

## **Summary - Discovering the Art of Mathematics: Inquiry-Based Learning in Mathematics for Liberal Arts**

**Vision:** Mathematics for Liberal Arts students will be actively involved in authentic mathematical experiences that are both challenging and intellectually stimulating, that provide meaningful cognitive and metacognitive gains, and that nurture healthy and informed perceptions of mathematics, mathematical ways of thinking, and the ongoing impact of mathematics not only on STEM fields but also on the liberal arts and humanities.

Discovering the Art of Mathematics meets this challenge directly by developing a foundational library of 10 full-length, stand-alone learning guides for Mathematics for Liberal Arts (MLA) and other cognate audiences. Each volume furnishes curriculum materials sufficient for a semester-long course. The pedagogy is radically student centered, a form of inquiry-based learning that is a descendent of the Socratic dialogue, but nonetheless allows faculty employing the materials significant pedagogical flexibility. The mathematical content is both sophisticated and accessible, with deep and natural connections to the arts, history, culture, philosophy, humanism, and literature throughout.

The materials that make up this library provide: a) concrete, successfully tested vehicles for teachers to make learning in their classrooms more student-centered, b) mechanisms for non-STEM students to pursue mathematics as mathematicians – with responsibility for their own learning and with the knowledge they have been entrusted to investigate real mathematics, and c) opportunities for non-STEM students to help bridge the Two Cultures (Snow, 1960; Davis, 1993) divide.

Since 2008 Discovering the Art of Mathematics has grown organically from a Phase 1, CCLI project with a single program component focus (Creating Learning Materials and Strategies) into a mature project which now integrates four TUES program components. The goals of Type 2 work on this project are:

1. Successfully complete the Discovering the Art of Mathematics curriculum materials.
2. Develop Teacher Resources Guides and assessment materials for each volume.
3. Disseminate the series and its supporting materials nationally through robust publication.
4. Provide resources for the expanded use of inquiry in general education mathematics courses.
5. Implement a series of 12 professional development “traveling workshops” targeting faculty who are generally without the resources to explore and nurture the use of alternative pedagogies.
6. Create and employ assessment tools which will evaluate the impact of project materials on student achievement and attitudes and may add to the knowledge base on the efficacy of inquiry-based learning in collegiate mathematics.

**Intellectual Merit** – Discovering the Art of Mathematics is unique, an entire library being built to make the vision above a practical reality. The original content has already sparked six peer-reviewed publications. With a purposeful focus on the Arts, it directly engages MLA students in bridging the Two Cultures divide. Knowledge from a strong research base has been translated into a practical pedagogy. By providing a baseline of student-centered materials, which can even be used by those inexperienced with inquiry-based learning, knowledge transmission will no longer have to be the default starting point in course design. Teachers can use the extensive teacher resources and assessment tools to readily adapt their students’ voyages of discovery to their particular style, goals, and requirements while maintaining the focus on student inquiry. External review and beta-tests have uniformly praised the quality and potential impact of the library. Most importantly, the learning gains and affective benefits already seen by over 1,000 students have been considerable.

**Broad Impact** – Over 1,300 students will directly benefit from Phase 1 of DAoM. During Type 2 there will be a similarly sized local cohort and upwards of 200 faculty who will be directly impacted, subsequently involving some 4,000 students as a secondary effect. Traveling professional development workshops, offered in conjunction with AMATYC, will help develop communities of inquiry-based learning practitioners from the generally under-supported cohort of teachers that most often teach MLA. The high-profile, nationwide dissemination of the DAoM library and scholarly work it generates, taken together with the other project initiatives, will transform the way MLA is taught and learned.