Academic Audit Self-Study

MATHEMATICS DEPARTMENT

Pellissippi State Community College

2014-2015

Submitted January 30, 2015
Introduction

During the past forty years, the Pellissippi State Community College Mathematics department has been responsible for providing students with the opportunity to study and apply many areas of mathematics. From the beginning ensemble of three mathematics faculty to the current group of 35 full-time and 36 adjunct instructors who are supported by the departmental dean and an administrative professional support person, its mission to provide students with the opportunity to develop the mathematical and analytical skills necessary to attain educational goals and pursue lifelong learning has remained the focus of the entire department. In 1995 the academic areas at Pellissippi State Technical Community College were reorganized, resulting in the consolidation of the Learning Support Services Division mathematics with the Arts and Sciences Division mathematics. This resulted in the merger of the developmental mathematics program and the college-level program into a single Mathematics department. In fall 2008, with the redesign of the structure of all developmental studies programs in Tennessee, the Transitional Studies Department was formed to provide centralized instruction and learning support to that component of the student population, while the college-level mathematics continued to be offered in the Mathematics department. Beginning August 1, 2014, the two groups again merged into a single department to provide a seamless coordination of the two curriculums and to begin the development of a co-requisite approach to instruction.

Pellissippi State itself has grown to five campuses in its service areas of Knox and Blount counties as well as a strong web and dual-enrollment presence. As reported in the 2013 – 2014 College Factbook, the population of fall 2013 students was divided into 5211 full-time and 5493 part-time students attending classes at Blount County, Division Street, Hardin Valley, Magnolia and Strawberry Plains campuses, or as Dual Enrollment students at one of six high schools served, or as web students online. The total headcount for the College in fall 2013 of 10,704 students was also split by the course of study chosen, with 2816 students in Career or Technical programs, 5960 students in University Parallel programs, and 1928 students who had not yet declared an area of study. The average ACT composite score of first-time freshmen in fall 2013 was 19.69, with an overall ACT average score of 21.45 in the same semester.

The Mathematics department is currently comprised of 35 full-time members who teach an average of 15 hours each semester in both developmental and college-level sections. Five of these instructors teach sections online, and one full-time instructor has full released-time to carry out administrative duties for the College. Three faculty members assist the department with administrative duties as College-level, Learning Support Program, and Learning Support Curricular coordinators. There are 20 adjuncts who teach at the Hardin Valley campus, and 16 who teach at one of the site campuses or as a dual-enrollment or web instructor. The general administrative duties are carried out by the departmental dean and an administrative professional for college-level courses and faculty. An additional administrative assistant is shared with the English department and has responsibilities that support the Learning Commons computer lab and Learning Support faculty and classes.

Two components of the Mathematics department have recently completed a comprehensive review of the strengths and weaknesses of their areas. The Learning Support faculty in the Transitional Studies department completed a five-year self-study of that program in 2013 and achieved certification by the National Association of Developmental Education (NADE) at that
time. An academic audit of the Teacher Education program, including MATH 1410 and MATH 1420, was conducted by the faculty of that area in spring 2013 and was successfully evaluated by peers from TBR at that time. Because of the recent assessments of those programs, the focus of this academic audit is the college-level mathematics program only.

The initial self-study audit of college-level mathematics offered has been conducted by the faculty whose primary responsibility is the instruction of those courses. In spring 2014 the newly-appointed department dean named two faculty members to lead the study and six committees of four or five faculty peers to address the five common areas and the initiatives component to be developed from the study. During the fall, the committees met several times to collaborate and gather evidence for a coherent audit. The department has striven to provide a comprehensive snapshot of the college-level student learning taking place within and outside the mathematics classrooms at Pellissippi State.

**Overall Performance**

Students are served by college-level mathematics classes (Appendix A) where the essential general education mathematical skills are taught that are necessary for success in both STEM and non-STEM programs of study offered by the College. Courses offered for college credit in fall 2014 include

- MATH 0530 Statistics Principles and Lab
- MATH 1010 Survey of Mathematics
- MATH 1030 Introduction to College Mathematics
- MATH 1410 Numbers and Operations for Teachers
- MATH 1420 Geometry for Teachers
- MATH 1530 Introduction to Probability and Statistics
- MATH 1710 Precalculus Algebra
- MATH 1720 Precalculus Trigonometry
- MATH 1730 Precalculus
- MATH 1630 Finite Mathematics
- MATH 1830 Business Calculus and Modeling
- MATH 1910 Calculus I
- MATH 1920 Calculus II
- MATH 2000 Matrix Computations
- MATH 2010 Matrix Algebra
- MATH 2050 Introduction to Statistics
- MATH 2110 Calculus III
- MATH 2120 Differential Equations

Each syllabus can be found at [http://www.pstcc.edu/curriculum/master-syllabi/1415/math/index.php](http://www.pstcc.edu/curriculum/master-syllabi/1415/math/index.php), with a sample in Appendix B. The majority of these classes are structured as traditional face-to-face sections (Appendix C) with computer support, offered as both day and night classes. Sections of MATH 1010, MATH 1130, MATH 1530, MATH 1630, MATH 1830 and MATH 2000 are also taught in an online format and offer students a local computer-based alternative, and the hybrid delivery style for MATH 1630 is offered as an
alternative to the traditional or web-only format of that course. Sections of MATH 1010, MATH 1030 and MATH 1530 which have been held in the Two-Way Audio-Visual (TWAV) classrooms at each campus offer students at all campuses the opportunity to take popular courses with the primary instructor at the Hardin Valley campus. Additional courses conducted using TWAV or similar hardware would provide more students with the opportunity to take a wider variety of courses at the site campuses. Also, with the increase in enrollment from the “Drive-to-55” and Tennessee Promise initiatives, the department anticipates adding sections using effective alternative formats.

The involvement of Pellissippi State in the Tennessee Consortium for International Studies (TnCIS) has generated opportunities for students to study mathematics abroad with a class led by a Pellissippi math faculty member. In the past, MATH 1530 was taught in South Africa, with plans being made for summer 2015 for MATH 1530 to be taught in Peru and MATH 1630 to be taught in Ireland.

The Mathematics department supports accelerated and traditional cohort programs by offering students who follow a common schedule the math classes needed to complete their degrees in two years or less. The Accelerated Pathways Cohort (APC) sections are shorter in length, are comprehensive, and are scheduled at times which are convenient for working professionals. The programs offered in this format are Associate of Science in Teaching, Civil Engineering, Computer Accounting, Culinary Arts, Early Childhood Education, Health Records Specialist Industrial Maintenance, Medical Insurance Coding and Reimbursement, Welding and a 41-hour General Education curriculum. The Traditional Path Cohorts (TPC) students move as a unit to complete degrees in Associate of Science in Teaching and Industrial Automation. The location, times and sequencing of all math courses needed by participating students are coordinated so that the prerequisites and requirements for each cohort fit into the specified curriculum.

As a part of its ongoing mission to serve its community, Pellissippi State offers Prior Learning Assessment (PLA) for students who believe that previous academic or work experience fulfills the requirement for a particular course. This can be verified by the student taking the final exam in lieu of attending the course in MATH 1010, MATH 1030, MATH 1130, MATH 1530, MATH 1710, MATH 1720, MATH 1730, MATH 1830 and MATH 1910. The final exam is administered by the mathematics dean and graded by the dean and two other faculty members. If the exam receives a score of 70%, then the course credit is awarded by the vice president of Academic Affairs. The effect of this procedure of awarding credit on student persistence and graduation has not been investigated locally, but is assumed to be effective, based on the increased emphasis on PLA by TBR and THEC.

Since its beginning in fall 2012, the Mathematics department has supported with personnel and planning the Seamless Alignment Integrated Learning Support (SAILS) program in Knox and Blount counties. Students who score 19 or below on the ACT exam as high school juniors have the opportunity to take college developmental mathematics as their bridge course in the senior year and are strongly encouraged to complete all five learning support competencies. A faculty member in Learning Support built the initial course which was offered at six area high schools in 2013-2014. Currently, during the 2014-2015 academic year, a mathematics faculty member and the SAILS Coordinator provide technical support and professional development for teachers and students in the SAILS sections. As of December 2014 the completion of all five modules of
the SAILS program by 79% of Pellissippi State SAILS seniors was well above the state average of 64% of students completing the entire curriculum.

The department annually sponsors many activities that build a positive relationship with mathematics faculty and the college community of students. During April, the department conducts activities at all campuses to highlight our Math Awareness Month. The department also annually sponsors two mathematics competitions, the Student Math League contest and the PSCC Math Bowl. The Student Math League is a national competition among two-year colleges, and the PSCC Math Bowl is part of the state-wide math contest sponsored by the Tennessee Mathematical Association of Two-Year Colleges (TMATYC). Both competitions are open to currently enrolled students who have not yet received a two-year degree and Pellissippi State students who have done well at the state level.

The Pellissippi State Mathematics department is also the host to over 600 6th, 7th and 8th graders from area home-schooled, independent or public schools who attend the Middle School Mathematics Contest. Math faculty members and students work together to plan and launch the activities, which are supported by a generous grant from Oak Ridge Associated Universities (ORAU). The Contest is now in its fourteenth year.

In fall 2013, a math faculty team wrote and was awarded a grant to reinvent MATH 1530 to incorporate remediation as specified in the Guidelines A-100 in a specific support co-requisite, MATH 0530, for that class. The pilot sections of the supported course were developed in spring 2014 and are being offered during fall 2014 with preliminary student success. The co-requisite format will be expanded in fall 2015 to include MATH 1010 and MATH 1030 and co-requisites MATH 0010 and MATH 0030, respectively.

The department has contributed significantly to the SACS-COC accreditation project of the College’s Strong to the Core Quality Enhancement Plan (QEP) (Appendix D). MATH 1130 is one of the three core courses that has experienced an increase in achievement of student learning outcomes by incorporating active learning strategies in those classrooms. This active approach has been researched by faculty and successfully integrated into MATH 1030, MATH 1530 and the MATH 1700 series, resulting in a wide variety of successful new classroom techniques that engage students in mathematics.

The department also has begun to look at course success with its annual academic planning document (Appendix E) using Compliance Assist. The information gathered across the department is a collection and summary of data that is used to inform decision-making about improvements within the department.

**Focal Area 1. Learning Objectives**

Pellissippi State’s Mathematics department follows the Tennessee Board of Regents (TBR) General Education (Gen Ed) guidelines and incorporated them into the curriculum of PSCC’s math courses to meet students’ needs in various disciplines and “to ensure that college students have the broad knowledge and skills to become life-long learners in a global community that will continue to change.” The TBR Gen Ed outcomes for mathematics are as follows:
1. Build on (not replicate) the competencies gained through the study of two years of high school algebra and one year of high school geometry.
2. Use mathematics to solve problems and determine if the solutions are reasonable.
3. Use mathematics to model real world behaviors and apply mathematical concepts to the solution of real-life problems.
4. Make meaningful connections between mathematics and other disciplines.
5. Use technology for mathematical reasoning and problem solving.
6. Apply mathematical and/or basic statistical reasoning to analyze data and graphs.


As a TBR and SACS-COS accredited institution, Pellissippi State must also evaluate student competencies in the following Mathematics Gen Ed subject categories:

1. Understanding of mathematics beyond the entry-level requirements for college
2. Extension of knowledge through relevant mathematical modeling with applications
3. Employment of problem solving
4. Development of critical thinking skills
5. Use of appropriate technologies

Almost all students at Pellissippi State are required to complete at least one general education math course in order to graduate. These courses are:

- MATH 1010 - Survey of Mathematics
- MATH 1130 - College Algebra
- MATH 1530 - Elementary Probability & Statistics
- MATH 1630 - Finite Mathematics
- MATH 1710 - Precalculus Algebra
- MATH 1720 - Precalculus Trigonometry
- MATH 1730 - Precalculus
- MATH 1830 - Basic Calculus & Modeling
- MATH 1910 - Calculus I

Pellissippi also offers several other courses that do not satisfy the general education requirements but do complete or support several programs and pathways offered by the College. These courses are:

- MATH 0010—Survey of Mathematical Principles and Lab
- MATH 0030—College Mathematical Principles and Lab
- MATH 0530—Statistics Principles and Lab
- MATH 1030—Introduction to College Mathematics
- MATH 1410—Numbers & Operations for Teachers
- MATH 1420—Geometry for Teachers
- MATH 1920—Calculus II
- MATH 2000—Matrix Computations
Each math course at PSCC, regardless of format, has a master syllabus (Appendix B) which contains course objectives which reference TBR’s Gen Ed goals. These syllabi assure that agreed-upon content is delivered, and there is access for all instructors to online materials on the departmental G-drive for each course in the department. Included among these materials are detailed semester calendars, homework lists, past exams and worksheets, special projects, and sample course policies. Additionally, lead instructors for each course have developed online courses in software such as MyMathLab, so that instructors can copy and edit these courses to support their classes. The objectives listed for each course determine the expected student learning outcomes required for success. Each semester, the dean of Mathematics and the course coordinators review individual syllabi to assure compliance with college standards. The master syllabi are revised annually to make specific course adjustments such as textbook edition changes and topic sequencing. These revisions are drafted by the lead teachers for each course, who tie the test questions to the assessment of the course student learning objectives and discuss and finalize the exam with the faculty currently teaching these courses. The master syllabus is made available for each student. In addition, the master syllabi are easily referenced from the Mathematics department homepage and in the electronic catalog: http://www.pstcc.edu/curriculum/master-syllabi/1415/math/index.php#.VEVeu_uLWoY

Each semester, a required common final exam is administered in the general education high-enrollment courses of MATH 1130 College Algebra and MATH 1530 Probability and Statistics to assess the TBR outcomes and to provide instructors with information concerning successful strategies and techniques. The final exam contains at least three embedded questions/problems devoted to each learning outcome for the course. The students’ responses are recorded and analyzed with 70% correct answers for each of the learning outcomes as the benchmark for success. MATH 1130 results are reported to the TBR each year, whereas MATH 1530 results are accumulated and reported to the department. The reports allow the department to make any necessary improvements in MATH 1130 and MATH 1530 via strategy sessions during curriculum meetings. Exams in other courses are written by the individual instructors who customize sample exams posted on the Mathematics department computer G-drive and testing materials available in the computer support for the text.

Pellissippi State’s current Quality Enhancement Plan (Appendix D) has focused on facilitating the learning outcome assessments and course-improvement strategy sessions for MATH 1130 and MATH 1530. The focal point of the monthly QEP meetings has been to discuss and develop strategies to address and engage students with in-class activities in which the 70% benchmark was not achieved. These assessments are also collected and reported during the annual QEP evaluation. During academic year 2013-2014, MATH 1030 was incorporated into the QEP to include additional full-time and adjunct faculty who are incorporating new strategies into their classes. The original QEP initiative in MATH 1130 has been extended into MATH 1030 and 1530. Instructors teaching other math courses have also implemented some of the QEP practices into their classes. During 2013-2014, the Mathematics department had 10 faculty members participate in QEP activity, reaching 400 students. Based on the overall semantic
differential results for math, nearly 82% of the students reported positive engagement from a QEP activity.

At Pellissippi State, the Mathematics department specifically serves declared mathematics majors--on average, between 75 and 80 per year.

Declared Math majors by calendar year:

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
</tr>
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<tbody>
<tr>
<td>MATH 2009</td>
<td>86</td>
</tr>
<tr>
<td>MATH 2010</td>
<td>82</td>
</tr>
<tr>
<td>MATH 2011</td>
<td>77</td>
</tr>
<tr>
<td>MATH 2012</td>
<td>83</td>
</tr>
<tr>
<td>MATH 2013</td>
<td>79</td>
</tr>
<tr>
<td>MATH 2014</td>
<td>62</td>
</tr>
</tbody>
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The majority of these students transfer to a four-year institution, primarily the University of Tennessee, Knoxville, without a specific degree designation. The sequence of the Tennessee Transfer Pathway (TTP) for a degree in mathematics includes MATH 1910 Calculus, MATH 1920 Calculus II, MATH 2110 Calculus III, MATH 2010 Matrix Algebra, and MATH 2120 Differential Equations. Pellissippi State courses and learning objectives correspond to the UTK courses and are identical in content for all five of these core courses for mathematicians, thus assuring students who continue in the study of mathematics of a comparable, if not superior, preparation for higher-level courses upon arrival on the UTK campus.

When the master syllabi for these courses originally were created, the main reference for constructing their learning objectives was UTK's corresponding course syllabi. The department strives to coordinate with UTK's course content and sequencing for our STEM classes. In the past (ca. 2002), the Mathematics department has consulted with Engineering Science, Physics, and Computer Science instructors to ensure that the math course content and sequencing were in sync with the prerequisite expectations of these courses and there is not a schedule conflict. Appendix F shows math learning outcomes as they apply to business, engineering, computer science, science, and nursing student learning objectives, as stated in the syllabi.

The Mathematics department at Pellissippi State will focus on the following improvements for course learning objectives: (1) Increased collaboration with business, engineering, computer science, science, and nursing departments to ensure that the courses offered are meeting the mathematics requirements for their curricula. (2) There will be yearly course committee meetings to update department course syllabi collaboratively, and based on data from an expanded assessment of each course, instead of by individual lead teachers. Due to curriculum changes in the Learning Support (LS) program, (3) there will be immediate review of the course content to seamlessly embed A-100 concepts into the appropriate college-level courses. Implementation of these recommendations will further strengthen the student learning objectives and outcomes of each mathematics course at Pellissippi State.

Focal Area 2. Curriculum and Co-Curriculum

A student’s choice of a mathematics course offered by the Mathematics department to fulfill the general education requirement or to provide the foundation for further study in mathematically intensive curriculums can take one of three paths. Students in nursing or in a non-algebraic area often take MATH 1010 or MATH 1530 or both, if two math courses are required. Students studying business and its applications or nursing at a four-year institution are advised to take the MATH 1130-MATH 1830-MATH 1630 sequence because of its emphasis on the mechanics and
applications of business calculus. A STEM major requires those students to follow a path through MATH 1710/1720 or 1730-MATH 1910-MATH 1920- and, if required, MATH 2110 and MATH 2120. As noted in the Learning Objectives section, the partnership with the University of Tennessee, Knoxville, has brought about a collaboration of curriculums which fulfills the needs of both institutions.

Mathematics department courses are created by faculty, approved by the department dean, and then approved by the PSCC Curriculum Development Committee (CDC). CDC includes two members from each academic department, as well as members of administration. All courses and course syllabi must be approved by the PSCC vice president of Academic Affairs and by the Tennessee Board of Regents (TBR). Math courses currently are administered by the department dean, who works with the department to choose the instructor for all course sections, the program coordinators for college-level courses and learning support courses, and a lead teacher for each course. All courses are designed individually and collectively to meet all of the six TBR General Education Math Learning Outcomes.

In 2012, the Mathematics department raised the ACT prerequisite scores for many of its courses. These changes affected MATH 1130, 1630, 1710, 1730, and 1830. After months of departmental discussions and research using longitudinal data related to the success of various student groups as determined by prerequisite course and their ACT Math scores, the proposal with the set of prerequisite suggestions was sent to CDC. After discussion at CDC during the fall of 2011, the proposal passed without opposition. In late March of 2012, the college president allowed the Mathematics department proposal to be adopted in time to be included for fall 2012 registration.

MATH 1030 Introduction to College Mathematics was added to the mathematics curriculum as a bridge course for STEM students in 2012. The course was needed to cover the prerequisite material for MATH 1130 College Algebra, MATH 1710 Precalculus Algebra, and MATH 1730 Precalculus due to the state-mandated elimination from the curriculum of the final third of the former developmental math sequence, most recently DSPM 0897, 0898, 0899. MATH 1030 is a 3-credit-hour course with numerous sections at all five campus locations. The Mathematics department designed the course to present all of the skills formerly covered by the developmental courses it replaced at a more rigorous level that is appropriate for STEM curriculums. In addition, the course covers expressions and equations involving radicals, which were not covered in the recent developmental set of courses.

In terms of co-curriculum, the faculty have identified the following support opportunities for students:

- The requirement of a Texas Instruments calculator as an integral component of every mathematics class offered.
- The incorporation of the computer support of Desire2Learn at a level appropriate for the content of the course.
- The incorporation of the textbook computer-support systems Excel, MyMathLab, CalcPortal, and the system of MATH 1410/1420 to make available guided practice for students enrolled in a mathematics course.
- The Academic Support Centers, to provide a tremendous amount of support to students’ questions ranging from basic arithmetic to Calculus II.
• The introduction of Supplemental Instruction (SI) to support high-enrollment, high-failure courses. This began in 2005 as a way to utilize successful peer tutors. Vetted tutors provide help for students at least five days each week to improve student success in MATH 1130 and MATH 1530. SI leaders are recommended for employment by instructors, who nominate students with good people skills and a good understanding of the course material. Now student learning is enhanced by using Supplemental Instructors in any math course where students indicate a need for that support. The College has funded an expansion of SI to include MATH 1030, MATH 1830, MATH 1910, and MATH 1920 to better support students who struggle with those classes. These Supplemental Instructors are peer tutors who sit in on class lectures and then provide targeted tutoring for students in the course. The SI leaders receive training and communicate directly with the classroom teacher in order to maximize the achievement of students in the class and serve as a role model for student behavior and attentiveness in the classroom.

• The availability of free, web-based tutoring through tutor.com, as well as drop-in tutoring in many academic subjects at the Academic Support Centers at each of the five campuses.

• Opportunities for eligible students who participate in the Pellissippi State TRIO program, which offers a variety of supports for the first-generation college population.

• The creation and promotion of cohorts for students majoring in Elementary Education, Accounting, and Business Management in a full-time schedule of classes coordinated to support the areas of concentration that they have selected. The math faculty who instruct those classes work with instructors in other departments to provide focused applications that will be useful when those student enter the workforce.

The department needs to improve upon the areas of monitoring and updating course syllabi. Issues, such as being unaware of college-level writing being eliminated as an entry-level standard for courses and overlooking some differences between syllabus and outline and the actual content covered, have continued for periods longer than a semester. The syllabi of all courses also need to tie the student learning objectives more directly to the assessment of each course. The coming incorporation of Learning Support student learning outcomes in fall 2015 will make this an imperative assignment.

In the future the faculty must remain vigilant when planning embedded courses to work closely with their peers in other departments to coordinate skills and content that will strengthen programs across the College. The integrity of each course must also be maintained.

Focal Area 3. Teaching and Learning Practices

The departmental goals (Appendix G) of excellence in instruction and the opportunity for success in each of the mathematics classes (Appendix H and I) are ones which the entire department works towards with perseverance and professionalism. College-level mathematics courses are structured with formats developed to fit the twenty-first-century student. Each of the five campuses offers courses that meet in the traditional MWF or TR timeframes with three contact hours per week. Sections of MATH 1010 and MATH 1030 have also been offered as a fast-track 10-week course. Some classes, particularly the two statistics classes and calculus,
meet four hours per week, while the MATH 1730 Precalculus classes meet five hours weekly. The hybrid MATH 1630 sections that meet weekly rely on a slightly flipped classroom approach.

The web sections of MATH 1010, MATH 1130, MATH 1530, MATH 1630, MATH 1830 and MATH 2000 each use a delivery method of a commercial textbook package that is often customized to include additional materials, such as Camtasia instructional videos, lesson notes, and instructor-developed assessment, to guide the learning of these independent students. The classroom instruction of MATH 1010 and MATH 1030 as fast-track 10-week courses delivered by TWAV has provided convenience, but often at the cost of student success in the course. A change in that mode of presentation is being investigated by the College to utilize some of the many technological platforms now available for course delivery.

Currently, three new math courses have been developed as a result of the TBR co-requisite initiative that requires reinvention of college-level courses to include remediation support: MATH 0530 (companion course to MATH 1530), MATH 0010 (companion course to MATH 1010), and MATH 0030 (companion course of MATH 1030). MATH 0530 and MATH 0010 will have the remediation embedded for students with ACT scores that are less than 19. A third co-requisite to be developed for STEM students is MATH 0030, which has been approved and will be piloted in the fall. At this time, MATH 0530 is being taught as a pilot on all campuses except Strawberry Plains (due to low enrollment). The instructors of this embedded pilot continue to have follow-up meetings to discuss the course progress and any unresolved issues. MATH 0010 is still in the planning stages, but since MATH 0530 has already gone through the process, the individuals on the 0010 committee will have input from lessons learned from the development of the 0530 pilot, as will the developers of MATH 0030.

Different courses have specific calculator or computer-aided programs to help enhance the student’s understanding of the material. One factor remaining constant is that all of the college-level math classes require a non-symbolic graphing calculator; either a TI-83© or TI-84© (or plus editions of each model) is recommended. Most faculty members use online homework systems such as MyMathLab© and MyStatLab©, which provide embedded instructional aids in an immediate feedback format. These systems are now supported on mobile devices, and some mathematics faculty are developing projects that will better utilize these devices. The MATH 1530 Elementary Statistics course requires a lab component that uses MyStatLab, which is bundled with the book at no extra charge to the student. In addition, statistics sections also sometimes utilize software programs such as StatCrunch®, Statdisk®, and Excel® to facilitate statistical calculations. There are scheduled lab days during which all students are working with the statistical software. MATH 1130, 1630 and 1830 use MyMathLab (MML) for either homework and/or quizzes. The engineering calculus sequence incorporates CalcPortal. With the availability of this technology, a number of instructors use the opportunity to incorporate videos, custom homework problems, and group projects for students to further their understanding of the material.

Two instructors are piloting the use of different APPs on mobile devices and investigating how they can be utilized in their current course. Once the pilot is complete, the findings will be shared with the department as a whole during one of the department’s monthly meetings. The minutes of these monthly meetings are placed on the department’s G-drive, which contains about a decade of the minutes. Along with those minutes from the monthly departmental meetings, the G-drive contains course calendars, supplemental materials, sample tests, and projects.
Faculty are encouraged to incorporate D2L, PSCC’s online course management system, to transmit materials to students online and to encourage online discussions between students in a class. The College provides frequent workshops to show faculty how to make optimum use of this system.

Any instructor who will be teaching a course for the first time is encouraged to shadow another instructor of that course in order to gather information about the course and see how material is presented. This shadowing, along with discussions between the instructors about course presentation incorporating material available on the G-drive, helps to maintain the consistency of the course content.

The Mathematics department analyzes the teaching and learning processes over the course of the year through student perceptions and the annual evaluation of faculty members by the dean. Through administration of student perceptions, all adjuncts are evaluated in each class they teach every semester. Every other fall semester, tenured faculty administer student perceptions, whereas non-tenured faculty are evaluated in every class they teach during both fall and spring. These results are then used in the faculty member’s annual evaluation, which reflects on the success of the faculty members’ annual goals accomplished through the year in the courses they teach and the students they reach. If new strategies were used in the course of the year, the faculty member reflects on either the success or the subsequent reassessment of that strategy.

Not only are there student perceptions and annual faculty evaluations, but the Mathematics department dean also observes each tenure-track faculty member at least once an academic year. Every adjunct is also observed in at least one course every semester by his or her mentor or another Mathematics department member. The evaluation tool used is the same for both observations, and there is room at the end for the most positive outcome of the lesson and areas of possible improvement. The dates for the observations are arranged in advance so that they do not coincide with a review or a testing day. Once the observation is complete, the information is shared with the instructor. This is a very good source of information for both individuals – the observer often learns as well.

Instructors also have opportunities for professional development by attendance of, and sometimes giving presentations at, various conferences where other faculty members from different institutions convey their best practices. PSCC faculty members, upon returning from a conference, will either e-mail all of the departmental members, including adjuncts, a synopsis of the conference or give a report at the monthly departmental meeting.

These organizations also identify in their literature best practices for teaching and the learning environment which are available to faculty. According to the “Teaching and Learning Methods” survey that was conducted by the Academic Audit Committee, the majority of instructors indicated that they occasionally consult research and current literature.

Through the course of the academic year there are webinars, workshops, and experts that provide special instruction with respect to teaching and learning at Pellissippi. All members of the Mathematics department, from tenure-track faculty to adjunct faculty, receive e-mails with times, dates, and purposes of these webinars and workshops. Several textbook authors have visited. The different sessions provide avenues for the instructors to receive professional development and up-to-date instruction on the use of technology. Before the fall and spring semesters begin, all adjunct faculty are strongly encouraged to attend an in-service designed especially for them.
They can attend different sessions emphasizing teaching and learning practices, but they are also able to talk with the lead teachers about the courses they are going to be teaching. They are provided material for the course and shown how to access email and the math department’s G-drive for more information. Every fall the Mathematics department conducts a Saturday workshop which provides a one-day in-service for both full-time and adjunct instructors and tutors, with sessions dedicated to best practices, use of technology, round-table discussions, etc.

Another opportunity for discussion of teaching practices with colleagues at Pellissippi, as well as with faculty from other schools, is through the Quality Enhancement Plan (QEP) (Appendix D). When it was initiated in 2011, the QEP originally encompassed just MATH 1130, ENGL 1010 and SPCH 2100. Improvement in critical thinking and oral communication through active learning strategies is the primary goal, with the subsequent implementation of the strategies. The Mathematics department’s QEP has grown from those three core courses to encompass MATH 1030, 1530 and 1710. All instructors are invited to participate with the appropriate release time or monetary compensation. Once completed, the activities are then evaluated by the students, giving instant feedback. These activities are then loaded into the Mathematics department’s G-drive in the QEP folder, where they can be accessed and used by any department member.

There are opportunities to share and work collaboratively to improve individual teaching and effectiveness, but it is up to the individual instructor to get involved.

As a result of the QEP, many more instructors now use a variety of techniques in their classes to actively engage their students. A few examples of the techniques used in various classes include hands-on activities, back channels, group discussions, flipped classrooms, small group work, group projects, capstone projects, etc. Although math classes are categorized as lecture, they encompass a great deal more. Using different learning strategies helps math students stay actively engaged with the material and has helped to improve MATH 1130 in its GenEd assessment to reach beyond the 70% success level in all six areas in fall 2013. This was the first time ever that every GenEd outcome was achieved in that course.

The data provided by the Community College Survey of Student Engagement (CSSEE) ranks Pellissippi State very high with respect to student engagement. Faculty members utilize various methods to enhance student engagement including, but not limited to, projects, discussions, group problem solving, online discussion boards and “clickers” (personal response systems).

The new initiative to incorporate co-requisite remediation and the A-100 competencies into a college-level general education non-algebraic course has brought about many revisions to existing courses, along with development of the co-requisite courses. The Pellissippi State Mathematics department has chosen to focus on MATH 1530 and MATH 1010 to achieve this goal.

The MATH1530 re-invention includes a new component, a semester-long capstone project which uses a single, large data set to illustrate all of the course content. The topic of the capstone is selected to engage the students by being both relevant and interesting. For example, one of the capstone projects involves data from a reverse-discrimination case which went all the way to the US Supreme Court. The redesign initiatives have been informed by research by faculty into current trends in best teaching practices at the local, state and national levels. These projects have been well received by both students and faculty in the pilot phase. With the incorporation of the A-100 topics into either two or three freshman courses, the department will be challenged
to motivate students to attain college-level skills while maintaining the rigor of each original course.

**Focal Area 4. Student Learning Assessment**

The Mathematics department uses several measures in its assessment of student learning. All students entering college-level math courses at Pellissippi State have earned the required ACT, SAT, Compass and/or Pellissippi State placement test scores for entry into these courses. Otherwise, they have mastered the five required competencies of Learning Support Math by the completion of MATH 0800 and/or MATH 0820 or of a SAILS course or have received dual credit from their high school.

As stated in the first section of this report, the Mathematics department has developed syllabi for every college-level mathematics course, with objectives linked specifically to each of the six criteria as stated by the TBR General Education Outcomes. The curriculum itself, for each college level mathematics course, insures that objective one is met. Each syllabus then links objectives two through six to specific learning objectives for the course.

To assure that students are successfully mastering these objectives, departmental final exams are administered for MATH 1130 and MATH 1530. These exams have specific identifiable questions designed to measure competency for each of the objectives. Every semester, data is collected by the respective lead teachers and is used to determine areas of strength and areas in need of improvement. The data is shared with all faculty members during a department meeting. The lead teachers and the instructors work together to develop strategies to increase student mastery and address remedies indicated by low-success areas evident in the common final.

When a full-time tenure-track position becomes available in the Mathematics department, the TBR, Pellissippi State and EEOC hiring practices are followed to help insure that the same process is used for all applicants. A committee is formed to review applications and select qualified individuals to go through the interview process. During the interview, all applicants are asked the same questions. Each selected applicant demonstrates a short teaching lesson selected from a list of topics. After a new faculty member is hired, he or she is mentored by an experienced faculty member. Since fall 2012, each new faculty member also participates in a New Faculty Academy during his or her first year of full-time tenure-track employment. This cohort meets Pellissippi State administrators at a pre-service retreat and then participates in informational training and in-service sessions conducted by key administrators and student support personnel throughout the inaugural year.

MATH 1030, MATH 1710, MATH 1720, MATH 1730, and MATH 1830 also have departmental final exams tied to the TBR objectives that are utilized by the majority of instructors teaching the course. These finals are included in the course G-drive file and are available for use by all full-time and adjunct instructors.

In the fall 2014 semester, a survey was distributed to all full-time faculty members to determine the number of instructors who administer departmental final exams compared to those who do not. In addition, the faculty members who choose to create their own final exams were asked to
indicate which of the TBR Mathematics Objectives 2 – 6 were incorporated into their exams (Appendix J).

The remaining college-level math courses have final exams designed by instructors making every effort to adhere to objectives two through six. Using exam results, instructors assess their student learning outcomes and make appropriate changes. Faculty committees routinely examine end-of-course grade distributions and withdrawal rates in order to determine the best avenues of overall improvement for the department.

All Mathematics department faculty members use additional forms of student assessment which include, but are not limited to, homework, quizzes, chapter tests, portfolios, projects, QEP activities, and capstone projects. Faculty members share their methods of assessment with one another, using the common G-drive and brief presentations at departmental meetings. The assessment of QEP activities is done using the semantic differential written by the QEP Design Team to allow feedback to the instructor on the effectiveness and buy-in of the students. Using this unique assessment tool gives the instructor timely information about the success or failure of the QEP activity.

The information gathered by the Mathematics department and the college office of Institutional Effectiveness, Assessment and Planning (IEAP) has led to adoption of the following measures to improve student success:

- There has been incorporation of Supplemental Instruction and peer tutoring.
- The position of “Student Success Coordinator” was created by the College for each department—a faculty member whose responsibility is to reach out to students who are struggling and connect them with math learning resources.
- Changes in course curricula are on-going as the department works to improve its programs to meet the needs of students. For example, for students with ACT scores below 21, or students successfully completing learning support, Math1030, an algebra intensive course, was piloted in the summer 2011 semester. The success of that pilot led to Math1030 being added to our curriculum.
- The faculty is encouraged to identify additional best practices in assessment of learning objectives through investigation of similar programs at other institutions and comparable departments within our institution.

Members of the Mathematics department also track the success of students enrolled in entry-level courses through their terminal courses to ascertain whether students are receiving adequate preparation. This is done using an ARGOS report for “Math Prep” available in MyPellissippi, where faculty can look back at a previous class to see student success in subsequent mathematics classes. For example, MATH 1130 needs to prepare students for MATH 1830, MATH 1630, and MATH 2050. The student data from all these courses is analyzed, and appropriate changes in curriculum, textbook, and instructional methods are implemented.

A preliminary analysis was done by the committee to determine the longitudinal effectiveness of prerequisite classes (Appendices K – M). Further analysis needs to be done to make sure that students are provided with a robust stream of mathematical knowledge to be applied in the sequence of courses as required by the College’s diverse programs of study.
Focal Area 5. Quality Assurance

Consistency within each math course begins with the use of a common textbook which supports a common master syllabus. A textbook committee is formed to study available textbooks/software and share the committee members’ findings with the entire department prior to a book/software being selected by the instructors who teach the course.

Master syllabi are posted on the department’s web-site and are kept current by the lead teachers, who provide updates in the fall of each year. Since all courses have lead teachers, they are the “go-to” people for any instructor, full-time or adjunct, who needs anything for successful instruction of the course. Lead teachers prepare lecture and (suggested) homework schedules, which are used not only by adjuncts but by all full-time instructors. Since PSCC currently has five different campuses, every adjunct has a mentor. The material for every course is filed in course folders on the department’s G-drive, which every instructor has access to. If major course goals or student learning outcomes change within a course or a new course is created, the revised syllabus then must go through the Curriculum Development Committee (CDC) for review and approval.

The department also uses informal exchanges between faculty members to share teaching strategies and discuss the effectiveness of various methods employed in the classroom. These exchanges are further enhanced by conversations that take place during monthly department meetings and by the use of a departmental email list serve. In these ways a dialogue is encouraged between individuals on the various campuses of the College, as well as between instructors whose schedules may not otherwise allow them the chance to participate in informal discussions. Similarly, informal discussions also take place with faculty from other departments. For example, past discussions have included understanding applications of physics or biology within math classes and the types of math used in business courses and in the nursing program.

Supporting adjunct faculty in a variety of ways is a key effort by the mathematics department to provide the resources needed to create a successful classroom environment. Adjunct math faculty are guided by the course lead instructor and the college-level curriculum coordinator, who provide course resources throughout the semester. Each semester, a full-time faculty member observes each adjunct. During the observation, the full-time faculty member fills out an observation form and shares it with the adjunct instructor prior to submitting the report to the dean. Prior to the beginning of each semester, an adjunct in-service is held to provide departmental updates, syllabus changes, and professional development workshops for adjunct faculty. The department relies upon and appreciates the efforts of adjunct math faculty and strives to make sure they are provided with the help they need to teach the agreed-upon course content. Adjunct faculty who have taught at Pellissippi State for six semesters have the option to develop a portfolio of their teaching practices and other academic work to earn a 15% salary increase.

Various methods of assessment are used to evaluate the effectiveness of the Mathematics department’s faculty and their classroom practices. The department’s dean observes each full-time faculty member within the classroom on a yearly basis. The dean collects examples of each faculty member's syllabi, exams, and other classroom materials in order to more fully assess the faculty's classroom activities. A meeting between the dean and the faculty member is then scheduled, and the results of the observation are shared. The department dean administers a
yearly assessment of each full-time faculty member. This assessment addresses how faculty members have performed within the department, including participation in professional development and service to both the school and the community. Student perceptions of faculty are included in this process. The results of student perception are made available to each instructor and are discussed with the department dean.

The placement of students using the ACT math subscore and previous course history is monitored regularly by faculty using a MathPrep check prior to the start of each semester. Each instructor checks the individual student’s record to be sure that the appropriate prerequisite entrance level or course has been successfully completed. The department regularly gathers information regarding student outcomes within specific math classes in relation to student scores on placement tests. Of particular concern recently is the effectiveness of student placement into a math class by using student ACT scores. The department regularly gathers longitudinal information using MathPrep to help determine if past success in a math class can predict future success in the next course in the sequence. This is especially important now as the state makes changes to the entry requirements allowing students to enter into college-level classes. Students with a deficiency in the precalculus concepts necessary for the engineering/science calculus classes have the option of addressing this need through either a one- or a two-semester sequence. The department assesses the placement of students within these two options, as well as their corresponding success or failure within the calculus courses, in order to determine how effectively each course prepares students for the calculus.

Students are provided with numerous aids to improve their learning, and the department supports student use of the Learning Center. Faculty volunteer in the Learning Center, and former math students are frequently employed as tutors. Current students are regularly encouraged by their instructors to make use of the Center's facilities. A peer tutoring lab was recently added to serve students in MATH 1030 and 1130. In the past, online tutoring help was provided by Smarthinking.com, and currently it is provided by tutor.com. This heavily used service is an option for online students or students whose study schedules do not fit the available hours of the Academic Support Center. Additionally, the College provides funding for the use of student Supplemental Instructors to aid in the classroom.

The department has a goal of each faculty member taking part in at least one professional development activity per semester, but most faculty members take advantage of more than one activity per semester. Activities that math faculty take part in are reported to the departmental administrative assistant, who keeps track of all activities over the semester and submits a professional development report to IEAP at semester’s end. The percentage of faculty who participated in at least one professional development activity each semester over the past five semesters is shown in the following table:

<table>
<thead>
<tr>
<th>Professional Development Participation</th>
<th>2014 Spring</th>
<th>2013 Fall</th>
<th>2013 Spring</th>
<th>2012 Fall</th>
<th>2012 Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Adjunct &amp; temporary full-time</td>
<td>93.8%</td>
<td>94%</td>
<td>95%</td>
<td>94.4%</td>
<td>100%</td>
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</tbody>
</table>

Within the department, there is faculty representation in American Association of Two-Year Colleges (AMATYC), Tennessee Mathematical Association of Two-Year Colleges (TMATYC), National Association of Developmental Education (NADE), National Council of Teachers of
Mathematics (NCTM), Tennessee Association for Student Success and Retention (TASSR), Tennessee Mathematics Teachers Association (TMTA), National Education Association (NEA), Mathematical Association of America (MAA), electronic Conference on Teaching Statistics (eCOTS), and International Conference on Technology in Collegiate Mathematics (ICTCM). Several faculty members have routinely made presentations at state and national conferences. Many faculty and adjuncts are active members of these professional organizations, with one faculty member having served as Secretary-Treasurer of TMATYC, one as past president of TMATYC, and one as incoming president of TASSR. The Mathematics department has had four faculty to be chosen as AMATYC Fellows since 2008. This fellowship provides an intensive two-year professional development of new faculty which is conducted by the professional organization. Other professional development activities include publisher workshops and presentations, webinars, departmental training, and in-house presentations such as PSCC’s Faculty Lecture Series. All of these various activities have helped to keep faculty in the department aware of new approaches and best practices in the area of mathematics education.

In addition to the personal goals that are set by each faculty member, the Mathematics department also sets departmental goals each year, and these goals are agreed upon by full-time faculty members. All math faculty members are made aware of these goals, and throughout the semester, progress towards achievement of these goals is studied and shared at departmental meetings. Every effort is made to achieve those goals annually as the budget allows.

Because of the particular focus of the TBR General Education assessment, MATH 1130 and MATH 1530 have the most comprehensive quality assessment plans within the department. In MATH 1130, a yearly General Education Outcomes report (Appendix N) is prepared to identify the strengths and weaknesses in student learning on the final exam. This data is used to develop strategies to improve student success rates. During 2011-2012, the department opened a Math Lab staffed with peer tutors five days a week. Faculty were also invited to serve some of their office hours in the Math Lab. Cumulative reviews for the final exam were made available to all instructors on the G-drive and in the software component, MyMathLab. A YouTube channel was created for direct access to PSCC instructor videos for both students and adjunct faculty. Through PSCC’s QEP, active learning strategies for student engagement have been developed for MATH 1130 to help improve student learning outcomes through increasing student engagement.

To address the historically weak area of meaningful connections between mathematics and other disciplines, the following strategies were implemented to improve student success in MATH 1130:

- Challenge students with more difficult applications related to real life and applicable to the lives of the students.
- Develop more applications related to nursing and business in MATH 1130.
- Design activities for students that focus on improving their ability to analyze their solutions to problems.
- Provide additional training for faculty on active learning strategies.
- Conduct more workshops for instructors to expand the effective use of computer support.
- Continue the use of ACT math scores for appropriate placement and advisement.
Each semester in all MATH 1530 Elementary Probability & Statistics sections, a set of multiple-choice questions is used department-wide and given as part of the final exam (Appendix O). The following semester after data is collected, meetings involving MATH 1530 instructors are held to discuss ways to improve performance in these areas. Some specific changes that have occurred as a result of these sessions are the development of handouts to help students in these areas and changes in points of emphasis during lectures and class assignments.

The overall assessment of the individual college-level math courses within the department is an area that could be expanded to enhance the quality of the specific courses. MATH 1130 and MATH 1530, the two General Education courses, have been assessed and improved based on those results for several years. A similar focused assessment needs to be developed to close the course loop in all of the other freshman courses and also in the terminal courses to ensure that students completing program and articulation requirements have the mathematics knowledge and skills needed to be successful in those areas.

**Recommendations**

As the Academic Audit of college-level mathematics department has concluded, four primary recommendations have been recognized and suggested by the faculty teams as areas to improve. These responses to the Audit have also been recognized by others who have an interest in the quality of our courses at the College as areas to be addressed.

1) The department will institute a broader analysis of the effectiveness of college-level mathematics courses to more closely follow the progress made in each course. All faculty members teaching each course will collaborate to create a common problem set to be used as a component of the final exam to evaluate the efficacy of each course. A sample will be reported to faculty with strengths and deficiencies noted. This information will be used to update each master syllabus every fall, making changes based on the success in each student learning outcome for each course.

2) The department will develop and assess co-requisite courses that incorporate remediation for all students with ACT Math sub-scores below 19 or the equivalent and who have not achieved mastery of the A-100 Guidelines as outlined by TBR. The initial co-requisite courses are MATH 1530 and MATH 0530, MATH 1010 and MATH 0010, and MATH 1030 and MATH 0030.

3) The department will improve consistency and student success in online sections by analyzing and sharing the best practices of successful online classes and incorporating a variety of those practices through faculty development within the department and the College.

4) The department will improve collaboration with other departments across the College to review and delineate student learning objectives of the mathematical courses that support other academic programs.
## Matrix of Improvement Initiatives

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Objective</th>
<th>Who</th>
<th>Performance Indicator</th>
<th>When</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Improve and assess more directly the effectiveness of college-level mathematics courses.</td>
<td>Review for consistency and update all syllabi. Write a common set of final exam problems tied to the student learning outcomes of each course.</td>
<td>Lead Instructors and Instructors of each course, College-Level Coordinators, Math Department Dean</td>
<td>This will be an ongoing initiative. All course syllabi will be reviewed annually. A pool of exam problems will be written and posted on the G-Drive in 2015-2016. Beginning fall 2016 a sample of final exam problems will be collected and analyzed and course improvements made.</td>
<td>Annually beginning fall 2015</td>
</tr>
<tr>
<td>2. Develop and assess co-requisite remediation courses according to A-100 Guidelines.</td>
<td>Create, pilot and offer MATH 1010/0010, MATH 1030/0030 and MATH 1530/0530.</td>
<td>Entire Math Department, Faculty Members Teaching Co-requisite Courses, Lead Instructors of Co-requisite Courses</td>
<td>Establish baseline data for success in co-requisite courses 2015 – 2016. Monitor student success rates of co-requisite courses by analyzing success in subsequent courses beginning fall 2016.</td>
<td>Each semester beginning fall 2015</td>
</tr>
<tr>
<td>3. Improve the success and consistency of online sections.</td>
<td>Analyze and share best practices of successful online classes and incorporate a variety of those techniques into web sections.</td>
<td>Faculty Members Teaching Web Sections and Lead Instructors of Courses taught in web format, College-level Coordinators, Math Dean</td>
<td>Improvement of student success rates of all online mathematics sections when compared to courses taught in a traditional format. Online sections will be monitored for steady and consistent improvement over time.</td>
<td>Annually beginning fall 2015</td>
</tr>
<tr>
<td>4. Improve the collaboration with other departments at the College.</td>
<td>Collaborate with faculty outside department to ensure that course student learning objectives meet requirements of curricula.</td>
<td>All Math faculty, Math Dean, Departmental Assistant for Mathematics</td>
<td>This will be an ongoing initiative. Minutes of meetings will be warehoused on the G-Drive and action items will be noted and implemented.</td>
<td>Annually beginning fall 2015</td>
</tr>
</tbody>
</table>
Audit Appendices
Mathematics Department
Pellissippi State Community College

Links to the supporting documents listed below may be found on this website:

http://www.pstcc.edu/math/audit/.

Appendix A: Number of Course Sections Offered
Appendix B: Sample Syllabus of MATH 1710
Appendix C: Number of Students Enrolled
Appendix D: Pellissippi State's QEP
Appendix E: Annual Academic Assessment
Appendix F: Math Prerequisites
Appendix G: Department Goals 2013 – 2014
Appendix H: Summary of Success Rates in College-level Mathematics Courses
Appendix I: Summary of Success Rates Online
Appendix J: Assessment Survey Results
Appendix K: Prerequisite MATH 1130 Appendix L: Prerequisite MATH 1710
Appendix M: Prerequisite MATH 1730
Appendix N: General Education Assessment of MATH 1130
Appendix O: General Education Assessment of MATH 1530