</th>
<th>Who &amp; What was Assessed</th>
<th>When Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Experiences in Learning Mathematics</strong></td>
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<td>Students will be able to apply and explain the concepts, methods, and applications in the following six broad content areas:</td>
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<tr>
<td>• Mathematics of the Continuous</td>
<td>Course assessment for: Math, 331, 355, 455, 360, 361, 320, and 430</td>
<td>Math Faculty Assess Courses According to Course Standards</td>
<td>Math Faculty brought data from these course assessments to the Math Ed. faculty meeting in June to evaluate student and program effectiveness.</td>
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<tr>
<td>• Mathematics of the Discrete</td>
<td>Secondary Teaching Mathematics Portfolio</td>
<td>Student Performance Student Knowledge Student Attitude</td>
<td>Entry of Program, winter (MATH 299E), Fall Senior Year (MATH 499E), Winter Senior Year (MATH 324)</td>
</tr>
<tr>
<td>• Algebra</td>
<td>West-E exam</td>
<td>Student Performance Student Knowledge</td>
<td>Exit (Report in Spring of pass rate)</td>
</tr>
<tr>
<td>• Geometry</td>
<td>National and University Surveys (Graduating Senior, Alumni, and NSSE)</td>
<td>Institutional Research</td>
<td>We receive data in the spring</td>
</tr>
<tr>
<td>• History of Mathematics</td>
<td>Student Teaching Survey</td>
<td>Program Director</td>
<td>Entry and Exit Survey</td>
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<tr>
<td></td>
<td>Entry and Exit Survey</td>
<td></td>
<td>Entry (Winter Junior Year)</td>
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<td>Exit (Winter Senior Year)</td>
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<td><strong>2. Use of Technology</strong></td>
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<td>Students will be able to use appropriate technology to investigate and represent concepts, methods, and applications of mathematical problems. Use appropriate technology to teach and assess understanding of mathematical concepts.</td>
<td>MATH 299E, 499E, and 324</td>
<td>Math Faculty Assess Courses According to Course Standards</td>
<td>Math Faculty brought data from these course assessments to the Math Ed. faculty meeting in June to evaluate student and program effectiveness.</td>
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<td>Secondary Teaching Mathematics Portfolio</td>
<td>Student Performance Student Knowledge Student Attitude</td>
<td>Entry of Program, winter (MATH 299E), Fall Senior Year (MATH 499E), Winter Senior Year (MATH 324)</td>
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<tr>
<td></td>
<td>Entry and Exit Survey</td>
<td>Student Attitude Student Performance Program Improvement</td>
<td>Entry (Winter Junior Year) Entry (Winter Senior Year)</td>
</tr>
<tr>
<td><strong>3. Mathematical Thinking</strong></td>
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<tr>
<td>Students will be able to use principles of mathematical thinking to solve and prove mathematical problems.</td>
<td>MATH 260, MATH 299E, and MATH 499E</td>
<td>Math Faculty Assess Courses According to Course Standards</td>
<td>Math Faculty brought data from these course assessments to the Math Ed. faculty meeting in June to evaluate student and program effectiveness.</td>
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<td></td>
<td>Secondary Teaching Mathematics Portfolio</td>
<td>Student Performance Student Knowledge Student Attitude</td>
<td>Entry of Program, winter (MATH 299E), Fall Senior Year (MATH 499E), Winter Senior Year (MATH 324)</td>
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<tr>
<td></td>
<td>West-E exam</td>
<td>Student Performance Student Knowledge</td>
<td>Exit</td>
</tr>
</tbody>
</table>
4. Historical and Cultural Perspectives
Students will be able to develop their knowledge of the rich historical and cultural roots of mathematical ideas and practices and use this knowledge to teach and assess understanding of mathematical concepts from these different historical and cultural perspectives.

MATH 299E, MATH 320, and MATH 324
Math Faculty Assess Courses According to Course Standards
Math Faculty brought data from these course assessments to the Math Ed. faculty meeting in June to evaluate student and program effectiveness.

Secondary Teaching Mathematics Portfolio
Student Performance
Student Knowledge
Student Attitude
Entry of Program, winter (MATH 299E), Fall Senior Year (MATH 499E), Winter Senior Year (MATH 324)

Entry and Exit Survey
Student Attitude
Student Performance
Program Improvement
Entry (Winter Junior Year)
Exit (Winter Senior Year)

Final Thoughts Survey
Student Attitude
Exit

5. Understanding of Mathematical Pedagogy, Curriculum, and Students
Students will be able to apply mathematics pedagogy that is developmentally appropriate and culturally responsive to plan, teach, and assess lessons using their understanding of mathematics, learning theory, and mathematics curriculum standards.

MATH 299E, MATH 499E, and MATH 324
Math and Science Faculty Assess Courses According to Course Standards
Math Faculty brought data from these course assessments to the Math Ed. faculty meeting in June to evaluate student and program effectiveness.

Secondary Teaching Mathematics Portfolio
Student Performance
Student Knowledge
Student Attitude
Entry of Program, winter (MATH 299E), Fall Senior Year (MATH 499E), Winter Senior Year (MATH 324)

National and University Surveys (Graduating Senior, Alumni, and NSSE)
Institutional Research
We receive data in the spring

Student Teaching Survey
Program Director
June

Entry and Exit Survey
Student Attitude
Student Performance
Program Improvement
Entry (Winter Junior Year)
Exit (Winter Senior Year)

A) What methods were used?
Explanation of Key Assessment Instruments
Math Faculty Assess Students According to Course Standards
The math faculty created course assessment activities that are aligned with program outcomes and consistent between course instructors. Every spring these course assessments and student achievement on these assessments is reviewed.

Secondary Teaching Mathematics Portfolio
Candidates must demonstrate knowledge, skills, and disposition proficiency by providing tangible, verifiable evidence chosen from coursework, research and fieldwork related mathematics-teaching experiences. Candidates must also justify their choice of evidence and connect these to progress in meeting professional standards through a reflection that accompanies each portfolio dimension.

Entry and Exit Surveys
When a candidate enters the program (MATH 299E), they must complete an entry survey that includes basic demographics as well as written items that assess candidate disposition embedded within the Mathematics Teaching Portfolio. At the completion of the program (MATH 324), each candidate must also complete an exit survey whereby they evaluate program effectiveness. Experiences that were particularly useful are described, as are met and unmet candidate expectations. Exit and entry survey results are subsequently compared and a comparative reflection completed.

Common Assessments in the Required Mathematics Courses
The mathematics education faculty outlined common assessments and criterion for the required courses of the Teaching Mathematics Program. Also each student must receive a C or higher in these course.

West-E exam
All students must pass the West-E content exam for secondary students. This is Washington State requirement and data is collection on the pass rate and the type of questions answered correctly and incorrectly.

National and University Surveys -- Graduating Senior, Alumni, and NSSE Surveys
Every year the CWU Institutional Research Office distributes data from the above surveys.

Student Teaching Survey
Every June the program director (Dr. Mark Oursland) conducts an informal survey of students who have completed student teaching to find out the strengths and weaknesses of their preparation for the classroom. This information is combined with feedback I also receive from the CWU field experience office.

B) Who was assessed?
All students are assessed on all program outcomes multiple times as outlined in the above assessment plan.

C) When was it assessed?
Each student is assessed on each of the program outcomes at the beginning of the program in MATH 299E, during the middle of the program in the mathematics content courses, and at the end of the program in MATH 499E and MATH 324 using multiple assessment methods. Each student assesses and reviews the program upon completion of Math 324 (just before student teaching). The information from this assessment is collected and used in the Mathematics Education program review meeting. Mathematics education meets in September and May of every year to analyze the assessment data: content, pedagogy, and program. Changes are recommended and acted upon. The program director Dr. Mark Oursland is in charge of filing the reports and following–up on all action recommended. Reports from these meeting can be obtained from the Department of Mathematics or on the CWU NCATE website.

3. What was learned?

Math Faculty Assess Students According to Course Standards
Information from the June 11, 2010 Math Education Faculty meeting on student achievement revealed that most students were doing well in the mathematics courses. Two students failed to receive a C or better in two of the courses. The faculty revealed they were unable to meet the course standards. Two students, one of which failed in a content course were weak in the initial teaching assessment in MATH 299E and they will need extra help and practice to become a confident teacher.

Mathematics Teaching Portfolio
The program electronic portfolio for secondary mathematics was completely revised after the May 2008 mathematics education faculty meeting. The portfolio data is completely accurate in assessing the program standards because the students select an artifact that demonstrate their performance in meeting the standards and then write a reflective argument supporting their proficiency in meeting every aspect of the standard. Note the scores in participating in profession and use of instructional strategies are the lowest and are a point of emphasis in the methods course. This is also why a teaching activity was added to the Math 499E. The students needed more practice teaching in the local school districts under the supervision of the mathematics faculty. The consistency is dependant on how consistent the different instructors applied the course rubrics of Math 299E, Math 324, and Math 499E to the electronic portfolio. In the past two years the standard error of measurement on all standards was less than 5% and rubric levels are 20%, therefore the consistency of the scoring of the rubric had no statistical or practical effect on identifying the performance of the students. The portfolios are assessed fairly because the Math 299E, Math 324, and Math 499E instructors discuss the artifacts and use of the rubrics every fall and spring to assure that the portfolio are being used for instruction and assessment in a consistent method.
Math 299E -- Rubric Math 299E

The proficiency of the students is high (over 83%) for all the mathematics process skills. The consistency is high (less than .56 of a point) which means we are confident that the students have met at least the proficiency in each of these standards. Teaching mathematics was low (only partially proficient) with a large standard deviation. This is expected since this was most of the student’s first time teaching. This baseline shows the instructors what teaching skills to emphases. There was practically no difference between instructors because the standard error of measurement on all standards was less than 10% and standard deviation rubric levels are 20%, therefore the consistency of the scoring of the rubric had know statistical effect on identifying the performance of the students.

<table>
<thead>
<tr>
<th>Rubric: Performance Assessment</th>
<th>Exemplary (5 pts)</th>
<th>Proficient (4 pts)</th>
<th>Partially Proficient (3 pts)</th>
<th>Incomplete (0 pts)</th>
<th>Mean</th>
<th>Mode</th>
<th>Stdev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching Mathematics</td>
<td>8</td>
<td>12</td>
<td>8</td>
<td>1</td>
<td>2.50</td>
<td>3</td>
<td>1.22</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>10</td>
<td>14</td>
<td>6</td>
<td>3</td>
<td>4.62</td>
<td>4</td>
<td>0.48</td>
</tr>
<tr>
<td>Mathematical Reasoning</td>
<td>4</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>4.25</td>
<td>4</td>
<td>0.56</td>
</tr>
<tr>
<td>Communicating Mathematics</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4.12</td>
<td>4</td>
<td>0.33</td>
</tr>
<tr>
<td>Making Connections</td>
<td>4</td>
<td>11</td>
<td>1</td>
<td>0</td>
<td>4.50</td>
<td>4</td>
<td>0.50</td>
</tr>
<tr>
<td>Mathematical Representations</td>
<td>1</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>4.56</td>
<td>5</td>
<td>0.50</td>
</tr>
</tbody>
</table>

The proficiency of the students is high (over 83%) for all the mathematics process skills. The consistency is high (less than .56 of a point) which means we are confident that the students have met at least the proficiency in each of these standards. Teaching mathematics was low (only partially proficient) with a large standard deviation. This is expected since this was most of the student’s first time teaching. This baseline shows the instructors what teaching skills to emphases. There was practically no difference between instructors because the standard error of measurement on all standards was less than 10% and standard deviation rubric levels are 20%, therefore the consistency of the scoring of the rubric had know statistical effect on identifying the performance of the students.
Notice that the proficiency of the students on their math content knowledge is high but this was for only half of the students. This is because of the problem with LiveText that I will discuss later.

The consistency for the past two years between instructor evaluations was not captured because the director could only include his own data.

**MATH 324 Assessment**
Notice that the proficiency of the students on their math pedagogy knowledge and skills is very good in the dispositions but again this is only about half of the students. MATH 324 has been changed to give more time to curricula and instructional strategies in winter quarter 2009 and 2010. The student scores were higher and student products have improved.

The consistency between instructor evaluations for this year was unavailable because of LiveText but was not practically different in the past two years, the standard error of measurement on all standards was less than 10% and rubric levels are 20%, therefore the consistency of the scoring of the rubric had know statistical effect on identifying the performance of the students.

**WEST-E exam**
The WEST E changed in 2009 and is now administered by the Evaluation Group by Pearson (formerly NES). It remains to be the State’s requirement for certification and one of our program exit criteria, measuring content knowledge by endorsement area. The mathematics education faculty follows each student’s progress in the program and this includes taking the West-E. West-E data reveals 16 of 20 test taken by CWU students were passing scores: 14 of 16 students passed on their first attempt, one student passed on his second attempt and 1 student passed on her third attempt. This is 80% pass rate, which is not as high as the math education faculty would like but it does show that most of the students are prepared to pass this math content exam.

**National and University Surveys**
The national and university surveys revealed that both students need better advising, writing instruction, and classroom management instruction.

**Entry and Exit Surveys**
These surveys revealed a good improvement from MATH 299E (winter of junior year) and MATH 324 (winter of senior year) in teaching skills and knowledge. The majority of the students (over 95%) felt they were prepared through multiple experiences to plan, teach, and assess students in all the math content areas.

**Student Teaching Survey**
Eight of the 18 students were surveyed and all eight felt they were prepared to student teach, had good experiences, and all had jobs for the up coming school year. I had no negative reports from the field teaching office this year.

**4. What will the department or program do as a result of that information?**
Since the standards changed and instructors improved the portfolios and rubrics from the 2009-09 year. The math education faculties is pleased with the changes and are always working on improving the electronic portfolio. The basic assessment system will stay the same but the format of the portfolio will have the following changes:

1. Entrance and exist surveys will be collected within the portfolio
2. Rubrics language and structure will be uniform throughout the program
3. The presentation of the math unit in Math 324 will have more structure
4. The math content requirements in the Math 499E rubric will be more descriptive

*All these suggestions are reflected in the fall and spring Math Education Minutes for the past two years. Data from electronic portfolio for last two years. The standards used in this report are the latest state (2009), NCTM (2007), and CTL (2004) standards.*

New information from the Mathematics Teaching Portfolio cannot be made until LiveText changes the way reports can be run. The math faculty as of right now can only run reports on assessments that they assessed. This has been reported to LiveText and the CTL and no changes have been made.

The spring faculty meeting revealed that we need to improve our advising system. Faculty advisors need to have better access on pass/failure of courses and the West-E exams. The faculty agreed that a handbook is needed for the program and all students should meet with their advisors every quarter before enrolling in courses.
5. What did the department or program do in response to the feedback from last year's assessment report?
As mentioned above a program handbook will be created for next fall (September 2010) and students will be instructed to visit with their advisors before enrolling in courses each quarter. Also the program director (Dr. Oursland) will make entry and exit survey, student course failures, West-E data available for each Math Ed. advisor each quarter.

Because the student data met faculty expectations, no changes will be made to the courses or the Livetext Portfolio this year.

6. Questions or suggestions concerning Assessment of Student Learning at Central Washington University: