

Executive Summary

Evaluation Results from Aurora University's Illinois Mathematics and Science Partnership (IMSP) Projects

On its Aurora campus, Aurora University conducts six IMSP projects: content-related master's degrees for middle and secondary (1) mathematics teachers, (2) life-science teachers, and (3) elementary teacher of mathematics and science, and summer institutes for teachers of all levels in (4) mathematics and (5) physical science, and for (6) intermediate-grade teachers of mathematics. All projects, except the mathematics institute for intermediate-grade teachers, recently completed their second year. Evaluators reported results regarding teacher performance, the performance of their students, and the health of the community-partnership overseeing the projects.

- To test for gains in the teachers' content knowledge, the projects conducted pretests at the beginning of the teachers' academic work, and post-tests as the teachers completed content courses. The projects used Diagnostic Teacher Assessments in Mathematics and Science (DTAMS), developed by the University of Louisville's Center for Research in Mathematics and Science Teacher Development. In the second year of the master's degree program, instructors administered 198 DTAMS post-tests. For 144, there were statistically significant gains between the pre and post-test.

- University observers in the teachers' classrooms applied the Reformed Teaching Observation Protocol (RTOP), developed at Arizona State University, to detect adherence to national mathematics and science standards of good teaching. The RTOP records a teacher's lesson design and implementation, two types of content knowledge, and two aspects of classroom culture. Scores range from 0 to 4 on each of 25 items. The master's degree teachers scored highly in confident delivery of content. Means equaled 3.8 for the middle and secondary life science teachers and 3.5 for the mathematics teachers. For the elementary teachers, the

evaluator noted that, for 3 of the 5 questions on propositional content knowledge, there were mean scores of 4.0.

- National mathematics and science standards favor using models and manipulatives for instruction. Observers saw them used in 16 of the 17 middle and secondary mathematics classrooms and in 17 of 25 life science classrooms.
- Among teachers finishing their second year of 2-week summer institutes, out of 20 possible RTOP points in lesson design, a third of the teachers scored 17 or above. Out of 40 possible points in content and classroom culture, three-quarters of the teachers scored 30 or above in content, and a third scored 30 or above in classroom culture.
- On the University of Wisconsin's Surveys of Enacted Curriculum (SEC), teachers report how they use their time in the classroom. Over the past year, the middle and secondary mathematics teachers in the master's program have moved from spending 16% of their time engaging students in active learning to 19%; summer institute mathematics teachers gained even more, moving from spending 19% of time in active learning to 28% of time. Physical science institute teachers gained two points from 14 to 16% of time in active learning, while teachers in the elementary masters program remained steady at 12%. Similarly, the life science teachers reduced time spent on memorization and recall from 28% to 23% of their time and increased time spent making connections and applying science from 16% to 23% of time.
- Teachers report a higher degree of student engagement as a result of their coursework. An elementary teacher noted, "I do algebra with my kindergarteners." Stated a middle school teacher, "What an improvement in my teaching style! I felt like more of a facilitator than a teacher because the students discovered most of the new material through hands-on activities used throughout the lessons." A high school teacher found, "The students who would

normally be unengaged or causing problems in the classroom could not wait to get on the computer and complete the investigations.” Teachers also reported a personal gain in confidence regarding the content that they teach. A middle school teacher reflected, “I definitely feel more confident about geometry. I understand more of the connections between algebra and geometry and the ways that I can integrate geometry-based problems into my algebra classes.”

- The teachers’ students show evidence of gains. In the elementary-teacher master’s program, 74% of students met or exceeded state mathematics standards after Year 1 of the program; 76% met or exceeded after Year 2. For elementary science (tested in Grade 4), 69% of students met or exceeded standards in Year 1; by Year 2, the proportion had risen to 74%. For the middle and secondary mathematics teachers, the proportions changed from 80% of middle school students meeting or exceeding mathematics standards in Year 1 to 81% in Year 2. For high school students the proportions were 56% and 58%. For life science scores, proportions rose from 75% to 82% meeting or exceeding standards on the 7th grade standardized science tests and remained steady at 54% for 11th grade tests.
- When given pre and post-tests developed by the Mathematics Diagnostic Testing Project of California State and University of California, middle through secondary students improved a third of a standard deviation.
- Perhaps the most powerful aspect of the IMSP projects is the strength of the partnership developing across the university, school districts, Fermi Laboratory, the Illinois Mathematics and Science Academy, the Robert Crown Center for Health Education, Packer Engineering, DuPage Children’s Museum, and the SciTech Hand-on Museum. Partners report a high degree of trust, respect, and shared commitment to education and to the community. Their network stretched to include additional parties collaborating on related projects, for example

a proposed mathematics and science magnet school on the Aurora University campus for talented third through eighth graders. The project will involve four school districts, teachers, parents, undergraduate and graduate students, and seven community partners.