Mission/Vision Statement

After much discussion, we updated our Mission and Vision Statement to the following.

The Mathematics Discipline strives to help St. Norbert College achieve its mission of providing students with a superior education and encouraging all students to develop their full potential in understanding and serving their world. The mathematics program is designed to be personally and intellectually challenging, and has three objectives:

1) To introduce students to the methodology and applications of mathematics;
2) To provide students in all disciplines with the mathematical competency required in their studies; and
3) To train professional mathematicians for graduate school, teaching, or other careers.

The faculty members of the Mathematics Discipline strive to maintain the Norbertine ideal of *communio*, characterized by trust, mutual esteem, shared responsibilities, and a common area of intellectual inquiry; and to demonstrate this model of community to the students they teach and counsel.

Mathematics is housed in the Natural Science Division of St. Norbert College and is associated with the various disciplines in the Natural Science Division: several courses in mathematics are requirements or recommended electives for the various science majors. In addition, some mathematics courses foster the development of students with majors outside the Natural Science Division, most notably within Education, Business Administration, Accounting, and Economics.

Finally, the mathematics discipline contributes to the broader liberal-arts tradition of the College with its analytical, logical, and quantitative approaches to learning; with its contributions to the general education of almost every St. Norbert student through the Core Curriculum; and with its efforts to address the needs of intellectual communities beyond the College.

State of the Discipline

The Mathematics Discipline meets weekly. Rather than scheduling a separate “Retreat”, the discipline decided to extend our weekly meetings and talk about the program review weekly. Since the first two meetings of the semester already had full agendas, our first such meeting was September 10, 2013. In all, during the fall semester, we had 30-45 minutes dedicated to the program review during each of nine meetings. We started by analyzing the data provided by OIE.

Numbers of Majors and Minors
Our number of majors is consistently around 60 and the number of minors runs around 30. This represents about 3% of the total SNC student population. We have roughly even numbers of men and women and most of our majors declare in their sophomore year.
Our majors seem like they are probably among the brightest of the SNC students: in the graduating classes of 2009-2012, our graduates had an average of 28.1 composite score on the ACT with the 2012 graduates averaging a 29 ACT composite.

**Course rotation and enrollment by semester**
With the new core requirements, we don't have a good sense just yet as to what enrollments will be in courses such as Math 115, Math 120, and Math 123. In the past, enrollments fluctuated heavily when we dropped Math 114 from the curriculum and added Math 123. We hesitate to use past data to predict the future here, since we have changes in what satisfies quantitative reasoning in the new core in comparison to what satisfies quantitative skills in the old general education program. We think we'll have to wait and see how students are satisfying the Core requirement for Quantitative Reasoning.

For upper level courses, enrollments are fairly stable. We have slightly higher enrollments in the applied courses, especially differential equations and operations research.

**Placement/Fail Withdrawal Rate**
The Mathematics Discipline has a relatively high withdrawal (10% since 2009) and failure rate (3% since 2009) relative to the college. Although not all withdrawals are created equal (a student finding their passion in a different field of study is a very positive withdrawal), the Mathematics Discipline is dedicated to better understanding why students withdraw from our courses. In response to this data, we have developed a few measures to help us improve our retention rates.

An important way to lower our withdrawal rate is by continuing to improve our placement of new students. In Summer 2010 we began offering an alternate placement exam for incoming students with some Calculus experience. The majority of our incoming freshman (74-80%) take the algebra placement exam, while the remainder take a Calculus based exam designed to test their understanding of the key concepts of Math 131. We are still collecting data from our placement exam to make sure that it is helping us place students appropriately and we intend to revisit the exam to make sure that it is an effective tool for placement. Additionally, the effect of the introduction of Math 123 (Applications in Contemporary Mathematics) on our withdrawal rate is yet to be seen. There is reason to believe that as Math 123 becomes more integrated into the culture of SNC, it will have a positive effect on our withdrawal rates as it is a much more appropriate quantitative reasoning course for majors in the humanities than Precalculus or Calculus.

Another way to better assess our withdrawal rate is through more detailed collection of data behind why our students are withdrawing. Before signing a withdrawal sheet, we all meet with our students to discuss their reasons for not completing the semester. This fall at one of our discipline meetings we narrowed down a list of the most common reasons students withdrew from our courses. We now have a recordkeeping spreadsheet that is located on the J drive for us to update whenever a student withdraws from a mathematics
course. In addition to the semester, professor name, student ID and course number, we keep track of the grade at the time of withdrawing, effort on a score of 0-2 and chief reason from a list of 6 (changed major, unhappy with grade, prioritizing other courses, personal/medical leave, recovered from a slow start too late or wrong course). We believe that using this information in conjunction with our placement data from the summer will give us insight into our withdrawal rate. (see Appendix 1)

**Below Calculus Service Courses:**
We are trying to provide courses that are more targeted to our students’ quantitative needs so we have made changes in the past five years and are in the midst of further changes. In particular, we have three populations whose needs are addressed in various ways.

**Elementary Education Students:**

We are presently working with Teacher Education to increase the mathematical preparation of SNC’s future teachers. This semester, we have a pilot offered of a course which ties the Common Core State Standards for Mathematics to the mathematical content knowledge required to teach deep understanding of mathematics in the new paradigm. We anticipate this course becoming the first course in a required sequence of math courses for future elementary education teachers.

We anticipate continuing to work with Teacher Education to refine the courses in this sequence.

**Pre-Calculus Students:**

Math 115, preceded by Math 102 if necessary, is designed to prepare students for Calculus. Because we have introduced more targeted courses for students not interested in taking Calculus, this course now focuses entirely on the required algebraic skills needed for success in Calculus. Presently, a digital homework system is used in the course. We are analyzing its success in order to help us serve the students who need to take Calculus.

We are in the early stages of discussion of a year-long Pre-Calculus/Calculus course, primarily for those students who plan to take Survey of Calculus.

**Other students whose major does not require Calculus:**

Math 123, Applications of Contemporary Mathematics, was first offered in fall, 2010, to better serve the needs of these students. The course covers mathematics that the students will encounter in their lives such as probability, statistics, math of finance including such topics as loans and annuities, and logic. We anticipate the enrollment in Math 123 will increase as the Core Curriculum gets underway.
Assessment of the Student Learning Outcomes of Mathematics Majors

Viable Assessment Plan
There is a viable assessment plan for the mathematics program. Thus far, this plan has served well. The Discipline, however, has begun discussing whether the current plan has a proper balance between pure and applied mathematics. This discussion may result in a revision of the plan.

Direct Evidence
The assessment plan includes a zero-credit course, MATH 499, Senior Examination, in which students take the ETS major field exam in mathematics as well as an exam generated in-house which tests the proof writing skills of our majors.

The table below shows some of the results of the major field test. The entries are the percentile ranks\(^1\) of SNC students’ scores, not the raw scores. Since 2007, with the exception of 2012, at least half of the SNC math majors achieved at the 50\(^{th}\) percentile, or above, among all students taking the major field test.

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\(^1\) The percentiles are determined for ranges of scores, not necessarily individual scores. The percentiles listed from 2009 on were determined using linear interpolation.
Below are the institutional mean scores for SNC students and the corresponding percentiles among the mean scores for all institutions taking the major field test.

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<td>Institutional Mean (to nearest integer)</td>
<td>154</td>
<td>161</td>
<td>155</td>
<td>161</td>
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<td>159</td>
<td>158</td>
<td>159</td>
<td>158</td>
<td>154</td>
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<tr>
<td>Institutional Percentile</td>
<td>40</td>
<td>75</td>
<td>45</td>
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**Note:** Some caution must be taken reading these numbers. These percentiles reflect only those schools which choose to participate in the major field test. Furthermore, it is not known what criteria those schools used in determining which students take the exam.

The in-house test focuses on proof-based “pure” mathematics which is largely non-content-specific. Students are required to write proofs which assess their ability to think and communicate mathematically. Two members of the Mathematics Discipline correct each proof based on the same rubric. There is a four-point scale and if the two professors differ in their assessment by more than one point on any proof, they discuss that proof to resolve the discrepancy before bringing the results to the entire Mathematics Discipline for approval. The Mathematics Discipline is anticipating adding assessment of applied mathematics courses in the future.

**Indirect Evidence**
Data from the Current Student Surveys for the last five years was analyzed. The table below shows the percentages of mathematics majors who answered “Satisfied” or “Very Satisfied” compared to the percentages for all majors in the latest survey. For the most part, the percentages of math majors responding positively are comparable to the high numbers recorded for all majors. The three notable exceptions are in the categories of Range of Courses Offered, where the math majors gave a noticeably higher approval rate (Math: 85%, All: 78%); Quality of Advisement, where again the math majors gave a noticeably higher approval rate (Math: 95%, All: 88%); and Graduate School Preparation, where the math percentage was noticeably lower (Math: 62%, All: 74%).

<table>
<thead>
<tr>
<th>1) Quality of Instruction</th>
<th>Math Majors (N = 143) Satisfied or Very Satisfied</th>
<th>All Majors (N = 883) Satisfied or Very Satisfied</th>
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<tr>
<td></td>
<td>93%</td>
<td>92%</td>
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<tr>
<td>2) Quality of Curriculum</td>
<td>90%</td>
<td>91%</td>
</tr>
<tr>
<td>3) Range of Courses Offered</td>
<td>85%</td>
<td>78%</td>
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<tr>
<td>4) Quality of Course Content</td>
<td>89%</td>
<td>92%</td>
</tr>
<tr>
<td>5) Quality of Advisement</td>
<td>95%</td>
<td>88%</td>
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<td>6) Career Preparation</td>
<td>74%</td>
<td>78%</td>
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<tr>
<td>7) Graduate School Preparation</td>
<td>62%</td>
<td>74%</td>
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<tr>
<td>8) Overall Major Program</td>
<td>86%</td>
<td>90%</td>
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<tr>
<td>9) Acquire Depth of Knowledge in Major Field</td>
<td>86%</td>
<td>89%</td>
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Program Improvement

With the addition of new faculty, the Mathematics Discipline is exploring the possibility
of changing its course offerings. Our major requires five upper level courses, one of
which must be a proof-based course. Most of our majors take only five upper level
courses. To encourage them to take more, we are considering adding concentrations
which would be granted based on additional courses taken, either proof-based or applied-
based. Also, we hope to add some intermediate level courses. In spring, 2014, one such
course is being offered as a MATH 289 course. Presently, it counts toward a math minor,
but if we can develop a set of courses at the 200 level, we could have introductory level,
intermediate level, and advanced level requirements for the major.

One important goal of the Discipline is to build up the mathematics community at SNC.
We want to attract and retain more math majors, to keep them excited about mathematics,
and to foster communio among our math majors and faculty. For these reasons we began
two initiatives in September 2013.

Colloquium
First, we began a mathematics colloquium series for students. These 45-minute talks by
faculty and off-campus visitors, held approximately once per month, expose our students
to topics that most of them will not encounter in their coursework. With no obligation to
do homework or master all the details, students are free to appreciate, enjoy, and puzzle
over topics like the Classification of Finite Simple Groups, Hall's Marriage Theorem, or
the convergence of the harmonic series.

Moreover, although many of our students do attend regional or national math
conferences, this is an easy opportunity for all of them to see what a professional math
talk is like. In the classroom mathematics appears far too cut, dried, and catalogued, as
though the human race already knew everything. Colloquia can shake students free of
that overconfidence; after colloquia last fall several students expressed surprise that his
professor had discovered a new theorem, or even that any new theorems were being
proved at all.

The colloquium also serves to increase the visibility of mathematics on campus: by
posting flyers and inviting the campus community through the SNC email news, we
remind our colleagues in other disciplines that mathematics is a living subject with
exciting open questions.

Newsletter
Second, we began publishing a mathematics newsletter, the SNC Math Sphaera.
Published approximately every two weeks, this newsletter is not only a way to inform our
students of upcoming mathematics events, but also a way to form a stronger
mathematical community. Advertising colloquium talks, or math club meetings should
bring more people together at those activities. A Problem Corner, with prizes for
successful solutions, spurs students to apply themselves to vie with one another to solve
good problems. In the pages of the Sphaera we can publicly congratulate our students on
their successes.
Finally, the newsletter will serve to document the life of the mathematics discipline. Information recorded—names of speakers, numbers of participants, club officers elected, and so on—can later be used for history, organization, or even assessment.

**The Summer Research Program in Mathematics**

The St. Norbert College Mathematics Discipline has long supported undergraduate research in mathematics. Pi Mu Epsilon (PME) is the national mathematics honorary society and MathFest is the annual meeting of the Mathematical Association of America. The discipline has had student presenters at the summer PME meetings, held during MathFest, every year since 1985. No other college or university in the nation can claim the same continuity of participation. We are unique and noted about our peers at a national level in promoting student research presentations. Our first speaker at an MAA Section meeting was in 1983. Since then, St. Norbert students have given over two hundred and fifty math talks, and it should be noted that research projects are not degree requirements for our majors. A good number of those students have received awards for their talks.

The Mathematics Discipline is genuinely interested in enriching our students’ educational experience through undergraduate research and scholarly activities. Faculty have encouraged students to participate in summer research experiences (REU) at other institutions and then nurtured those experiences by guiding students through the dissemination of their work at regional and national conferences each academic year. Although our students are among the most active in the country in presenting the results of their research, in 2008, it became time to take it to the next level and offer those research experiences here on our campus.

In April 2008, the Mathematics Discipline began The Summer Research Program in Mathematics. This program consists of eight to ten weeks of full time work beginning with an application process in the spring semester open to St. Norbert mathematics students. The program is advertised in our courses, the Sigma Nu Delta math club newsletter, and on our website. It is strongly encouraged that interested students meet with a member of the Mathematics Discipline before putting together an application. In the application, students provide a list of their mathematics and other relevant course work, their research interests, and how a research experience would contribute to their professional goals. Students do not need to propose a project. Faculty members may already have projects in mind. Applications are reviewed by the Mathematics Discipline and students are selected by each of the faculty mentors willing to lead research in the upcoming summer.

In August, at the closing of the summer appointment, the research students are expected to present their work at the national MathFest meeting. By Summer 2013, eleven research projects had been presented at a national conference by St. Norbert students through this summer research program. The American Mathematical Society Award for Excellence is given to those students whose talks are outstanding. In recent years, four St. Norbert students have won this award, including both students from the 2013 Summer Research Program.
Withdrawal Recordkeeping

We are beginning to record all of the following information for each student withdrawing:

- **Bookkeeping Data**
  - Instructor (e.g., Seth Meyer)
  - Course (e.g., Math 115)
  - Term (e.g., Fall 2013)
  - Student ID (so as to track repeated withdrawals)

- **Performance in the Course**
  - Grade at time of withdrawal (e.g., CD or F)
  - Level of effort: substandard, average, or high

- **Placement Data:**
  - Which placement test was taken, and the score received
  - Which course we recommended the incoming student take

- **Reason for Withdrawal:**
  - If the student was in the wrong course, which course he or she should have taken instead.
  - Chief reason (pick exactly one of the following):
    - Changed major
    - Unhappy with grade or the effort required to keep/improve grade
    - Personal/medical leave
    - No or little effort
    - Poor prior preparation
    - Prioritizing other courses
    - Slow start, tried to recover too late