

**Course Title: Mathematics of Origami: *Paper Square Geometry*
Grades 6 and up**

Instructor's Name: Dave Youngs, AIMS Education Foundation

Course Number: MAT 945

Number of Credit Units: 3 semester units

Course Content/Description:

This course seeks to empower teachers to provide for their students a hands-on discovery-based approach to teaching geometry through origami. The geometry focus of the origami experiences provided can be modified to suit a wide range of grades from elementary through high school. Topics which can be studied include properties of two- and three-dimensional shapes, symmetry, surface area, problem solving, pattern development and recognition, geometric vocabulary, and geometric notation, to name a few. The course is supported by classroom lessons found in the *AIMS* publication *Paper Square Geometry: The Mathematics of Origami*, which forms the nucleus of the course. It is also supplemented with an instructional CD-ROM which provides video training for how to fold and assemble several of the models in the book as well as practical suggestions for implementing the activities in a classroom.

Primary Learning Outcomes

Students will:

1. Participate in opportunities for implementation and sustained use of hands-on experiences in mathematics in a classroom setting
2. Engage in reflective practice through the use of instructional planning, focused questions, and reflective responses
3. Make connections for conceptual understanding by showing alignment of instructional experiences with national reform documents and state content standards for mathematics
4. Develop positive attitudes and confidence in teaching and learning
5. Expand their knowledge base of mathematics education
6. Will make connections to professional literature regarding content, theory and practice
7. Will identify State or National Standards that apply to the selected AIMS activities by aligning learning goals with State or National Content Standards

Course Materials

AIMS Book – *Paper Square Geometry: The Mathematics of Origami*

Manipulatives for one class to be used with lessons from text.

Instructional CD

2 packages of Origami Paper

Patty Paper

An Overview of AIMS (online- PDFs;

<http://www.aimsedu.org/downloads/pdf/download.php?file=sps.pdf>)

with required reading and application of ideas from the following:

A Model of Learning

The Skills for Thinking

(If Internet is not available to download the pdfs, AIMS can mail copies of these pages. Please email spscourses@AIMSedu.org or call 1-888-733-2467 ext 120 to request copies.)

Focus questions and guidelines for responses based on understanding and application of materials and ideas.

Overall plan for Implementation

Summary of Alignment with State Content Standards

Application of the Model of Mathematics

Application of Thinking Skills and Alignment with Standards and Learning Goals

Reflective Response and Focus Questions

Integrated Curriculum Form

Professional Growth and Reflection: A Response to Articles and Experience

Course Requirements/Schedule of Topics and Assignments

1. Read completely the related AIMS publication, *Paper Square Geometry: The Mathematics of Origami*.
2. Students will read the selected articles in **An Overview of AIMS** (online- PDFs; <http://www.aimsedu.org/downloads/pdf/download.php?file=sps.pdf>) with required reading and application of ideas from the following:
A Model of Learning
The Skills for Thinking
(If Internet is not available to download the pdfs, AIMS can mail copies of these pages. Please email spscourses@AIMSedu.org or call 1-888-733-2467 ext 120 to request copies.)
3. Design a plan for implementation of at least seven experiences from ***Paper Square Geometry***, including a summary of and rationale for the selection of AIMS lessons. You must include the *Cube* (pgs 39-48) as one of the selected activities.
4. Choose one lesson from ***Paper Square Geometry*** and describe how it addresses the four learning environments of the Model of Mathematics/Learning.
5. Implement at least seven lessons in the classroom with students over the course of three or more weeks.
6. Compile a photo journal (using standard or digital photographs) chronicling the lessons done with your class. Include pictures of students in the process of folding and assembling models, as well as their completed products. Provide brief descriptions of the contents of the pictures.

7. Prior to teaching each lesson, determine learning goal(s) for the lesson based on the topic(s) you will be addressing. These learning goal(s) should be clearly focused and summarize what you hope students will understand by the end of the activity. They need not be related to the *Key Questions* and/or discussion questions provided in the lesson. Use the **Skills for Thinking** to help guide you in designing tasks and discussion questions reflecting important concepts, skills, and processes integral to the stated learning goal(s). Record these, along with the appropriate state standards, on the **Applying Thinking Skills** page.
8. After each lesson, reflect upon your teaching by responding to the Reflective Response focus questions.
9. Show summary of alignment of learning goals with **State Content Standards**. Content Standards for each state may be found at this Web-site address: US Department of Education has links to the state department of education for each state.
http://wdcrobcolp01.ed.gov/Programs/EROD/org_list.cfm?category_ID=SEA
10. Complete a *Professional Growth and Reflection* form describing how the selected articles (see number 2 above) and the teaching experience impacted you and your teaching.

Method of Assessment

Provide evidence of the design, implementation, evaluation and reflection of the collective experiences by returning the completed assignments and accompanying photo journal.

Unless otherwise indicated, students successfully completing this course will earn a credit/no credit grade, or where a letter grade is requested in writing, a letter grade of B will be issued. In order to earn a letter grade of A, additional work beyond what is described above will be required. (See *Requirements for an A*.) The discernment between an A or a B is at the discretion of the instructor of record based on the quality of the evidence submitted.

Requirements for an A

There are two options for additional work in order to earn a letter grade of A. You may select whichever one is most appropriate for your grade level and students.

1. Design a lesson connecting the study of origami to a subject area other than mathematics/geometry. Other subjects could include art, history, geography, literature, writing, or culture. Submit a lesson plan and four samples of student work from this activity.

For example, read *Sadako and the Thousand Paper Cranes* and have students fold a paper crane. Have them write and illustrate a short story about their paper crane. For example, read *Sadako and the Thousand Paper Cranes* and have students fold a paper crane. Have them write and illustrate a short story about their paper crane.

Coerr, Eleanor

Sadako and the Thousand Paper Cranes

(Bantam Doubleday Dell, 1977)

(ISBN 0-440-47465-5)

2. Complete each activity from *Section Two: Platonic Solids*. Design an assessment tailored to meet the specific learning goals and state/national standards you

addressed in these five activities, and submit it along with four samples of student work.

For example, if the learning goals focused on symmetry, an assessment could involve students identifying and defining the axes of rotational symmetry in each of the Platonic solids.

University Policy on Plagiarism

All people participating in the educational process at Fresno Pacific University are expected to pursue honesty and integrity in all aspects of their academic work. Academic dishonesty, including plagiarism, will be handled according to the procedures set forth on page 8 of the Fresno Pacific University Catalogue.