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A Multi-Perspective Class Project at Oral Roberts University

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In 2001, Oral Roberts University launched an honors program. Unlike most honors programs, the ORU program is two-tiered, meaning that the top sixteen to eighteen students in every class are considered fellows and the rest of the students who meet the academic requirements are scholars. ORU requires both fellows and scholars to complete twenty-four hours of honors coursework through designated sections of general education classes. One unique aspect of the program is that the fellows are required to complete five of six special interdisciplinary honors seminars as part of their required twenty-four hours. These classes replace traditional general education courses like introductory English, humanities, and social sciences. Two departmental teachers work together to integrate their areas of specialty to create a cohesive synthesis. Disciplinary combinations include: art and English, mathematics and history, science and philosophy, and drama and English. Students find that these seminars provide a more challenging, interesting, and comprehensive educational experience as opposed to the ordinary introductory level courses.

One of these classes, "History of Quantitative Thought," was co-created by a faculty member from the mathematics department whose specialty is quantum field theory and by a colleague from the history, humanities, government department whose specific area of study is the ancient and modern Middle East. They first taught the course in the spring of 2003. The goal of the course was to teach the history of mathematics and in doing so give the students a feel and appreciation for the culture and times in which the mathematics developed. Objectives included a mastery of early number systems, an understanding of Babylonian and Egyptian quantitative thought and culture, a knowledge of Greek accomplishments with special emphasis on thinkers like Pythagoras and Euclid, an awareness of Asian mathematics and its context, and finally, a familiarity with mathematics in Europe during the medieval period. The course investigated the historical and cultural context behind the development of quantitative accomplishments. For example, the professors sought to help students understand the implications of significant mathematical accomplishments during an era without electricity (no computers, calculators, or electric lights), pens, or even paper. Because the object of the course was understanding the historical development of mathematics, it did not concentrate on developing specific quantitative skills but rather utilized the existing abilities of the honors-caliber students in the class.

Students came from a variety of majors and mathematical backgrounds. While some students were engineering or mathematics majors, others had not done serious quantitative reasoning since high school. Understanding that mathematics can be frustrating for individuals with limited prior training, the professors sought to make the students' academic diversity an asset rather than a liability by capitalizing on their multiple perspectives through a class project. The goal of this project was to have the students trace the conflict between science and religion from the ancient world through the early modern period over the earth's shape, size and position relative to the stars. The class was divided into four groups, each with a variety of students whose educational background would complement each other. That is, each group contained one student with a major such as engineering or mathematics, one with religious studies, one focused on a science, and one or two students from another major. As a result, group dynamics contributed to a multi-faceted understanding of the subject matter. Through group collaboration and classroom presentation, the students worked together to enhance one another's understanding of the material. Students with a strong science and mathematical background researched and gave an in-depth look at the quantitative side to the assigned subject, while others who understood religion presented an analysis of the church's reaction to the science, and still others with an interest in history and culture examined the sociopolitical context of that science.

The four groups took sequential key individuals in the development of Western cosmology from ancient times to the scientific revolution. The first looked at Claudius Ptolemy and the geocentric theory of the universe; the second examined Nicholas Copernicus and the beginnings of a heliocentric model; the next group looked at Galileo Galilei and his concrete support of Copernicus' theory; and the final group discussed Isaac Newton and Johannes Kepler and their creation of mathematical formulas to describe, explain, and predict the movements of the heavens. Each group wrote and presented a paper, giving a biography, cultural context, mathematical and scientific explanation of theories, and an ecclesiastical response. These four chapters became a single paper more than one hundred pages long presenting an overview of developments in cosmology spanning more than 1000 years. In addition, the presentations prompted class discussion, which helped to solidify ideas and concepts.

The class project was so unique and distinctive that it was accepted for presentation in a special session of the American Association for the Advancement of Science's 78th annual meeting. Eight students, two from each group, and the faculty member from the mathematics department presented five papers in a session entitled "Christianity and Cosmology." The first four papers were those of the students', while the final paper, "Einstein and the Big Bang" was given by the faculty member. Together, the five presentations gave a multi-perspective look at how the Western world has viewed the universe from the time of the Romans until today. This session truly stood out at a conference of biological, chemical, and psychological papers and added an interdisciplinary dimension to the conference as a whole. The class's efforts and contribution were rewarded when one of the student presentations received an honorable mention.

Offered for the first time in 2003, this class was an experiment in multi-perspective learning. With a variety of students, a team of teachers, several thousand years of history, and an array of mathematical concepts, this class had many frontiers to explore and challenges to overcome, the principle of which was the extreme diversity of mathematical backgrounds. It was difficult to create a challenging but not frustrating curriculum that would cater to the needs, abilities, and interests of both the engineering major and French education major.

From a faculty perspective the biggest problem we faced in the class was the integration of history and mathematics. Both faculty members expected a certain level of achievement in their respective fields by the students. This expectation at some points made the course seem like two different classes in one. We were not alone in having problems like this. Our honors program has several classes being team taught by two faculty members from different departments, and they all have had this same problem to varying degrees. Complete integration is impossible to achieve; we do not expect the mathematician to teach history or vice versa, but we do want the course to flow well. We are currently teaching the course for a second time and are avoiding disjointed feelings from lecture to lecture by working closer together than we did before. With knowledge gained from previous experience, we are doing a better job with the course this time. We have more general discussion time with both faculty members present, each presenting their own perspective, more expert guest speakers reinforcing material, and more class research projects.

As with any pioneering undertaking, the class had its triumphs and failures, as students realized firsthand the difficulties inherent in even ancient mathematical discoveries. Chief among the triumphs was the class project and paper, and even more so, its presentation at a professional scientific conference. Furthermore, this project provided a success story for the fledgling ORU Honors Program because it was able to create synergy from the diversity of student backgrounds and disciplines rather than allowing the different viewpoints to become a detriment to learning.

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