Request to Offer Bachelor of Science and Bachelor of Arts Degrees in Mathematics Education
Beginning Spring 2011
Dixie State College

Prepared for
William A. Sederburg
By
Victor Hasfurther and Scott Mortensen

September 2010
Table of Contents

Title Page .................................................................................................................. Page 1
Table of Contents ........................................................................................................ Page 2
Section I:  The Request ................................................................................................. Page 4
Section II:  Program Description .................................................................................. Page 4
          Complete Program Description........................................................................ Page 4
          Purpose of Degree.............................................................................................. Page 5
          Institutional Readiness....................................................................................... Page 5
          Faculty............................................................................................................... Page 5
          Staff................................................................................................................... Page 6
          Library and Information Resources..................................................................... Page 6
          Admission Requirements..................................................................................... Page 6
          Student Advisement......................................................................................... Page 6
          Justification for Number of Credits..................................................................... Page 6
          External Review and Accreditation..................................................................... Page 6
          Projected Enrollment............................................................................................ Page 7
Section III:  Need ........................................................................................................ Page 7
          Program Need..................................................................................................... Page 7
          Labor Market Demand........................................................................................ Page 8
          Student Demand................................................................................................ Page 8
          Similar Programs................................................................................................ Page 8
          Collaboration with and Impact on Other USHE Institutions.............................. Page 9
          Benefits.............................................................................................................. Page 9
          Consistency with Institutional Mission............................................................... Page 9
Section IV:  Program and Student Assessment.............................................................. Page 9
          Student Assessment............................................................................................. Page 9
          Program Assessment............................................................................................ Page 9
          Expected Standards of Performance.................................................................... Page 9
Section V:  Finance........................................................................................................ Page 11
          Budget................................................................................................................. Page 11
          Funding Sources.................................................................................................. Page 11
SECTION I: The Request

Dixie State College requests approval to offer a Bachelor of Science degree and a Bachelor of Arts degree in Mathematics Education, effective Spring 2011. The program was approved by the institution’s Board of Trustees on_____________. This degree proposal is accompanied by a proposal to offer BS and BA degrees in Mathematics.

SECTION II: Program Description

Complete Program Description: The proposed degree in Mathematics Education will provide students with the knowledge, skills, and training required to become qualified mathematics educators in secondary schools, grades 6-12, or to continue their own education in graduate studies. Employment prospects are excellent for mathematics education degree students. As evidenced by a 2009 Carnegie study\(^1\), a shortage of math teachers exists throughout the nation, creating increasing demand for new instructors. Likewise, the Washington County School District indicates a need for math and science teachers (see Appendix E).

The Mathematics Education degree will require students to complete a set of rigorous core courses which will provide graduates with a foundation of the fundamental areas of calculus, linear algebra, Euclidean/Non-Euclidean geometry, analysis, number theory, probability, and statistics. The Math Education degree requires the completion of at least 120 semester credits, including at least 25 credits of general education and 36 secondary education credits. Graduates of the Math Education program will be prepared to enter the teaching profession at the secondary level and/or pursue further graduate studies in education.

All content courses in the Mathematics Education program will be taught by qualified faculty members of the Department of Mathematics, and the Mathematics Education courses will be taught by qualified faculty in DSC’s Secondary Education Teacher Program (SET), which is nationally accredited through the Teacher Education Accreditation Council (TEAC). The main goal of the program is to rigorously prepare the best-qualified secondary math teachers who can demonstrate knowledge in the content area by passing the required PRAXIS exams, and who meet the requirements of the nationally accredited teacher preparation program.

Recognizing the need for coordination between the mathematics content area and secondary education certification, DSC anticipates several interlocking connections. One of the standing committees at DSC is the Professional Educator Committee. This committee is directed through the Academic Vice President’s office in consultation with the Department of Education. Members include the Education School’s Dean and Chair, the SET Director, and selected Deans, faculty, and advisors from approved undergraduate majors for secondary licensure along with four-year degree programs that are interested in developing an education emphasis. The purpose of the PECC committee is to plan, coordinate, and evaluate the content, quality and effectiveness of the DSC teacher preparation program. It provides an avenue for discussion and coordination between all parties who have a vested interest in teacher education. The committee reviews program elements, curriculum, field experiences, student concerns, and makes recommendations for improvements.

Purpose of Degree: One of the central roles assigned to DSC is to meet the educational needs of Washington and Kane counties. Given the rapid growth of the area and the infusion of public school-aged children, combined with retirements projected in the Washington County School District, the need for public school teachers continues to grow. Mathematics, throughout the county, state, and nation, is projected to be a significant need in secondary education as the economy rebounds. The U.S. Bureau of Labor Statistics reports that “Most job openings will result from the need to replace the large number of teachers who are expected to retire over the 2008–18 period. Currently, many school districts have difficulty hiring qualified teachers in some subject areas—most often mathematics, science (especially chemistry and physics), bilingual education, and foreign languages.” They add: “the supply of teachers is expected to increase in response to reports of improved job prospects, better pay, more teacher involvement in school policy, and greater public interest in education.”

This degree proposal addresses the high-demand statewide need for secondary mathematics teachers, as well as a critical local need (see Washington County School District letter, Appendix H). The expected outcome is that highly-qualified secondary mathematics teachers will be produced, thereby alleviating some of the shortages occurring now and projected to occur in the future based on retirement and teacher turnover.

The proposed degree is targeted toward the following students: new freshmen at Dixie State College who wish to obtain secondary education licensure and who wish to teach mathematics; current teachers in the WCSD and outlying areas such as Kanab who need additional courses to meet USOE endorsement requirements; and individuals having baccalaureate degrees and higher who have relocated to Washington County and who wish to meet the requirements for secondary teacher licensure in the State of Utah.

Institutional Readiness: With steady and sustained development as a baccalaureate institution, DSC’s infrastructure and institutional environment are now fully ready to respond to southern Utah’s demand for more varied degrees. The institution has devoted resources and attention to developing student services and library services. Dixie State College now has a decade of experience as a baccalaureate institution, and it boasts an infrastructure and institutional environment appropriate for its role. Thoughtful and sustained attention to seeking and retaining credentialed teaching faculty, developing student services and library and technological resources, and funding facilities expansion have poised the institution to successfully add the proposed degree.

The Department of Mathematics at DSC has been offering upper-division courses each semester for the past four years, and enrollment has increased sharply since the first offerings, with the total number of upper-division students increased from 9 in Spring 2007 to 43 in Spring 2010. The existing faculty includes experienced educators with doctoral degrees who are qualified to teach upper-division courses, as well as master’s-prepared teachers experienced in offering the required lower-division mathematics courses.

Faculty: The mathematics faculty at DSC is composed of qualified, experienced, and diverse professors. Existing Mathematics faculty include four members with Ph.D. degrees. Full time faculty also includes five Masters-prepared faculty members whose combined teaching experience at Dixie State totals nearly eighty years. There are individuals holding doctoral degrees in each sub-discipline. With the addition in the next year of another Ph.D. faculty in Mathematics, and with a second Ph.D.-qualified hire expected in the second year of the program, the ratio of faculty with terminal degrees will meet or exceed national

benchmarks for four-year colleges and universities. Education courses will be taught by PhD-prepared faculty in the Secondary Teacher Education Program. As the program grows, additional faculty may be needed to accommodate growth. See Appendix C for the list of current faculty in Mathematics and Education (full-time and adjunct) and the background and qualifications of each.

**Staff:** The Mathematics Department at Dixie State College currently functions with one .74-time secretary and one work-study student, which is sufficient at this time. Currently, the department has a lecturer/advisor with a 60% instruction-to-40% advisement contract. As the program grows, additional advising personnel will be added.

**Library:** Dixie State College is well aware that building library sources is an integral part of program development, and the Browning Library continues to expand appropriate collections for current baccalaureate offerings. The library currently has sufficient titles in mathematics itself, with additional titles in secondary mathematics and an abundance of titles in secondary education. Many of the resources in the library are electronic offerings. Journals in mathematics and math education are on the library shelves, and videos and CDs are also available. The Browning Library is committed to supporting the baccalaureate programs by ordering any material requested. Details on the Browning Library holdings are available in Appendix D.

**Admission Requirements:** Any matriculated DSC student in good standing with the college is eligible for admission to the major. Declaration of the major is required for admission and is accomplished through the processes defined by the Registrar’s Office. Students are admitted to the degree program directly upon declaring the major. To graduate under this program, in addition to the required course work, all Mathematics majors are required to receive a “C” or better and an overall GPA of at least 2.0 GPA in major course work. Formal admission to the SET program is somewhat more rigorous: Students must complete all pre-education core classes with a 3.0 GPA or above, and have a minimum of a 2.75 GPA in the most recent completed 30 semester hours. SET also requires a formal group interview with faculty members.

**Student Advisement:** The Mathematics Department recognizes that advisement is crucial to student success. The program faculty is in the process of developing an advisement protocol that will guide students from the time they declare the Mathematics Education major through to graduation. Each student will be assigned a faculty mentor and will also be directed to an advisor in the Education Department. At the implementation of the degree, the Math lecturer/advisor will serve to assist program majors, and as the program enrollment grows, academic advisement staff will be added as necessary.

**Justification for Graduation Standards and Number of Credits:** Graduates will earn a total of 120-126 credits, including a minimum of 45 mathematics credits, 8 required credits in Physics and Computer Science, 36 SET credits, and 34-36 General Education and elective credits. The total credit amount is within the 126 credit hour limit for a BS degree, as mandated by Regents.

**External Review and Accreditation**
Diana Suddreth, Curriculum and Instruction Secondary Mathematics Specialist at the Utah State Office of Education, reviewed the proposed program and offered the several recommendations, to which mathematics department faculty responded. An external consultant, Dr. Virginia M. Buchanan, Professor and Chair of the Mathematics Department at Hiram College, Hiram, Ohio, also evaluated the program proposal; she writes: “the proposed mathematics education program overall appears to be a good one.
Students who complete the program will have experienced the breadth of mathematics and will have studied the foundational areas of mathematics. Graduates of the program will be prepared for careers in secondary education and for further study." She also offers several important recommendations, which have been incorporated into the final proposal. Dr. Buchanan’s and Ms. Suddrath’s recommendations and the program’s actions as a result are available in Appendix G.

Accreditation of the Mathematics Education program will be incorporated into the institution’s established regional accreditation process with all appropriate evaluations and measures to ensure rigor and excellence. The Secondary Education Teacher licensure program associated with the degree is approved by the Utah State Office of Education and accredited by the Teacher Education Accreditation Council (TEAC).

Projected Enrollment: Nationwide and local data (described in detail under “Need” and “Market Demand” below) suggest that this degree will be modestly popular among majors at the college. Projected enrollment growth for the program is detailed in the chart under Market Demand below. Following are projected student FTEs and faculty FTEs for the proposed baccalaureate programs:

<table>
<thead>
<tr>
<th>Year</th>
<th>Student FTE</th>
<th># of Faculty</th>
<th>Mean FTE</th>
<th>Student-Faculty Ratio</th>
<th>Accreditation Req’d Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>14.6 FTE</td>
<td>2:1</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>14.6 FTE</td>
<td>3:1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>14.6 FTE</td>
<td>3:1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>20</td>
<td>14.6 FTE</td>
<td>4:1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>20</td>
<td>14.6 FTE</td>
<td>4:1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SECTION III: Need

Program Need: The Mathematics Education emphasis is a foundational degree that is almost universally offered at baccalaureate institutions granting secondary licensure. The nationwide emphasis, at the state and federal levels, on increasing math knowledge and abilities among school-age children in the United States highlights the need for highly qualified mathematics teachers; furthermore, secondary schools throughout Washington County, the State of Utah, and elsewhere are constantly seeking mathematics faculty. Students at Dixie State College should have this degree option available to them.

Prior to the economic downturn of 2009, much had been made of the teacher shortage in Utah, particularly in mathematics and science. Until then, it had been estimated that Utah’s student enrollment was expected to grow from 540,000 to more than 680,000 students by 2014. At the same time, the state’s colleges and universities were not producing qualified graduates in numbers to meet the projected demands. The Desert News reported that “about half of those who do become teachers quit within the first five years. Of Utah’s some 9,000 new teachers licensed between 2000 and 2004, fewer than half remain in Utah public schools by the 2005-05 school year, the supply and demand study states.”3 It was reported that in 2007 the state of

---

3 (http://deseretnews.com/article/1,5143,695202503,00,html)
Utah needed as many as 100 new math and science teachers, but was only able to attract six qualified candidates.\(^4\)

Of course, the economic downturn and subsequent recession may have tempered the demand, but more recent data tell of a sustained need nationwide for qualified secondary math and science teachers. In its 2009 report, “The Opportunity Equation: Transforming Mathematics and Science Education for Citizenship and the Global Economy,” the Carnegie Institute for Advanced Study said:

\[
To\text{ }achieve\text{ }dramatic\text{ }improvements\text{ }in\text{ }math\text{ }and\text{ }science\text{ }education\text{ }for\text{ }all\text{ }students,\text{ }we\text{ }will\text{ }need\text{ }to\text{ }increase\text{ }the\text{ }supply\text{ }of\text{ }teachers\text{ }with\text{ }strong\text{ }working\text{ }knowledge\text{ }of\text{ }mathematics\text{ }and\text{ }science\text{ }and\text{ }the\text{ }pedagogical\text{ }techniques\text{ }necessary\text{ }to\text{ }teach\text{ }math\text{ }and\text{ }science\text{ }effectively.\text{ }Our\text{ }secondary\text{ }schools\text{ }will\text{ }continue\text{ }to\text{ }need\text{ }math\text{ }and\text{ }science\text{ }teachers\text{ }with\text{ }deep,\text{ }specialized\text{ }knowledge\text{ }of\text{ }those\text{ }disciplines,\text{ }and\text{ }increasing\text{ }their\text{ }numbers\text{ }must\text{ }continue\text{ }to\text{ }be\text{ }an\text{ }important\text{ }priority.\text{ }For\text{ }the\text{ }future,\text{ }however,\text{ }we\text{ }must\text{ }also\text{ }aim\text{ }to\text{ }build\text{ }a\text{ }teaching\text{ }profession\text{ }in\text{ }which\text{ }all\text{ }teachers,\text{ }in\text{ }every\text{ }discipline\text{ }and\text{ }from\text{ }the\text{ }elementary\text{ }grades\text{ }on\text{ }up,\text{ }are\text{ }“STEM-capable,”\text{ }or\text{ }sufficiently\text{ }conversant\text{ }with\text{ }math\text{ }and\text{ }science\text{ }content\text{ }and\text{ }relevance\text{ }to\text{ }infuse\text{ }their\text{ }classrooms\text{ }with\text{ }rigorous,\text{ }motivating\text{ }math\text{ }and\text{ }science\text{ }learning.\text{ }To\text{ }prepare\text{ }American\text{ }students\text{ }to\text{ }participate\text{ }fully\text{ }in\text{ }tomorrow’s\text{ }economy\text{ }and\text{ }society,\text{ }our\text{ }K-14\text{ }educational\text{ }system\text{ }needs\text{ }a\text{ }STEM-capable\text{ }human\text{ }capital\text{ }infrastructure.\(^5\)
\]

**Labor Market Demand:** The Mathematics Education degree prepares students to work toward a specific career, that of a mathematics teacher. Demand for mathematics educators is brisk, both regionally and nationally. In fact, the regional demand for secondary teachers is such that the Washington County School District (WCSD) included mathematics as one of four specially requested degrees (See letter from WCSD in Appendix E.) Given the proficiency requirements in Utah high schools in mathematics, such needs will continue to be reflected in the years ahead.

**Student Demand:** Because of ongoing student interest in educational careers at most state colleges and universities, Colleges of Education have an institution’s largest number of annual graduates. Data from a joint survey conducted by Dixie State College and the Washington County School District in the spring of 2006 indicate a respectable population in the County that is interested in pursuing a degree in education. Many in this population already possess a baccalaureate degree and desire secondary licensure. Because of the current market demand for math educators, it is anticipated that many of DSC’s current students will move toward the Math Education degree. A survey conducted in January 2009 of 230 students enrolled in mathematics courses above the level of MATH 1210 at Dixie State showed substantial interest in pursuing degrees in Mathematics or Mathematics Education: Of 230 students surveyed, 26 indicated an interest in Math Education; 35 were interested in majoring in Mathematics; and 21 were interested but undecided as to which degree to pursue, Mathematics or Math Education. In addition to current and future DSC students, approximately half of the Washington County School District teachers with mathematics endorsements have Level 2 or Level 3. WCSD indicates that a number of those teachers would be eager to gain a Level 4 endorsement.

**Similar Programs:** All baccalaureate-degree-offering institutions in the Utah System of Higher Education have a Mathematics Education Program.

\(^4\) [http://www.heraldextra.com/content/view/253710/155/]

Collaboration with and Impact on Other USHE Institutions: Collaboration with sister institutions has been primarily confined to informal contacts at majors meetings, most recently at the face-to-face Math Majors meetings in Salt Lake City in September 2010. Mathematics faculty at Dixie State have carefully reviewed the Mathematics programs of USHE institutions and used those program curricula as the template for the DSC program. Dixie State expects that impact on sister institutions will be minimal, if it exists at all, primarily because 70% of Dixie’s students are Washington County residents; these are students who traditionally don’t go elsewhere for undergraduate education, regardless of availability of degree options.

Benefits to DSC and to the USHE: Baccalaureate completion rates in Utah are declining, and one probable contributor is access. While associate degree attainment in Washington County is strong (38% compared to 17.7% for the state), baccalaureate attainment for the 25- to 34-year-olds is almost reversed: 17.4% in Washington County compared to 25.4% for the state.\(^6\) The proposed degree in Mathematics Education, by offering one more baccalaureate option, should contribute to reversing this trend, since the costs and difficulty for Washington County students of traveling to another institution appear be a substantial hindrance to baccalaureate completion. Approving the proposed degree will improve access for the growing population of southwest Utah. Just as importantly, it will assist in the burden placed on USHE to provide the teachers needed in the State of Utah by providing a number of skilled and well-prepared secondary teachers for local, regional, and state school districts.

Consistency with Institutional Mission: The proposed degrees in Mathematics Education are in keeping with DSC’s mission to offer baccalaureate programs in “core or foundational areas” and to deliver “quality higher educational opportunities within its service area.” Furthermore, it is in keeping with the Mission’s mandate that “The College will be a cooperative and conscientious partner with other public and higher education institutions.”

SECTION IV: Student and Program Assessment

Program Assessment: Each department at DSC goes through a program review prescribed in policy. This review includes assessment of facilities, teaching resources, curricular design, and academic achievement of learning objectives, with each department reviewed on a five-year rotation. As required by BOR policy, a three-year follow-up report of the program will be submitted.

At the suggestion of consultant Dr. Virginia Buchanan, DSC Mathematic faculty adopted the recommendations of the Mathematical Association of America in revising its program goals and learning outcomes (see Appendix E). All majors will take the ETS graduate exam in their senior year. This nationally-standardized exam will provide program-level assessment as resulting student scores will be analyzed in relation to the program outcomes. Employer satisfaction will be measured in surveys to be developed.

Expected Standards of Performance: Central to this degree proposal is a commitment to student assessment and, ultimately, to the production of quality graduates. Graduates of the Mathematics

\(^6\) Available at: http://factfinder.census.gov/servlet/STTable?_bm=y&-state=st&-context=st&-qr_name=ACS_2005_EST_G00_S1501&-ds_name=ACS_2005_EST_G00_&-tree_id=305&-redoLog=true&-_caller=geoselect&-geo_id=05000US49053&-format=&-_lang=en
Education program will receive the training necessary to apply for Level 4 endorsement in mathematics, making them eligible to teach any and all high school mathematics courses offered in the State of Utah.

Mathematics Education graduates must complete 48 credits of coursework directly related to knowledge of the field, an additional 36 credits specifically designed to prepare them for careers in secondary schools, and a 5-credit calculus-based physics course to provide applied knowledge of mathematics. In addition, graduates must pass the PRAXIS II examination in Mathematics Content Knowledge (Test #0061). The SET program assessment is aligned with TEAC standards as well as INTASC and UPTS standards. The SET program standards alignment table describing assessments and measurements are included in Appendix E.

Mathematics graduates must complete 45 credits of coursework directly related to mathematics knowledge and a 5-credit calculus-based physics sequence.

Each course in the curriculum will have identified learning outcomes that must be achieved upon completion of the course. The ability to formulate mathematical proofs is one learning outcome in all courses numbered above 3000, as this is a necessary skill for graduate work in mathematics. Also, each course numbered above 3000 will be structured so as to provide Mathematics Education students with the essential content knowledge needed to pass the PRAXIS II exam. Sample PRAXIS II exam problems or their equivalents will be included on each final examination in these courses.
SECTION V: Finance

Financial Analysis Form for All R401 Documents

<table>
<thead>
<tr>
<th>Students</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projected FTE Enrollment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost Per FTE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student/Faculty Ratio</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Projected Headcount</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Projected Tuition          |        |        |        |        |        |
| Gross Tuition              |        |        |        |        |        |
| Tuition to Program         |        |        |        |        |        |

<table>
<thead>
<tr>
<th>5 Year Budget Projection</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expense</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salaries &amp; Wages</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benefits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Personnel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Expense</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Library Expense</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Expense</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
</tr>
</tbody>
</table>

| Revenue                    |        |        |        |        |        |
| Legislative Appropriation  |        |        |        |        |        |
| Grants                     |        |        |        |        |        |
| Reallocation               |        |        |        |        |        |
| Tuition to Program         | $ -    | $ -    | $ -    | $ -    | $ -    |
| Total Revenue              | $ -    | $ -    | $ -    | $ -    | $ -    |

| Difference                 |        |        |        |        |        |
| Revenue-Expense            | $ -    | $ -    | $ -    | $ -    | $ -    |

Comments

**Funding Sources**: The funding for the proposed degrees will come from institutional funds from state allocations and new tuition revenue, depending on future budgetary conditions. External funding sources will be vigorously pursued as conditions allow.

**Reallocation**: No current reallocation of program funds is planned.

**Impact on Existing Budgets**: No other programs will be affected by this program.
## Appendix A: Program Curriculum

### Core Courses for Mathematics Endorsement

<table>
<thead>
<tr>
<th>Course Prefix &amp; Number</th>
<th>Title</th>
<th>Credits</th>
<th>Pre-req</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 1040</td>
<td>Statistics</td>
<td>3</td>
<td>MATH 1010</td>
</tr>
<tr>
<td>MATH 1210</td>
<td>Calculus I</td>
<td>5</td>
<td>MATH 1050/1060 or 1065</td>
</tr>
<tr>
<td>MATH 1220</td>
<td>Calculus II</td>
<td>4</td>
<td>MATH 1210</td>
</tr>
<tr>
<td>MATH 2210</td>
<td>Multivariable Calculus</td>
<td>3</td>
<td>MATH 1220</td>
</tr>
<tr>
<td>MATH 2270</td>
<td>Linear Algebra</td>
<td>3</td>
<td>MATH 1210</td>
</tr>
<tr>
<td>MATH 2280</td>
<td>Ordinary Differential Equations</td>
<td>3</td>
<td>MATH 1220</td>
</tr>
<tr>
<td>MATH 2200</td>
<td>Discrete Mathematics</td>
<td>3</td>
<td>MATH 1210</td>
</tr>
<tr>
<td>MATH 3000</td>
<td>History of Mathematics</td>
<td>3</td>
<td>MATH 1220</td>
</tr>
<tr>
<td>MATH 3100</td>
<td>Euclidean/ Non-Euclidean Geometry</td>
<td>3</td>
<td>MATH 2200</td>
</tr>
<tr>
<td>MATH 3200</td>
<td>Introduction to Analysis</td>
<td>3</td>
<td>MATH 2210/2200</td>
</tr>
<tr>
<td>MATH 3400</td>
<td>Probability and Statistics</td>
<td>3</td>
<td>MATH 1220</td>
</tr>
<tr>
<td>MATH 3900</td>
<td>Number Theory</td>
<td>3</td>
<td>MATH 2200</td>
</tr>
<tr>
<td>MATH 4000</td>
<td>Foundations of Algebra</td>
<td>3</td>
<td>MATH 2200</td>
</tr>
<tr>
<td>MATH 4500</td>
<td>Methods/Teaching Sec. School Math</td>
<td>3</td>
<td>MATH 1210</td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td></td>
<td>45</td>
<td></td>
</tr>
<tr>
<td><strong>Other Required Courses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 2210</td>
<td>Physics for Scientists/Engineers I</td>
<td>4</td>
<td>MATH 1210</td>
</tr>
<tr>
<td>PHYS 2215</td>
<td>Physics Lab I</td>
<td>1</td>
<td>w/PHYS 2210</td>
</tr>
<tr>
<td>CS 1400</td>
<td>Foundations of Programming</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Sub-Total</strong></td>
<td></td>
<td>8</td>
<td></td>
</tr>
<tr>
<td><strong>Total Number of Core Course Credits</strong></td>
<td></td>
<td>53</td>
<td></td>
</tr>
</tbody>
</table>

*Must achieve a C or better in each course

**Three-five math credits may be applied to General Education Requirements
## Education Courses

<table>
<thead>
<tr>
<th>Course Prefix &amp; Number</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDUC 1010</td>
<td>Introduction to Education</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 2400</td>
<td>Foundations of Multicultural Education</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 2010</td>
<td>Introduction to Exceptional Learners</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 3110</td>
<td>Educational Psychology</td>
<td>3</td>
</tr>
<tr>
<td>EDUC 2500</td>
<td>Technology for Secondary Teachers</td>
<td>3</td>
</tr>
<tr>
<td>SCED 3720</td>
<td>Read/Write in Content Areas</td>
<td>3</td>
</tr>
<tr>
<td>SCED 4100</td>
<td>Curriculum, Instruction, Assessment</td>
<td>3</td>
</tr>
<tr>
<td>SCED 4600</td>
<td>Classroom Management</td>
<td>3</td>
</tr>
<tr>
<td>SCED 4900</td>
<td>Secondary Student Teaching</td>
<td>10</td>
</tr>
<tr>
<td>SCED 4989</td>
<td>Student Teaching Seminar</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total Number of Credits</strong></td>
<td></td>
<td><strong>36</strong></td>
</tr>
</tbody>
</table>

## Summary of Credit Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Requirements</td>
<td>53</td>
</tr>
<tr>
<td>Electives (course descriptions are included in the complete course list below)</td>
<td>9</td>
</tr>
<tr>
<td>General Education (excluding the credits included in degree requirements)</td>
<td>26-28</td>
</tr>
<tr>
<td>SET Requirements</td>
<td>36</td>
</tr>
<tr>
<td><strong>Total Requirements</strong></td>
<td><strong>124-126</strong></td>
</tr>
</tbody>
</table>

New Courses to Be Added in the next Five Years: The Mathematics Program has no plans for new courses to be added at the program’s inception since all the courses needed for the degree are already included in the curriculum; however, as the program grows and new faculty are hired with expertise in other areas, the program will expand its offerings to allow students to explore these other areas of mathematics.
Appendix A, continued: Course Descriptions

MATH 1001 1st Yr Exp - Intro to Math 1.00 CR MATH 1001 is an orientation course created to help students succeed in the math major. It is also designed to help new freshman and returning students to make a successful transition to being a college student. The primary objective of this course is to provide you with the resources you will need to succeed in your college career, particularly in your math courses. 2 lecture hours per week.

MATH 1010 Intermediate Algebra 4.00 - 5.00 CR Designed for students who need preparatory work before entering the minimum courses that fulfill the general education math requirement. Concepts emphasized in this course include the properties of the real number system, sets, functions, graphs, algebraic manipulations, linear and quadratic equations, systems of equations, and story problems. Students will be expected to reason mathematically and solve mathematical problems. This course is a lecture course and will include homework assignments, quizzes, tests, and a comprehensive final exam. Successful completion of the course gives students good preparation for college-level math courses. Satisfies prerequisites for MATH 1030, 1050, 1090, and BIOL 2400. Prerequisite: MATH 0990 (with an earned grade of C or better) or ACT score of 18 or higher within two years of enrollment. 4 or 5 lecture hours per week.

MATH 1030 Quantitative Reasoning *MA 3.00 CR This course is designed for general studies or liberal arts students majoring in humanities or other non-science programs seeking only an associate degree or certificate. The focus of the course is on the development of analytical problem solving skills through the application of various mathematical concepts to real-life problems. Topics of study include: modeling with algebra; geometry; logic; financial math; right triangle trigonometry (indirect measurement); probability and statistics. Successful completion of this course will satisfy the general education math requirements. Students who wish to enter four year programs are strongly encouraged to check with departments at transfer schools to determine program compatibility. Although this course transfers to all colleges and universities in Utah, it does not commonly meet specific department requirements. Prerequisite: Math 1010 (with an earned grade of C or better) OR placement test score of 23 or higher. 3 lecture hours per week.

MATH 1040 Intro to Statistics *MA 3.00 CR Designed as an introduction to basic concepts and methods used in statistical data analysis. Course includes descriptive statistics, sampling and inferential methods. Emphasizes problem solving and critical thinking. Prerequisite: Math 1010 (with an earned grade of C or better) OR placement test score of 23 or higher. 3 lecture hours per week.

MATH 1050 College Algebra/Pre-Calculus *MA 4.00 - 5.00 CR Designed for students majoring in science and engineering who need a calculus and/or physics series. Review of fundamental algebra. Polynomial and rational functions will be explored. Introduction into exponential and logarithmic functions and their applications. Trigonometric functions dealing with graphs, identities and equations including inverse functions. This course is a lecture course with homework assignments, quizzes, tests, and a comprehensive final exam. Successful completion of the course prepares students for MATH 1060. Satisfies prerequisites for MATH 1060, MATH 1100 and MATH 2010. Math 1050 is required for Utah Teacher Certification. Prerequisite: MATH 1010 (with an earned grade of C or better) or equivalent. 4 to 5 lecture hours per week.

MATH 1060 Trigonometry *MA 3.00 CR Continuation of MATH 1050. Further discussion in trigonometry and its applications. Analytic Geometry including conic sections, systems of equations and inequalities and partial fractions. Introduction into discrete algebra including sequences and series and the binomial theorem. This course is a lecture course with homework assignments, quizzes, tests, and a comprehensive final exam. Successful completion of the course provides students with the concepts needed to continue in a Physics or Calculus series. Satisfies prerequisites for MATH 1210 and PHSX 1110. Prerequisite: Math 1050 (with an earned grade of C or better) or equivalent. 3 lecture hours per week.

MATH 1065 Precalculus w/Trigonometry *MA 5.00 CR Designed for students who need an in depth review of precalculus and trigonometry before entering trig-based calculus. This course reviews the mathematical concepts
taught in Math 1050 and Math 1060. Students who choose to apply Math 1065 toward graduation cannot also count Math 1050 or Math 1060. Prerequisite: Within the previous two years a placement test score equivalency of 25 or better OR within the past two years Math 1010 with an earned grade of B or better OR successful precalculus experience more than two years ago. 5 lecture hours per week.

**MATH 1100 Business Calculus **MA 3.00 CR** Designed for students majoring in business, life sciences, certain computer science emphases, and certain allied health programs who are required to take a one semester calculus course. Concepts emphasized in this course include functions, modeling, differentiation, applications of differentiation, exponential and logarithmic functions, integration, applications of integration, and functions of several variables. Course includes; lectures, homework assignments, quizzes, tests, and a comprehensive final exam. Successful completion of the course provides students with the required calculus techniques that satisfy all areas requiring just one quarter of calculus. Prerequisite: Math 1050 or Math 1090 (with an earned grade of C or better) or ACT score of 25 or higher. 3 lecture hours per week.

**MATH 1210 Calculus I **MA 5.00 CR** Designed for students intending to earn an Associate of Science degree and then transfer to a mathematics, engineering program, or other calculus-based major at a four-year institution. Students will gain a basic understanding of calculus, the mathematics of motion and change. Topics include limits and continuity, differentiation, applications of differentiation, integration, applications of integration, derivatives of exponential functions, logarithmic functions, inverse trigonometric functions, hyperbolic functions and related integrals. Students must have a working knowledge of college algebra and trigonometry, and a graphing calculator is strongly recommended. Course includes lecture and homework assignments, quizzes, tests and a final comprehensive exam. Successful completion of the course prepares students for Calculus II. Satisfies prerequisites for MATH 1220 and PHSX 2210. Prerequisites: MATH 1050 and MATH 1060, or MATH 1065 (with an earned grade of C or better) or ACT score of 26 or higher. (Math 1060 is strongly recommended for all students.) 5 lecture hours per week.

**MATH 1220 Calculus II **MA 4.00 CR** This course is the continuation of MATH 1210. Topics covered includes arc length, area of a surface of revolution, moments and centers of mass, integration techniques, sequences and series, parameterization of curves and polar coordinates, vectors in 3-space, quadric surfaces, and cylindrical and spherical coordinates. Course includes lecture, homework assignments, quizzes, tests and final comprehensive exam. Successful completion of the course prepares students for MATH 2210. Prerequisite: Math 1210 (with an earned grade of C or better) or equivalent. 4 lecture hours per week.

**MATH 1800 Mathematics Work Experience 1.00 - 3.00 CR** Cooperative Education relates the classroom to the employment community. Those with a designated major and a vocational or career interest may be assisted in locating employment that relates to classroom studies. If a student has approved employment, they may be eligible for academic credit based upon the completion of structured learning objectives. Cooperative Education is available in all divisions. Permission must be obtained from the director of cooperative education before registration. Students are limited to four cooperative education credit courses or 12 cooperative education credits. Fall section.

**MATH 1810 Mathematics Work Experience 1.00 - 3.00 CR** Cooperative Education relates the classroom to the employment community. Those with a designated major and a vocational or career interest may be assisted in locating employment that relates to classroom studies. If a student has approved employment, they may be eligible for academic credit based upon the completion of structured learning objectives. Cooperative Education is available in all divisions. Permission must be obtained from the director of cooperative education before registration. Students are limited to four cooperative education credit courses or 12 cooperative education credits. Spring section.

**MATH 1820 Mathematics Work Experience 1.00 - 3.00 CR** Cooperative Education relates the classroom to the employment community. Those with a designated major and a vocational or career interest may be assisted in locating employment that relates to classroom studies. If a student has approved employment, they may be eligible for academic credit based upon the completion of structured learning objectives. Cooperative Education is available
in all divisions. Permission must be obtained from the director of cooperative education before registration. Students are limited to four cooperative education credit courses or 12 cooperative education credits. Summer section.

**MATH 2010 Math for Elem Teachers I 3.00 CR** The first course in a two-semester sequence in mathematics appropriate to the needs of the elementary/middle school teacher. Topics include: problem solving, sets, numeration systems, whole numbers, algorithms of arithmetic, number theory, rational numbers and decimal numbers. Required for prospective elementary school teachers. Prerequisite: Math 1050 (with an earned grade of C or better) and is required for Level 1 Math Endorsement and Elementary (K-8) Certification. 3 lecture hours per week.

**MATH 2020 Math for Elem Teachers II 3.00 CR** A continuation of Math 2010. Topics include: real numbers, statistics, probability, geometry, measurement, and algebra. Required for prospective elementary school teachers. Prerequisite: MATH 2010 with an earned grade of C or better. 3 lecture hours and 2 practicum hours per week.

**MATH 2200 Discrete Mathematics 3.00 CR** Designed primarily for students majoring in computer science. Topics include logic (including Boolean), set theory, functions, prepositional calculus, graph theory, combinatorics and counting methods. Prerequisite: Math 1100 or 1210 (with an earned grade of C or better). (Offered spring semesters.) 3 lecture hours per week.

**MATH 2210 Multivariable Calculus *MA 3.00 CR** This course is the continuation of MATH 1220. Includes partial derivatives, gradient vectors, Lagrange multipliers, multiple integrals, line integrals, Green's Theorem, surface integrals, the Divergence Theorem, and Stokes' Theorem. MathCAD - Calculus will also be introduced in computer labs. Course includes lecture and homework assignments, quizzes, tests and a comprehensive final. Successful completion of the course prepares students for all areas that require calculus as a prerequisite. Satisfies prerequisites for ENGR 2000. Prerequisite: Math 1220 with an earned grade of C or better. 3 lecture hours per week.

**MATH 2270 Linear Algebra 3.00 CR** Designed for mathematics and pre-engineering majors. Covers matrix and vector analysis and systems of equations with applications, linear dependence and independence, matrix algebra and invertibility, determinants and their applications, Cramer's Rule, diagonalization, eigenvalues and eigenvectors, linear transformations (kernel and range), inner product and orthogonality. Covers vector spaces and subspaces, including null and column and bases. Introduces basic proof theory. Uses lecture, text assignments, student presentations and discussions. Successful completion enhances students' post-calculus mathematical skills. Prerequisite: Math 1210 with an earned grade of C or better. 3 lecture hours per week.

**MATH 2280 Ordinary Differential Equation 3.00 CR** Designed for mathematics and pre-engineering majors. Covers methods of solving ordinary differential equations with applications. Separation of variable, homogeneous and non-homogeneous, exact, first and higher order, integrating factors, substitution methods, linear and non-linear, complex characteristic roots, variation of parameters, undetermined coefficients (superposition and annihilator approach) and Euler-Cauchy will be covered. Systems of equations, power series solutions, and the Laplace transform will be introduced. Uses lecture, text assignments, student presentations, and class discussion. Successful completion enhances students' post-calculus mathematical skills with applications. Prerequisites: Math 2210 and Math 2270 with an earned grade of C or better. (Concurrent enrollment allowed.) 3 lecture hours per week.

**MATH 2989 TI-89 Calculator Skills 1.00 CR** A course designed specifically to aid students in using the TI-89 calculator. A study guide will be provided, with demonstrations projected overhead for students to follow as they learn through hands-on experience. Covered features include basic computation, matrices, graphing, and calculus applications. The TI-92 and TI Voyage 200 calculators are similar to the TI-89 and are also acceptable tools for the course. Prerequisite: Own or have access to TI-89, TI-92 or TI Voyage 200 calculator. One lecture hour per week.

**MATH 3000 History of Mathematics 3.00 CR** Designed for all interested students. This course is a brief survey of the history of mathematics and its impact on world culture. Emphasis will be on the principal ideas of importance in the development of the subject, mathematical motivations and applications. This course partially fulfills requirements for Mathematics Endorsements Level 4 through the Utah State Office of Education. Offered upon sufficient demand. Prerequisite: MATH 1220 (with an earned grade of C or better), 3 lecture hours per week.
MATH 3100 Euclidean/Non-Euclidean Geometry 3.00 CR  Designed primarily for education majors. This course includes axiomatic development of geometry: Euclidean and non-Euclidean. This course partially fulfills requirements for Mathematics Endorsements Level 3 and 4 through the Utah State Office of Education. Offered upon sufficient demand. Prerequisite: MATH 1220 and MATH 2300 (with an earned grade of C or better). 3 lecture hours per week.

MATH 3200 Intro to Analysis 3.00 CR  Designed for those interested in advanced mathematics. This course introduces the construction of rigorous proofs of mathematical claims in beginning analysis. This course partially fulfills requirements for Mathematics Endorsements Level 3 and 4 through the Utah State Office of Education. Offered upon sufficient demand. Prerequisite: MATH 2210, MATH 2280 and MATH 2300 (with an earned grade of C or better). 3 lecture hours per week.

MATH 3210 Intro to Analysis II 3.00 CR  Continuation of MATH 3200. Advanced Multivariable Calculus. Topics include continuity, differentiation, chain rule, Riemann integration, Fubini's theorem, change of variable formula. Prerequisite: MATH 3200. 3 lecture hours per week.

MATH 3400 Probability and Statistics 3.00 CR  Designed for students in majors that require math-based statistics. This course is a study of probability theory and mathematical statistics including applications. This course partially fulfills requirements for Mathematics Endorsements Level 3 and 4 through the Utah State Office of Education. Offered upon sufficient demand. Prerequisite: MATH 1220 (with an earned grade of C or better). 3 lecture hours per week.


MATH 3900 Number Theory 3.00 CR  An overview of number theory and it's applications, including the integers, factorizations, modular arithmetic, congruencies, Fermat's and Euler's Theorems, Diophantine equations, cryptography, and RSA algorithm. Prerequisite: MATH 2300. 3 lecture hours per week.

MATH 4000 Foundations of Algebra 3.00 CR  Designed for students in all math-related majors. This course covers an introduction to algebraic systems including groups rings, fields and sets. This course partially fulfills requirements for Mathematics Endorsements Level 3 and 4 through the Utah State Office of Education. Offered upon sufficient demand. Prerequisite: MATH 1220 and MATH 2300 (with an earned grade of C or better). 3 lecture hours per week.

MATH 4010 Abstract Algebra 3.00 CR  Continuation of MATH 4000. Topics include Sylow Theory for finite groups, Galois Theory, factorization in commutative rings. Prerequisite: MATH 4000. 3 lecture hours per week.

MATH 4100 Intro to Topology 3.00 CR  An overview of elementary point-set topology. Topics include topological spaces, compactness, connectedness, metric spaces, and Hausdorff spaces. Prerequisites: MATH 2210, MATH 2300. 3 lecture hours per week.

MATH 4200 Intro to Complex Analysis 3.00 CR  An overview of basic theory and applications of complex variables. Topics include analytic functions, contour integration, and conformal mappings. Prerequisite: MATH 3200. 3 lecture hours per week.

MATH 4500 Methods/Teaching Secondary School Math 3.00 CR  Designed for education majors. This course covers methods, remedial instruction and curriculum development for secondary school mathematics. Includes applications of calculators and computers in mathematics. This course partially fulfills requirements for Mathematics Endorsements Level 2-4 through the Utah State Office of Education. Offered upon sufficient demand. Prerequisite: MATH 1210 (with an earned grade of C or better). 3 lecture hours per week.
### Secondary Education Teacher (SET) Course Descriptions

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDUC 1001</td>
<td>Freshman Seminar in Education (1)</td>
<td></td>
<td>This course is required for all entering freshmen, and is recommended for transfer students with 0-24 credits. The course is designed to help students adapt to college life and become integrated into Dixie State College. Students will refine academic skills, create and foster social networks, learn about college resources, and explore different fields of study, degree options, and career opportunities. Sections offered by academic departments will include information pertinent to that discipline, while open major sections will include information about choosing a major or area of student. 2 lab hours per week.</td>
</tr>
<tr>
<td>EDUC 1010</td>
<td>Foundations/Intro to Education (3)</td>
<td></td>
<td>Required prerequisite course for both the Elementary Education degree and the Secondary Education Teaching (SET) program. Provides an overview of vocational aspects of a teaching career including: certification requirements, foundations of education, current and historical issues in education, an overview of current trends in methodology, and classroom management. This class provides students with an opportunity to assess oneself as a prospective teacher. Various teaching methods are used including lecture, cooperative learning, inquiry methods, direct instruction and mastery learning. Students are required to do two full observation days in local K-12 school settings. 3 lecture hours per week.</td>
</tr>
<tr>
<td>EDUC 2010</td>
<td>Intro to Exceptional Learners (3)</td>
<td></td>
<td>Required prerequisite course for both the Elementary Education degree and the Secondary Education Teaching (SET) program. Provides an overview of exceptional students and examines the teacher’s role in integrating these students into the K-12 classroom. Identifies characteristics and special needs of students who have physical, emotional, social, mental, or health exceptionalities. In addition, students will learn the basic laws and policies of Special Education and the key characteristics of inclusion and co teaching. 3 lecture hours per week.</td>
</tr>
<tr>
<td>EDUC 2400</td>
<td>Foundations/Multicultural/ESL Education (3)</td>
<td></td>
<td>Required prerequisite course for both the Elementary Education degree and the Secondary Education Teaching (SET) program. Teacher candidates will examine a variety of theoretical frameworks associated with multicultural education and current issues affecting diverse students in the educational setting. The course content and assessments will provide teacher candidates with opportunities to discuss and reflect on issues of race, gender, individual differences, and ethnic as well as cultural perspectives. Additionally, a foundation of language acquisition theory and sheltered English techniques will also be introduced to address the needs of English Language Learners. This course also partially fulfills the requirement for ESL Endorsement. 3 lecture hours per week.</td>
</tr>
<tr>
<td>EDUC 2500</td>
<td>Technology/Education/Electronic Portfolio (K-12) (3)</td>
<td></td>
<td>Required prerequisite for both the Elementary Education and the Secondary Education Teaching (SET) programs. Teacher candidates will learn basic computer programs and technology tools that will be used to create productive learning environments in the educational setting. For example, computer programs will address grading software, creating databases, spreadsheets, word processors, email, bulletin boards, internet access, educational websites, and Smartboards. In addition to these technology tools, students will develop an electronic portfolio based on INTASC (New Teachers Assessment and Support Consortium) and NET (National Educational Technology Standards for Teachers). This portfolio will enable pre service teachers to document professional growth in a wide range of knowledge, skills, and dispositions through tangible artifacts and reflections throughout their educational career. 3 lecture hours per week.</td>
</tr>
<tr>
<td>EDUC 3110</td>
<td>Educational Psychology (3)</td>
<td></td>
<td>Required prerequisite course for both the Elementary Education degree and the Secondary Education Teaching (SET) licensure program. Provides teacher candidates with an overview of the relationship of psychology to teaching and learning. Students will learn about the nature of learning, human brain growth, the impact of brain research, child and adolescent development and how the brain processes information. An emphasis is places on how teacher candidates can apply</td>
</tr>
</tbody>
</table>
the theories and practices of educational psychology into day to day teaching practices. 3 lecture hours per week.

<table>
<thead>
<tr>
<th>Secondary Education Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SCED 3720</strong> Read/Write in Content Areas (3)</td>
</tr>
<tr>
<td><strong>SCED 4100</strong> Curriculum/Instruction/Assessment (3)</td>
</tr>
<tr>
<td><strong>SCED 4600</strong> Classroom Management (3)</td>
</tr>
<tr>
<td><strong>SCED 4700</strong> Content Methods Course (3)</td>
</tr>
<tr>
<td><strong>SCED 4900</strong> Secondary Student Teaching (10)</td>
</tr>
<tr>
<td><strong>SCED 4989</strong> Student Teaching Seminar (2)</td>
</tr>
</tbody>
</table>
Appendix B: Program Schedule

# Mathematics Education Degree
## Proposed 4-Year Schedule

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall (Even Year)</th>
<th>Credits</th>
<th>Third Year:</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall (Odd Year)</strong></td>
<td>Math 1210 Calculus I 5</td>
<td>Math 4000 Foundations of Algebra 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Math 1001 1st Year Experience 1</td>
<td>CS 1400 Foundations of Programming 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CIS 1200 Computer Literacy 3</td>
<td>Educ 2400 Foundations Multicultural Education 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>American Institutions GE 3</td>
<td>Educ 2010 Intro to Exceptional Learners 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fine Arts/Communication GE 3</td>
<td>Educ 3110 Educational Psychology 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td><strong>15</strong></td>
<td></td>
<td><strong>15</strong></td>
</tr>
<tr>
<td><strong>Second Year:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall (Odd Year)</strong></td>
<td>Math 1220 Calculus II 4</td>
<td>Spring (Odd Year)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engl 1010 Introduction to Writing 3</td>
<td>Math 3400 Probability and Statistics 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lib 1010 Information Literacy 1</td>
<td>Math 3100 Euclidean/Non-Eu Geometry 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Life Science GE 3</td>
<td>Educ 2500 Technology for Secondary Teachers 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PSY 1010 General Psychology 3</td>
<td>Electives</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lit/Humanities 3</td>
<td></td>
<td></td>
<td><strong>6</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td><strong>17</strong></td>
<td></td>
<td><strong>15</strong></td>
</tr>
<tr>
<td><strong>Third Year:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall (Even Year)</strong></td>
<td>Math 2270 Linear Algebra 3</td>
<td>Fall (Even Year)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Math 2200 Discrete Math 3</td>
<td>Math 3200 Introduction to Analysis 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phys 2210 Physics for Scientists/Eng I 4</td>
<td>Math 4500 Methods/Teaching Sec. School Math 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phys 2215 Physics Lab I 1</td>
<td>SCED 3720 Read/Write in Content Areas 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engl 2010 Intermediate Writing 3</td>
<td>SCED 4100 Curriculum, Instruction, Assessment 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Math 3000 History of Math 3</td>
<td>SCED 4600 Classroom Management 15</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td><strong>17</strong></td>
<td></td>
<td><strong>15</strong></td>
</tr>
<tr>
<td><strong>Fourth Year:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Spring (Even Year)</strong></td>
<td>Math 2280 Ordinary Differential Equations 3</td>
<td>Spring (Even Year)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SCED 4900 Secondary Student Teaching 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Math 2210 Multivariable Calculus 3</td>
<td>SCED 4989 Student Teaching Seminar 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Math 1040 Statistics 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Educ 1010 Introduction to Education 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Math 3900 Number Theory 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td><strong>15</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*American Institutions*

*Fine Arts/Communication*
### Appendix C: Faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Degree/Year</th>
<th>Area</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clare Banks</td>
<td>Assoc. Prof.</td>
<td>Ph.D., 2005</td>
<td>Mathematics, Education/Statistics</td>
<td>U. of Northern Colorado</td>
</tr>
<tr>
<td>Jie Liu</td>
<td>Asst. Prof.</td>
<td>Ph.D., 2006</td>
<td>Mathematics</td>
<td>U of Texas, Arlington</td>
</tr>
<tr>
<td>Taylor A. Jensen</td>
<td>Instructor, Tenure-track</td>
<td>Ph.D., 2009</td>
<td>Mathematics Education</td>
<td>Montana State Univ.</td>
</tr>
<tr>
<td>Lynn R. Hunt</td>
<td>Assoc. Prof.</td>
<td>MS, 1984</td>
<td>Mathematics, Computer Ed</td>
<td>Oregon State Univ.</td>
</tr>
<tr>
<td>Ross Decker</td>
<td>Assoc. Prof.</td>
<td>MS, 1994</td>
<td>Mathematics</td>
<td>Brigham Young Univ.</td>
</tr>
<tr>
<td>Barbara Blythin</td>
<td>Asst. Prof.</td>
<td>MS, 1989</td>
<td>Mathematics</td>
<td>U. of Nevada, LV</td>
</tr>
<tr>
<td>Gordon A. Russell</td>
<td>Asst. Prof.</td>
<td>MS, 1963</td>
<td>Mathematics Education</td>
<td>Utah State Univ.</td>
</tr>
<tr>
<td>Kathryn Ott</td>
<td>Lecturer/ Advisor</td>
<td>MS, 1981</td>
<td>School Psychology</td>
<td>Brigham Young Univ.</td>
</tr>
</tbody>
</table>

### Education Faculty:

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Degree</th>
<th>Area of Specialization</th>
<th>Institution awarding degree and date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracy Wheeler</td>
<td>Ed.D</td>
<td>Classroom Management &amp; Motivation; Educational Technology; Multicultural; Curriculum Design &amp; Assessment</td>
<td>Utah State Univ., 2006</td>
</tr>
<tr>
<td>John Goldhardt</td>
<td>Ed.D</td>
<td>Educ.Psychology; Classroom Mgmt. Secondary; Multicultural Ed; Curriculum, Instruction &amp; Assessment; WCSD Liaison</td>
<td>U. of Nevada Las Vegas, 2004</td>
</tr>
<tr>
<td>Brenda Sabey</td>
<td>Ph.D</td>
<td>Curriculum &amp; Instruction; Literacy Studies</td>
<td>U. of Nevada, Reno, 1997</td>
</tr>
<tr>
<td>Chizu Matsubara-Jaret</td>
<td>Ph.D</td>
<td>Curriculum &amp; Instruction/TESOL</td>
<td>University of Nevada, 2007</td>
</tr>
<tr>
<td>Shirley Davis</td>
<td>Ph.D</td>
<td>Curriculum &amp; Instruction, Learning Technologies</td>
<td>New Mexico State, 2003</td>
</tr>
<tr>
<td>Nancy Hauck</td>
<td>Ed.D in progress</td>
<td>Curriculum &amp; Instruction</td>
<td>Utah State (in progress)</td>
</tr>
<tr>
<td>Harry Odil</td>
<td>MA</td>
<td>Foundation Courses; SET Advisor</td>
<td>University of No. Colorado</td>
</tr>
</tbody>
</table>
Adjunct Faculty:

<table>
<thead>
<tr>
<th>Name</th>
<th>Degree</th>
<th>Area</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violeta A Ionita</td>
<td>M.S.</td>
<td>Mathematics</td>
<td>Louisiana State Univ. 2002</td>
</tr>
<tr>
<td>Kathryn Ott (Lecturer-Advisor)</td>
<td>M.S.</td>
<td>Psychology</td>
<td>Brigham Young Univ. 1981</td>
</tr>
<tr>
<td>Paul Brooks</td>
<td>M.A.</td>
<td>Mathematics &amp; School Administration</td>
<td>San Diego State 1970; BYU 1977</td>
</tr>
<tr>
<td>Odean Bowler</td>
<td>J.D.</td>
<td>B.S. Electrical Engineering</td>
<td>BYU, 1995; U of U 1988</td>
</tr>
<tr>
<td>Michelle Poast</td>
<td>M.S.</td>
<td>Mathematics</td>
<td>Fayetteville State U. 1999</td>
</tr>
<tr>
<td>Ryan Cascade McConnell</td>
<td>M.S.</td>
<td>Education; B.S. Secondary Education</td>
<td>Walden U. 2004; UNLV 2000</td>
</tr>
<tr>
<td>Barbara A. Talley</td>
<td>M.S.</td>
<td>Computer Science; B.S. Secondary Ed.</td>
<td>Texas A&amp;M 1998; U of Tennessee, Martin, 1972</td>
</tr>
<tr>
<td>Craig Seegmiller</td>
<td>MBA</td>
<td>B.A. Math Education</td>
<td>Thunderbird 1990; BYU 1986</td>
</tr>
<tr>
<td>Christine Cunningham</td>
<td>M.S.</td>
<td>Education</td>
<td>SUU 2005</td>
</tr>
<tr>
<td>Max Rose, Professor Emeritus</td>
<td>Ph.D.</td>
<td>Mathematics and Chemistry</td>
<td>BYU, 1976</td>
</tr>
</tbody>
</table>
APPENDIX D: Library and Information Resources

The Browning Library continues to expand appropriate collections for current baccalaureate offerings. It is committed to supporting the baccalaureate programs by ordering any material requested by a department.

The library currently has sufficient titles in mathematics itself, with additional titles in secondary mathematics and an abundance of titles in secondary education. Many of the resources in the library are electronic offerings. Journals in mathematics and math education are on the library shelves, and videos and CDs are also available.

Among other resources, the library has the following databases relevant to the Math Ed degree:

Global Search: a meta-search engine that searches multiple databases for various topics. It includes catalogs, databases and online resources. This search engine will be replaced soon by a similar search engine to be selected by the Utah Academic Library Consortium.

Academic Search Premier (EBSCO Host): a scholarly, multi-disciplinary database with full text coverage of 4600 journals in a range of subjects. This database is a good starting point for almost any topic search.

American Mathematical Society Journals: a searchable database that provides full text access to articles published in the journals of the AMS.

Annual Reviews: full text of various annual (subject/discipline) reviews online.

JSTOR: a scholarship journal archive that provides image and full text access to archival (more than five years old) scholarly journals in various subject areas.

MathSciNet: access to over 50 years of mathematical reviews and data. The database is a finding source for citations for scholarship in this discipline.

Project Muse: full text of over 40 scholarly journals from the Johns Hopkins University Press.

Web of Science: consolidated searching of citation search engines and multi-disciplinary listings of articles in 8500 major scholarly journals.

Other useful resources include the library catalog, electronic books, Utah’s catalog, full-text periodicals list, and interlibrary loan.

Physical materials in the Browning Library include a mathematics education physical periodicals list (at least one year’s worth of issues), the Journal for Research in Mathematics Education, Mathematics Teacher, and the National Council of Teachers of Mathematics News Bulletin.

There are 41 math education video recordings and 28 CD-ROMS. Other physical materials include a total 482 titles on the study and teaching of mathematics, but only 38 of them has secondary education as a subject heading. This is one area that will need to be addressed and amplified in the near future.
Mathematics Program Goals and Learning Outcomes:

Program Goal #1: Develop mathematical thinking and communication skills

Learning Outcomes:
1. Students will practice and demonstrate mathematical principles, gradually developing more sophisticated abilities in mathematical reasoning and problem solving.
2. Students will learn to apply precise, logical reasoning to problem solving.
3. Students will develop persistence and skill in exploration, conjecture, and generalization.
4. Students will read and communicate mathematics with understanding and clarity.

Program Goal #2: Communicate the breadth and interconnections of the mathematical sciences

Teach students, in a clear and understandable manner, the scientific process and fundamental scientific concepts upon which further, life-long scientific understanding can be built.

Learning Outcomes:
1. Students will present key ideas and concepts from a variety of perspectives.
2. Students will employ a broad range of examples and applications to illustrate and motivate the material.
3. Students will make connections to other subjects and apply the course material to these subjects.
4. Students will introduce contemporary topics from the mathematical sciences and their applications.

Program Goal #3: Use technology to support problem solving and to promote understanding at every level of the curriculum

Learning Outcomes:
1. Students will use technology appropriately and effectively as a tool for solving problems.
2. Students will use technology as an aid to understanding mathematical ideas.

Program Goal #4: Provide a broad view of the mathematical sciences

Learning Outcomes:
1. Majors will understand that mathematics is an engaging field, rich in beauty, with powerful applications to other subjects, and contemporary open questions.
2. Majors will have significant experience with a number of contrasting but complementary points of view, including:
   - Continuous and discrete,
   - Algebraic and geometric
   - Deterministic and stochastic
   - Theoretical and applied
3. Majors will study a single area in depth, drawing on ideas and tools from previous coursework and making connections, by completing two related courses or a year-long sequence at the upper level.

4. Majors will work on a senior-level project that requires them to analyze and create mathematical arguments and leads to a written and an oral report.

Program Goal #5: Encourage and nurture mathematical science majors
Learning Outcomes:

1. Students will receive effective teaching in introductory courses.
2. Students will be carefully advised and will learn about careers in the mathematical sciences.
3. Majors will be assigned a faculty mentor and will be actively advised.
4. Students will experience a welcoming atmosphere and opportunities to establish working relationships with peers, tutors, and instructors.

DSC Secondary Education Teacher Program Goals and Learning Outcomes:

Students who are admitted into the SET program must successfully meet the general education course requirements and complete five pre-education core requirements with a minimum of a 3.0 GPA. These requirements include introduction courses in the field of education, multicultural education, exceptional learners, education technology, and educational psychology.

The first semester curriculum for SET students includes professional secondary courses in reading/writing in the content areas, curriculum design, instruction, and assessment, classroom management, and a general content methods course for post-baccalaureate students or a content methods course in the academic major department for the undergraduate degree in the candidates’ major content area. Most of these courses are a combination of lecture/practicum or lecture/lab. The second semester includes the field experience of student teaching and a student teaching seminar. The total program licensure requirement is 36 credits.

The program requires candidates to successfully complete all courses, field experiences, and to take and pass the Praxis II text in their major content area as identified by the Utah State Office of Education.

SET Program Advisement and Monitoring:
Program advisors monitor students’ GPAs every semester and report this information to the department chair and the SET director. If a student’s GPA falls below 3.0, a meeting is required and a plan developed to meet GPA requirements. The student is placed on academic probation with a letter included in his or her file. If the required GPA is still not achieved, the student may be dropped from the program. Students are aware of the college appeal process, which would consist of a formal letter to the associate dean, requesting a meeting to discuss possible options.

SET Program Claims and Alignment with TEAC, INTASC, and UPTS Standards:

<table>
<thead>
<tr>
<th>Program Claim</th>
<th>TEAC Q.P 1</th>
<th>INTASC</th>
<th>UPTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diversity (DM1)</td>
<td>Multicultural Perspectives and Accuracy (QP 1.4.2)</td>
<td>2,3</td>
<td>1,2,3,5</td>
</tr>
<tr>
<td>Effective Pedagogy (DM2)</td>
<td>Pedagogical Knowledge (QP1.2)</td>
<td>4,7,8</td>
<td>1-4</td>
</tr>
<tr>
<td>Subject Matter (DM3)</td>
<td>Subject Matter Knowledge (QP1.1)</td>
<td>1,7</td>
<td>1,2</td>
</tr>
<tr>
<td>Environment (DM4)</td>
<td>Caring and Effective Teaching Skill (QP1.3)</td>
<td>2,5,6</td>
<td>1,2</td>
</tr>
<tr>
<td>Reflective (DM5)</td>
<td>Learning How to Learn (QP1.4.1)</td>
<td>9,10</td>
<td>3,5</td>
</tr>
<tr>
<td>Teaching Disposition (DM6)</td>
<td>Caring and Effective Teaching Skill (QP1.3)</td>
<td>3,10</td>
<td>5</td>
</tr>
</tbody>
</table>
Description of Program Claims
Claim 1: Diversity – Teacher candidates understand that diversity differences (i.e. race, gender, ethnicity, culture, exceptionalities, individual differences, etc.) affect learning and they know how to provide educational opportunities that meet the needs of all students. According to TEAC’s cross-cutting theme of Multicultural Perspectives, “Candidates must demonstrate that they have learned accurate and sound information on matters of race, gender, individual differences, and ethnic and cultural perspectives.” This theme aligns directly with the program’s Diversity claim and is also integrated through all program claims.

Claim 2: Effective Pedagogy – Teacher candidates can create effective and meaningful instruction and assessment for all students based on required subject matter knowledge, state content standards, curriculum goals, and use of technology. This claim requires teacher candidates to convert multiple sources of knowledge and resources (e.g. subject matter, state content standards, assessments, technology, etc.) into effective and meaningful lessons. The cross-cutting theme of technology is also embedded in all of the D.E.S.E.R.T. model principles, but for specific measurements has been placed under this claim.

Claim 3: Subject Matter – Teacher candidates have a strong knowledge of the subject matter they will teach and can facilitate the acquisition of that knowledge in their students. This claim aligns directly with the TEAC quality principle of Subject Matter Knowledge

Claim 4: Environment – Teacher candidates can create physically and emotionally safe classroom environments that encourage active learning, self-motivation, and cooperative interaction among students. This claim aligns with the TEAC quality principle of Caring and Effective Teaching and requires candidates to teach caringly, effectively, and in a professional manner. A safe classroom environment shows students a teacher cares about their physical and emotional needs. It also embraces structure and policies that demonstrate a professional expectation for learning.

Claim 5: Reflective – Teacher candidates will be active learners and reflective practitioners, individually and with their colleagues. This claim aligns with TEAC’s cross-cutting theme of Learning How to Learn. A reflective practitioner is one who becomes an active learner, develops the knowledge and skills needed to transfer what he or she has learned to new situations, and has a desire and disposition of life-long learning. This theme has been identified under this claim, but these principles are embedded throughout the program.

Claim 6: Teaching Disposition – Teacher candidates will foster a caring and professional relationship with students that focuses on acceptance and their educational needs. This claim embraced TEAC’s quality principle of Caring and Effective Teaching Skill. Teacher candidates need to develop professional relationships with their students that show students they are accepted. The teacher cares about them and will use effective teaching skills to ensure they reach their highest potential.

Program Assessment and Rationale:
The faculty and staff assess whether candidates have met the D.E.S.E.R.T. model claims through a variety of sources which include:
- Grades from coursework
- Standardized tests (Praxis II)
- Field experiences (practicum and student teaching)
- Final program assessments (teacher work sample and electronic portfolio)

A summary of the program’s claims, assessments, and rationale is in the following table:
<table>
<thead>
<tr>
<th>Program Claim</th>
<th>Evidence</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diversity</strong></td>
<td>EDUC 2400; Multicultural Education/ESL Course Grade</td>
<td>Course grade demonstrates content knowledge of multicultural perspectives/accuracy</td>
</tr>
<tr>
<td></td>
<td>DM1 Field Score</td>
<td>Student teaching final evaluation (1-5 scale) measures understanding and practice of multicultural perspectives</td>
</tr>
<tr>
<td><strong>Effective</strong></td>
<td>Overall GPA of Methods Courses</td>
<td>Methods courses focus on pedagogical knowledge and practice through practica field experiences</td>
</tr>
<tr>
<td><strong>Pedagogy</strong></td>
<td>EDUC 4500/2500 Technology Course Grade</td>
<td>Course grades demonstrate technology knowledge and skills based on curriculum and instructors’ multiple assessment measures</td>
</tr>
<tr>
<td></td>
<td>E-portfolios Total Scores</td>
<td>Scores demonstrate knowledge and skills in technology and effective pedagogy from artifacts and rationales</td>
</tr>
<tr>
<td></td>
<td>DM2 Field Experience Final Score (Average of 4 items)</td>
<td>Student teaching final evaluation (1-5 scale) measures effective pedagogy in the curriculum taught by candidates</td>
</tr>
<tr>
<td></td>
<td>Teacher Work Sample (TWS) Analysis Score</td>
<td>TWS analysis score measures effective pedagogy from a curriculum unit taught to students by candidates</td>
</tr>
<tr>
<td><strong>Subject Matter</strong></td>
<td>Major GPA</td>
<td>Course content is aligned with subject matter knowledge, instructors are knowledgeable about relevant subject matter and grades incorporate multiple measure of subject matter knowledge over the course of the candidate’s program.</td>
</tr>
<tr>
<td></td>
<td>Praxis II Test Score</td>
<td>Praxis II tests have been validated by experts for the purpose of measuring subject matter knowledge of specific content areas</td>
</tr>
<tr>
<td></td>
<td>DM# Field Score</td>
<td>Student teaching final evaluation (1-5 scale) measures subject matter knowledge in the curriculum taught by candidates.</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td>DM4 Field Score</td>
<td>Student teaching final evaluation (1-5 scale) measures class environment, management, and cooperation among students</td>
</tr>
<tr>
<td></td>
<td>Teacher Work Sample Design/Instruct Score</td>
<td>TWS design/instruct section measures class environment created from detailed lessons that demonstrate active learning strategies that motivate student learning from a curriculum unit taught by candidates</td>
</tr>
<tr>
<td><strong>Reflective</strong></td>
<td>DM5 Field Score (Average of 2 items)</td>
<td>Student teaching final evaluation (1-5 scale) measures reflective attitude and desire of learning how to learn</td>
</tr>
<tr>
<td></td>
<td>Teacher Work Sample Reflection Score</td>
<td>TWS reflection score measures candidates self-evaluation, reflection, and ways to improve practices from teaching a curriculum unit</td>
</tr>
<tr>
<td><strong>Teaching</strong></td>
<td>DM6 Field Score (Average of 3 items)</td>
<td>Student teaching final evaluation (1-5 scale) measures candidates’ teaching dispositions of caring/professional relationships with students as demonstrated by their effective teaching skills that address student needs</td>
</tr>
<tr>
<td><strong>Disposition</strong></td>
<td>Teacher Work Sample Total Score</td>
<td>TWS total score measures teaching disposition components of caring and effective teaching skills that are included in all areas of the TWS assessment</td>
</tr>
</tbody>
</table>
Appendix E, continued:

**INTASC Standards**: The Interstate New Teacher Assessment and Support Consortium (INTASC standards reflect the professional consensus of what beginning teachers should know and be able to do. The standards and the key indicators associated with them follow. They provide the framework for the rubrics used to assess the products.

Principle #1: The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and can create learning experiences that make these aspects of subject matter meaningful for students.

Principle #2: The teacher understands how children learn and develop, and can provide learning opportunities that support their intellectual, social, and personal development.

Principle #3: The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.

Principle #4: The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.

Principle #5: The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.

Principle #6: The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.

Principle #7: The teacher plans instruction based upon knowledge of subject matter, students, the community, and curriculum goals.

Principle #8: The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of the learner.

Principle #9: The teacher is a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.

Principle #10: The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support students’ learning and well-being.
APPENDIX F: Letter from Washington County School District

(See following page)
August 10, 2010

TO WHOM IT MAY CONCERN;

The Washington County School District urges your support of the BS/BA degrees being sought in Math Education and Physical Science Composite at Dixie State College. We are still a rapidly growing school district with over 26,000 students and 43 schools. We employ 1700 teachers and are seeing a growth prediction of 3% in the coming years. In our 19 secondary schools we need about 100 math teachers and more than that number certified to teach physical sciences. We have several private schools in the county, not associated with our district, which would also have need of these degrees. Interestingly, we have 23 elementary schools that have faculty members who would choose to have a full math education degree, which would add to the total.

We have found that Dixie State is an ideal partner to serve the needs of our students. They adapt well to our model of internships, and they work very well in offering curricula to meet the needs of our current teachers, and in the integrating of preparatory courses with our classroom strengths. It is not easy to correlate our needs with far away institutions.

It is worth noting that we have a former principal of our district working as an education professor and coordinator at Dixie College. We have a shared cost arrangement that makes for a positive model. We are confident that he will expand his correlating effort to the academic departments in such a manner that will result in an ideal teacher for our growing needs.

Please consider our support and endorsement as additional reasons to approve these programs for our student needs.

Sincerely,

Max H. Rose
Superintendent
APPENDIX G: Responses to recommendations from Diana Suddreth, Math Specialist, Utah State Office of Education:

- A major component that I see lacking the proposal is any kind of clinical experience for mathematics education students prior to student teaching. There should be at least one class devoted to a practicum or mathematics lab where students are in classrooms, observing, practicing lessons, evaluating, etc. Nearly all quality programs now contain this. Prospective teachers need to be in classrooms early and often.

**DSC Response:** DSC agrees with Ms. Suddreth that students in the Math Ed program should be in classrooms early and often, and in response, DSC proposes to modify two courses in the core requirements to include practica: MATH 3100, Euclidean and Non-Euclidean Geometry and MATH 4500, Methods/Teaching Secondary School Math. Ms. Suddreth’s observation that an entire class should ideally be devoted to a practicum or lab experience is noteworthy and the math department will take it under advisement.

- A piece that would be forward thinking would be something that would transition your graduates to classrooms, some kind of ongoing mentoring or support that would ensure success during that critical first year. You’ve made the case that Washington County will be your primary client, which means the teachers will be placed locally. That gives you a great opportunity to be creative in ensuring their success. This could also add something unique that SUU does not offer, thus strengthening your case that you offer something that is not currently available nearby.

**DSC Response:** DSC agrees. While such mentoring is currently taking place on an informal basis, the department has begun to plan for a more formal ongoing mentoring that would include development of a summer semester workshop, tentatively entitled “Praxis Prep,” in which recent graduates and teachers in local high schools will get coaching and assistance in preparing for the Praxis examination. A formal system of post-graduate mentoring will be explored that will serve the purpose of providing ongoing mentoring to new teachers, while allowing the Math Ed program an opportunity to track and survey graduates through personal and electronic contacts for assessment purposes.

- Your program of study leaves little room for student exploration in mathematics, which I think is unfortunate. There are no classes offered beyond the basic mathematics classes for students to deepen their understanding of mathematics past what is required as part of the endorsement process. Where are the required mathematics electives?

**DSC Response:** DSC acknowledges that this initial degree proposal does not offer frills; it was intended to be a basic, straightforward curriculum to produce well-trained, capable secondary education mathematics teachers. As the student demand grows and the program matures and acquires additional faculty, the department will expand offerings as appropriate.

- I would rethink requiring a full 10 credits of Physics. This is one narrow application of mathematics and requiring 10 credits there prevents students from exploring...
other, very applicable areas of mathematics such as mathematical modeling, computer applications of mathematics, or additional statistics that have broader application, and are quite frankly, more appealing to 21st Century students. This seems like an archaic requirement to me, perhaps more appropriate as an elective choice.

DSC Response: Actually, the curriculum includes 5 credits of physics, including a lab. The department is committed to offering the physics course as a requirement since the program graduates will be teaching mathematics at the secondary level, and they ought to be prepared to teach any needed classes, including calculus; furthermore, and just as importantly, most of the important and pedagogically useful applications of calculus are physics-based, making the class important to prospective teachers. Ms. Suddreth’s point that other applicable areas of mathematics may be more appealing to 21st century students is well taken, and the department will consider adding some courses as electives in the future. It is hard, however to think of physics as an archaic requirement.

- I don’t see any mathematics specific technology courses. The amount of technology in Methods is usually minimal. At the very least, technology should be mentioned in other mathematics courses.

DSC Response: In addition to the Core Courses, and the required EDUC 2500, Technology for Secondary Teachers, the program requires CS 1400, Foundations of Programming. This course covers structured programming techniques and the syntax of a high level programming language. Other courses with strong technology inclusions are MATH 1040; MATH 2270; MATH 3100; and MATH 3400.

- In establishing the need, I think it would be wise to use more local data. The 2007 data from the K-16 alliance is out of date, especially considering the downturn in the economy. More recent local data would be a stronger indicator of need.

DSC Response: The reference to 2007 data has been replaced with more current data and an updated letter of need from the local school district is forthcoming.

- Your Mathematics Endorsement chart reflects the requirements for a Level 3 license, not a Level 4. Students graduating with Mathematics Education Degrees should minimally meet the requirements for a Level 4 endorsement.

DSC Response: This observation pointed out to the proposal authors that their description of courses was confusing to readers; in fact, the required courses for a Level 4 endorsement were included, but were not logically placed in the appendix. That problem has been corrected and the curriculum now indicates required courses for Level 4 endorsement.
Appendix G, continued: Consultant’s Report, Dr. Virginia Buchanan

To: Department of Mathematics  
Dixie State College of Utah

From: Virginia M. Buchanan  
Professor and Chair, Department of Mathematics  
Hiram College

Date: August 20, 2010

RE: Dixie State College Mathematics Education Bachelor’s Degree Proposal

This memorandum contains my review of the Dixie State College proposal for a baccalaureate mathematics education degree. Please note that the draft that I received does not include Appendix E, so I do not know what learning outcomes the Mathematics Department has identified for each course in the program. Nevertheless, the proposed mathematics education program overall appears to be a good one. Students who complete the program will have experienced the breadth of mathematics and will have studied the foundational areas of mathematics. Graduates of the program will be prepared for careers in secondary education and for further study. I have a few suggestions for strengthening the proposal. I hope that my comments will be useful to you.

Approximately every ten years, the Mathematical Association of America (MAA) publishes a set of guidelines for programs and departments in the mathematical sciences. A mathematics education bachelor’s degree program should be consistent with the current guidelines, as stated in the recommendations of the MAA’s Committee on the Undergraduate Program in Mathematics (CUPM). The complete set of recommendations is described in detail in the report Undergraduate Programs and Courses in the Mathematical Sciences: CUPM Curriculum Guide 2004, published by the MAA in 2004.7 The teacher preparation recommendations of the CUPM Curriculum Guide were informed by The Mathematical Education of Teachers (MET)8, a CBMS report that gives detailed guidelines concerning the education of future teachers of mathematics. For the most part, the proposed Dixie State College mathematics education program follows the recommendations found in the CUPM Curriculum Guide and MET. However, there are a few recommendations for which the connections are absent or could be made more explicit.

The following recommendations for mathematics education programs are found in Part II, Sections C and D, of the CUPM Curriculum Guide.

- CUPM Recommendation: Courses designed for mathematical sciences majors should ensure that students become skilled at conveying their mathematical knowledge in a variety of settings, both orally and in writing.9

---

7 Available at http://www.maa.org/cupm/
9 Undergraduate Programs and Courses in the Mathematical Sciences: CUPM Curriculum Guide 2004, page 44
In the current proposal, it is not clear where students will develop the communication skills described in this CUPM recommendation. The course descriptions of two required courses, MATH 2270 (Linear Algebra) and MATH 2280 (Ordinary Differential Equations), mention student presentations and class discussion. Is oral communication of mathematics emphasized in other courses? Where is skill in the written communication of mathematics developed? Perhaps the information will be included in Appendix E.

- **CUPM Recommendation:** All majors should have experiences with a variety of technological tools, such as computer algebra systems, visualization software, statistical packages, and computer programming languages.\(^{10}\)

**CUPM Recommendation:** Mathematical sciences majors preparing to teach secondary mathematics should experience many forms of mathematical modeling and a variety of technological tools, including graphing calculators and geometry software.\(^{11}\)

The proposal would be strengthened by a description of the use of technology throughout the entire mathematics education program. The proposal mentions the use of MathCAD in the MATH 2210 (Multivariable Calculus) course and the requirement of a computer programming course. What technology is used in other courses? Are graphing calculators used in any courses other than the MATH 4500 Methods course? Is geometry software like GeoGebra or The Geometer’s Sketchpad used in MATH 3100? What statistics software is used in MATH 1040?

- **CUPM Recommendation:** All majors should be required to study a single area in depth, drawing on ideas and tools from previous coursework and making connections, by completing two related courses or a year-long sequence at the upper level.\(^{12}\)

This recommendation for study in depth is not reflected in the proposal. I recommend that students be required to include either MATH 3210 (Analysis II) or MATH 4010 (Abstract Algebra) in their programs.

- **CUPM Recommendation:** All majors should be required to work on a senior-level project that requires them to analyze and create mathematical arguments and leads to a written and an oral report.\(^{13}\)

This recommendation is not addressed in the DSC mathematics education proposal. A senior-level project provides students with an opportunity to explore an area in depth, to synthesize material from several courses, and to develop mathematics communication skills. I believe that a required capstone project would strengthen the program.

- **CUPM Recommendation:** Mathematical sciences majors preparing to teach secondary mathematics should learn to make appropriate connections between the advanced mathematics

---

10 Undergraduate Programs and Courses in the Mathematical Sciences: CUPM Curriculum Guide 2004, page 45
11 Undergraduate Programs and Courses in the Mathematical Sciences: CUPM Curriculum Guide 2004, page 52
they are learning and the secondary mathematics they will be teaching. They should be helped to reach this understanding in courses throughout the curriculum and through a senior-level experience that makes these connections explicit.\textsuperscript{14}

This recommendation is related to the immediately preceding one. An intensive senior-level project could be used to help future teachers to explore the relationships between advanced mathematics and the mathematics they will teach.

\textbf{DSC’s Response:} Dr. Buchanan’s suggestions are wise. The current proposal has been enhanced accordingly, with reference to and incorporation of the CUPM standards and revisions to the existing course descriptions to explicitly describe the technological tools with which students work and learn; the addition of a senior capstone project requirement; and a more clear description of the study-in-depth components of the curriculum.

In addition to my comments above regarding the CUPM and MET recommendations, I have a few observations and questions about the proposal:

- The mathematics education program requires students to complete a 5-credit calculus-based physics course. This requirement is appropriate but strikes me as being a bit old-fashioned. The study of calculus-based physics certainly is the traditional way of introducing students to significant applications of mathematics in a related field. However, modern economics, computer science, statistics, and biology also make significant use of mathematics. A more flexible requirement that can be tailored to individual interests may more attractive to students than the traditional physics requirement.

\textbf{DSC’s Response:} The College agrees that more flexibility is desirable; however, the physics series is currently the only available option. As other courses, i.e. economics, quantitative chemistry and others, are created, they will become options for students in this program.

- One striking aspect of the proposal is that it includes no mathematics electives. Is there a way to create room in the program for students to pursue their individual mathematical interests? I realize that the program already is crowded and that I have recommended an additional course to increase depth. However, if at all possible, students should have the opportunity to select some topics to match their interests. One way this can be done is through a senior-level project, as described earlier. But there are other ways to introduce flexibility in the program. For example, is it necessary for students to take a number theory course, or could the essential topics from number theory be incorporated into the discrete mathematics and abstract algebra courses? Since some topics from differential equations usually are covered in the calculus sequence, is it necessary for all students to take the differential equations course? These are examples of choices that other institutions have made in order to create room for electives.

\textbf{DSC’s Response:} The program faculty restructured the proposed curriculum in response to Dr. Buchanan’s concerns and the changes are included in this proposal.
Appendix D lists journals published by the National Council of Teachers of Mathematics (NCTM) that are available to students through Browning Library. The three MAA journals—The American Mathematical Monthly, Mathematics Magazine, and The College Mathematics Journal—also are important resources for undergraduate mathematics education majors. The list of Library Resources includes JSTOR, which contains all but the most recent few years’ issues of the MAA journals. Do students have ready access to the recent issues, those not available through JSTOR?

*DSC’ Response: Students do have access to MathSciNet and to the American Mathematical Society Journals, but not full-text access to recent issues of the Journals listed. Coverage in JStor for the American Mathematical Monthly is from 1894 to 2006, Mathematics Magazine is covered from 1947 to 2006, and The College Mathematics Journal is from 1984 to 1986. (JStor is an archival database—everything is generally 5 years old or older.)

Through the Indexing in MathSciNet, students could locate and request specific journal articles and turnaround for requested articles through ILLiad is 2 to 3 days in general, though students are told to allow a week for delivery.
Institution Submitting Proposal: Dixie State College of Utah

College, School or Division in Which Program/Administrative Unit Will Be Located: School of Science and Technology

Department(s) or Area(s) in Which Program/Administrative Unit Will Be Located: Mathematics

Program/Administrative Unit Title: Mathematics

Recommended Classification of Instructional Programs (CIP) Code: 13.1311

Certificate, and/or Degree(s) to Be Awarded: Bachelor of Science and Bachelor of Arts

Proposed Beginning Date: Spring Semester 2011

Institutional Signatures (as appropriate):

Department Chair

Dean

Chief Academic Officer

President

Date: