Q: Has your department made any changes in the way instructors (faculty or graduate students) teaching your core courses in the areas listed above are trained, oriented, or supervised?

A: Yes. Recent reviews have shown a need for assessing student learning in a more uniform way. Consequently, since Fall 2012, the course coordinators of core curriculum courses have asked/trained all the instructors teaching sections of the same course to:

- cover the same exact set of chapters/sections as specified in syllabus, as much as possible, at the same time;
- create a common collection of problems to be used for quizzes, tests and exams (for all classes; homework problems may differ in the numerical data, but are covering essentially the same concepts) in such a way that all the required learning objectives and outcomes will be appropriately represented in this collection;
- use the common collection of problems as a pool to select examination problems from;
- grade the common final exam by establishing a common rubric or a general itemized guideline (for both the multiple choice problems, and for the show-work problems on the final exams).

The department also offers a special course, taught by a specialist in Mathematics Education, which trains graduate students how to teach the core curriculum material, and uniformly assess the student learning.

Q: Has your department made any changes in the base syllabus for your core courses in the areas listed above in response to assessment results?

A: A major change that was made to the core curriculum due to assessments was that of replacing the 3-hour Calculus I, II, III courses (respectively: Math 1351, Math 1352, Math 2350), with 4-hour Calculus with Applications I, II, III courses (respectively: Math 1451, Math 1452, Math 2450) in Spring 2012. This was a direct consequence of the assessment results, which demonstrated a need for the students to be exposed to a more in-depth study of basic calculus notions, and become familiar with a larger range of examples and direct applications of calculus to other sciences, and everyday life. Since that change took place, the base syllabi were adapted to the new goal of deepening the appreciation and understanding of calculus among students, and providing students with more concrete examples and applications. Similar changes took place in Math 1320 College Algebra, and Math 1550 Pre-calculus, where new textbooks were recently selected after a rigorous selection and ranking of text-books.

Have you adjusted the way the courses are assessed, the examinations, or the base content in the areas listed above in response to assessment results?

A: This was partly answered by the answer to the first question. For many years now, the department held course coordinator meetings for all instructors teaching the same course. Over the past two years, as a consequence of the learning assessments, course coordinators have taken a more active role in constructing a final exam as a result of a collaborative effort with all the instructors, and are closely following the newly updated syllabi every year. As a consequence, assessing learning objectives on the final examinations has become more uniform and more rigorous in nature; the learning outcomes are communicated to every instructor, together with providing assessment tool guidelines and advice for grading.
Have you made any changes in the way content is delivered such as adding on-line modules, improving classroom technology, using on-line quizzes or exams, making lectures available to students on-line, or flipping the classroom?

A particular emphasis for the new core curriculum course syllabi was placed on a deeper understanding of the fundamental concepts, as well as working with the students on interpreting formulas, diagrams, tables, interactive pictures, and other visual representations of mathematical concepts. A large emphasis was recently placed on new software tools (tutorials and homework on line), in particular WeBWorK, WeBAssign and MyMathLab as online learning and assessment tools. These web-based tools are used for both face-to-face and distance classes. The new edition of the calculus text-book will come with a website with interactive graphs and applets, that the students can manipulate in order to better understand calculus concepts. Regarding face-to-face instructional technology: most classrooms in the Mathematics and Statistics Building are "smart classrooms" equipped with state-of-the-art multimedia presentations which allow classroom demonstrations, and the use of this technology in the core curriculum classes is very frequent (every class period or every other class period). A tutorial for all instructors (faculty and graduate students) who are not yet familiar with certain online learning and HW systems (e.g., WeBWorK, WeBAssign and MyMathLab) has been provided every semester for the past three years, and individual help is also available from the department Associate Chair.

Have you made any changes in how students are provided with help to improve their comprehension of the material such as on-line tutoring, face-to-face or group help sessions, etc.

The department is hosting and sponsoring a Tutoring and Study Center (TSC) (which was informally known as Missouri Club until Fall 2010). TSC hires tutors among the best undergraduate and graduate students in mathematics and statistics. The center functions between 9 am and 4 pm, on a daily base except for holidays and final exam periods. The form of help is face-to-face, individual or group sessions. The tutors are proficient in the core curriculum course material. Due to the high demand and recent popularity, since 2012, the center has also been seeking and recruiting students who are qualified to teach upper division undergraduate courses.

Other comments:

One of the Undergraduate Committee Members, Dr. Chris Monico, recommended creating a Capstone Course (CC) for the mathematics major and mathematics minor. Upon his recommendation at the committee meeting held on April 25, 2013, the CC would allow a general assessment of all the Learning outcomes, and create a comprehensive perspective of the material taught in undergraduate courses. In particular, this course could be offered during two separate semesters:

- **CC-Part I** to assess the student proficiency in the lower division course topics (including the core curriculum courses)
- **CC-Part II** to assess the student mastery of the upper division material.