The School of Mathematical Sciences

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Units involved in this reorganization:

Department of Mathematics
Graduate Interdisciplinary Program in Statistics
Graduate Interdisciplinary Program in Applied Mathematics
University Learning Center
CATS Academics
MASTR
For the past 25 years, the Department of Mathematics and the Program in Applied Mathematics have been models for the Provost’s call to "create more synergy and strengthen [the University’s] core mission." Mathematics is a central intellectual and practical component of science, engineering, and the social sciences, and is the focus of a nationwide push for improvement in K-12 education that is vital for economic competitiveness. Many years of productive collaboration have brought national prominence to both programs and to the University.

We propose sealing this relationship and others through the formation of a School of Mathematical Sciences that incorporates these two units, along with the new Graduate Interdisciplinary Program in Statistics, and the mathematics tutoring and transition services currently scattered across campus. We also propose that the School provide closer coordination between the five Centers and one Institute currently operating under the umbrella of mathematics research, education, and outreach.

1 Alignment with the UA Strategic Plan

The School will consolidate the University’s strengths in the mathematical sciences under each of the four areas described in the UA Strategic Plan.

1.1 Preparing Arizona’s youth and ensuring access and opportunity

- The School will deploy a comprehensive minority recruitment program at all levels by combining the practical experience of the Undergraduate Math Center with research knowledge from the Center for the Mathematics Education of Latinos/as.

- The School will build collaborations between mathematical scientists, educators, and school teachers through the Institute for Mathematics and Education.

- The School will address the Strategic Plan’s call for “preparing more teachers (especially in STEM fields), targeting underserved areas first” by providing increased visibility, and improved recruitment, to the Department’s high school teacher preparation program.

1.2 Engaging and graduating students who can contribute to the state, nation and world

The Mathematics Department currently teaches more than 27,000 student credit hours each fall semester and serves approximately 500 majors and 550 minors. To provide opportunities for campus-wide savings in this endeavor, the School will:

- Establish a comprehensive and unified mathematics tutoring service, funded by a lab fee, that would replace the services of the University Learning Center, MASTER, and CATS Academics.

- Research and develop virtual classrooms as an efficient, and pedagogically sound means of delivering and complementing undergraduate mathematics education.
• Establish a Center for Transitional Mathematics to help students who have difficulty making the transition from high school to college, and whose tuition revenue is currently lost to Pima Community College.

• Provide the unifying framework to reduce current course duplication and expenditures in the campus-wide teaching of practical, introductory-level statistics at both the undergraduate and graduate levels.

1.3 Providing world class research that improves the human condition in Arizona and beyond

• The School will attack grand challenge problems in mathematical biology, climate change, data mining, information processing and transmission, and in materials science.

• The School will continue to achieve successes in fundamental mathematics research, building upon its excellent funding record. The School will provide greater visibility for its research centers, including the Arizona Center for Mathematical Sciences and the Southwest Center for Arithmetical Algebraic Geometry.

• The School will, through the Program in Statistics, coordinate campus-wide research and consulting needs in experimental design, acquisition and analysis of data, and quantitative interpretation of experimental results.

• The School will provide an umbrella under which the three graduate programs (Mathematics, Applied Mathematics, and Statistics) can continue to synergize and flourish. The combined total of full-time graduate students in the Mathematics and Applied Mathematics is currently well over one hundred and the growth of the new Statistics GIDP is poised to add fifty graduate students over the next five years.

1.4 Partnering with and serving the people of Arizona

In this area, the Department will provide to the School the following assets:

• The Center for Recruitment and Retention, dedicated to increasing the number of high school mathematics teachers in the Tucson area

• Mathematics and Parents Partnerships, helping underprivileged parents to help their children learn mathematics

• The Arizona Teacher Initiative, increasing middle school teachers’ mathematics knowledge through the Master’s Degree in Mathematics Leadership

• The Institute for Mathematics and Education, providing policy advice to the state on urgent problems in mathematics education.
Although these programs are exemplary on their individual merits, the School will integrate and coordinate their activities to provide a coherent exhibit to the state, to the business community, and to private foundations, thus multiplying their fundraising potential.

2 Effect on the University’s reputation

The collective experience of the primary units composing the proposed School has demonstrated that established and successful academic brands, such as mathematics education, applied mathematics, and statistics, are a means of binding faculty together with common aims in education and research across the campus, targeting resources, and attracting outstanding students.

The School, while retaining the distinct identity of the successful units, will have advantages as a whole that go beyond the sum of its parts. A past example of this phenomena is the joint application of the Mathematics Department and the Program in Applied Mathematics for two large training grants (VIGRE and S-STEM) that resulted in $4.1M of support, over five years, for undergrads, grad students and postdocs.

The formation of the School will make it clear that these units are part of a larger entity and improve the School’s visibility, enhance its competitiveness for funding, and increase the University’s national rankings in the mathematical sciences.

3 Consultations supporting this proposal

This proposal was prepared in consultation with the faculty and staff of the Department of Mathematics, the Program in Applied Mathematics, and the Program in Statistics. We have not yet had the opportunity to discuss the proposal with central units such as the University Learning Center, MASTR, and CATS Academics.
Budget

The Department of Mathematics and the Program in Applied Mathematics provide indispensable services to the University with an efficiency that has been recognized nationally in the publication Towards Excellence of the American Mathematical Society. The current funding streams to the School participants are through: the College of Science (to Mathematics), the VP for Research and ARL (to Applied Mathematics), and the Graduate College (to Applied Mathematics and Statistics). This proposal is based on the requirement that the total funding level currently provided by these streams would continue to be provided to the units comprising the new school. There is a small administrative cost savings that will be achieved within the School: The Program in Applied Mathematics will assume the administrative services for the Statistics GIDP thereby saving the cost of hiring a 0.5 FTE Program Coordinator for Statistics. The estimated savings (including 44.7% ERE) is approximately $28K.

The large cost savings to the University will come from the School providing the same efficiency to services currently distributed across the University. Notice that the projected savings to the University take into account the additional resources the School would need to provide services currently provided outside the three programs.

Consolidation of tutoring services: Projected Savings $0.4M

The University tutoring services targeted for consolidation are CATS academics ($560K), University Learning Center ($275K+), and MASTR ($55K), for a total of about $900K+. At a conservative estimate, 2/3 of this, or $600K, is devoted to mathematics tutoring. With the space freed up by the consolidation of these programs, the Department could provide the same services through a combination of absorbing much of the demand into its existing full-time tutoring rooms, and providing supervision and specialized services through the hiring of two academic professionals at $50K each plus 4 GTAs at $25K.

Consolidation of statistics courses: Projected Savings $2.25M

To compute the savings from consolidating statistics courses, we divided the total number of students enrolled in the past two semesters in the 40+ introductory statistics courses (3,302 students) into sections of 35 students, which could be taught by an experienced GTA. We made the assumption that the statistics courses are currently being taught by a faculty member with the average compensation for the University, and with a three course teaching load. We added the cost of three supervisors for the GTAs.

The current arrangement costs the University about $3.85M based on the assumptions that current instructors earn the university average salary and compensation rate, and teach three courses. The School estimates it could do the job for $1.6M using experienced supervised GTAs.

Possible increased revenue from recaptured tuition and lab fees.

There are 2,000 entering students each year who fail to score high enough on the Math Readiness Test to qualify for any mathematics course offered at the University of Arizona. We estimate that 1,000 of these could be accommodated by a 2-unit transitional course using the online AI-based learning system ALEKS. We assume that the resulting increased 21-day head count would increase revenue to the University.