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We Can Do It: Experiential Learning Activities in Mathematics Courses for Liberal Arts Undergraduates

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Abstract- Mathematics courses are often the last place anyone would expect to find experiential learning. Yet liberal arts undergraduates can benefit greatly from experiential learning activities in their required math course, and it is easy for educators to incorporate such activities into these courses. The author describes his practice of providing an experiential project in his course, Mathematical Explorations.

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I. INTRODUCTION

The mission statement of Prescott College, where I teach, concludes with this: “Our philosophy stresses experiential learning and self-direction within an interdisciplinary curriculum.” Many colleges and universities, as well as many individual educators, share Prescott College’s respect for experiential learning. We know that opportunities for hands-on application enrich our students’ learning process and in some cases provide a depth of learning that is not otherwise possible. Mathematics courses, however, are often the last place anyone would expect to find experiential learning. Yet liberal arts undergraduates can benefit greatly from experiential learning activities in their required math course, and it is easy for educators to incorporate such activities into these courses.

I have taught mathematics for liberal arts students at Prescott College since 1990. In 2004 I was asked to join the College’s Limited-Residency Undergraduate Program and specifically to create a math course that would engage students with meaningful learning. I quickly found that most students love doing self-chosen experiential projects on math-related topics. The course that I created is called *Mathematical Explorations*, an online humanistic math course that has four main components: a math therapy exercise (see Stogsdill, 2013a), quantitative reasoning exercises (see Stogsdill, 2014), a meaningful self-chosen experiential project, and self-chosen research into an interdisciplinary math-related topic of vital importance in the human quest to understand the world around us and what it means to be human (see Stogsdill, 2013b).

The experiential project actually addresses all three of the learning mandates in the Prescott College mission statement excerpt that opened this article. Obviously it’s experiential,

it's also self-directed because each student chooses what project to engage in, and it's inherently interdisciplinary because any useful application of math will necessarily venture into the territory of other disciplines.

At the beginning of *Mathematical Explorations*, students are presented with sample ideas for their experiential project along with a scoring rubric so that they understand how to receive full credit. Students are also invited to seek approval for their own unique experiential project that I've not mentioned in the sample ideas. Following are a few of the sample ideas that I provide:

- Design and build something of interest.
- Design and create plans for a substantial architectural project.
- Plan sustainability features for where you live (solar gain, rainwater collection, permaculture designs, etc.) and begin to implement some of these features.
- Calculate an "ecological footprint" for yourself, your family, or your community.
- Design and create a garden or landscape incorporating principles of sacred geometry.
- Explore patterns in nature (golden ratio, fractal, spiral, etc.) and document with photography.
- Create your own original tessellation design art.
- Explore music in terms of its mathematical components.
- Write an original story for children conveying ideas from your math-related research topic.
- Develop a financial business plan.
- Explore and apply the mathematics and physics of rock climbing.

Components of the scoring rubric include criteria for time commitment, quality of product, interest level, and interaction with classmates at the online forum dedicated to the experiential project.

Following are examples of experiential projects that have been completed recently. One student designed and constructed an elaborate tool shed, documenting the extensive use of mathematics at every stage of this process. An adventure education student documented a wide variety of patterns in nature through a 23-page original photo essay. An expressive arts student who was exploring chaos theory and fractals for her research topic purchased a computer fractal program and created several stunning pieces of original fractal art. A student with a creative writing major wrote and illustrated an original story for children on her math-related research topic of cosmology. A sustainability student designed a passive solar home with a permaculture yard, complete with calculations for solar gains, etc. A human development student wrote a substantial business financial plan for her future work as an aromatherapist. A teacher preparation student who is currently an aide in a special education classroom created and taught a series of lesson plans on her research topic of indigenous mathematics.

At the end of *Mathematical Explorations* all students complete a narrative self-evaluation as well as a course questionnaire that invites them to comment on what they found particularly helpful about the course. Following are a few of the comments that students have volunteered specifically about the experiential project, taken from recent offerings of *Mathematical Explorations*.

Probably my favorite activity was the experiential project. For my project I chose to photograph math [patterns] in nature, which encompassed both my [major] and my [minor]: adventure education and photography. I was delighted and surprised to find math in so many everyday things that I would usually walk by.

The experiential project helped me gain more of my own relationship to math and find my entrance into something I find very interesting and see it from a “mathematical point of view.” I can see that the type of thinking required is important to learn and is helpful for life in general.

The self-chosen experiential projects were very practical in nature [and] showed me how math-related projects such as these help us in our role as human beings to better understand the world around us. I’ve come to realize that whenever I work on a new project, no matter what it is, I think about how much math is integrated into our lives and the natural world and that we use [math] every day of our lives.

Having the opportunity to do a math project with something I love to do and have a great passion for, was the best experience I have ever had with math.

Mathematics can be found in virtually every aspect of the world around us and in most human endeavors. Experiential learning in math class allows students to discover this for themselves. Such activities are inherently interesting for most students and promote an appreciation for the usefulness of math. A self-chosen experiential project can be a welcome addition to any math course for liberal arts undergraduates.

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