# NATIVE AMERICAN-BASED MATERIALS FOR INTEGRATION INTO UNDERGRADUATE MATHEMATICS COURSES

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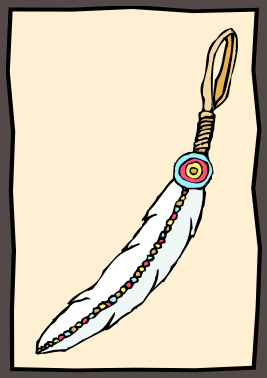
PI-Dr. Charles P. Funkhouser
Co-PI Miles Pfahl
NSF Funded Project
DUE Award #1122823



# PRESENTATION OUTLINE

- Welcome and Introductions
- Project Purpose and Summary
- Project Description and Objectives
- Integration into Courses
- Lesson Piloting Protocol
- Facebook Page and Website
- The Lessons

# INTRODUCTIONS

## Miles Pfahl

- Mathematics Instructor

14 years at Turtle Mountain Comm. Coll. located on the Turtle Mountain Chippewa Res. Belcourt, ND

- Mathematics Teacher

12 years at Turtle Mountain Comm. High School

- Project Director, PI, Co-PI

Numerous grants and programs (7-12 and higher ed)

## Dr. Charles Funkhouser

- Mathematics Professor

20 years at the University of Wyoming and Cal State Universities

- Math and Computer Sci. Teacher

17 years at Frenchtown High School, Frenchtown, Montana

- NSF Project PI

2003 – 2007 TUES Type I
2011 – present TUES Type 2

# MORE INTRODUCTIONS

- Harriet Edwards – CoPI at California State University – Fullerton
- Patrick Weasel Head – Project Tribal Cultural Liaison
  University of Montana (Retired)
- Luther Olson – Project Materials Developer
  Mathematics Instructor, Turtle Mountain Community College
- Roberto Wheaton – Project Materials Developer
  High School History/Science Instructor – Desert Hot Springs, CA
- Michael Little Crow – Project Materials Developer
  Mathematics Instructor, Scottsdale Community College
- Cecelia Myerion and Frances Allard Abbott – Cultural Advisors
  Turtle Mountain Community College

# PURPOSE

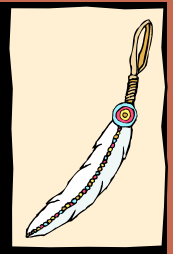
Infrequently mentioned in most mathematics instructional settings in the US is a parallel, rich system of mathematics developed and used by indigenous people of North America.

- These materials allow instructors of undergraduate courses to infuse culturally relevant and interesting mathematics activities into their courses.

- These materials will not only allow Native American students to be more fully involved in their learning, but also give all students a fuller appreciation of the universal nature and power of mathematics.

# NATIVE AMERICAN BASED MATERIALS FOR INTEGRATION INTO UNDERGRADUATE MATHEMATICS COURSES

## *PROJECT SUMMARY*



- Researches and develops undergraduate math materials based in the culture of Native American peoples.
- Materials are classroom ready.
- Various mathematical concepts that coincide with traditional math content in undergraduate courses.
- Give additional perspective as to how traditional math topics can be incorporated into real world situations in the Native American culture.

# PROJECT DESCRIPTION

- CSUF and TMCC develop materials based in intellectual and cultural traditions of Native American peoples to be used in undergraduate math courses.
- Integrate these materials into mainstream university and Tribal Community college mathematics courses.
- Foster faculty expertise in the materials' mathematics, methods and cultural bases.
- Assesses the materials' effects on student and instructor attitudes.
- Make the materials available for dissemination to universities and Tribal Community colleges.

# PROJECT OBJECTIVES

- 17 classroom ready lessons are being / have been developed including a powerpoint presentation and instructor guide for each lesson.
- Materials are being/have been piloted at CSUF, TMCC and other universities and community and Tribal colleges.
- Other technological enhancements have been developed such as a project website and Facebook page.
- Faculty training in deliverance of materials has taken place.
- Native American and other students will have integrated exposure to the traditional mathematics and methods of Native Peoples within courses taught in their undergraduate curriculum.

# CONTINUED…

- University and Tribal college faculty will have an opportunity to integrate traditional mathematics and methods of Native Peoples into the undergraduate courses they teach.
- The following topics from Native American mathematics will be integrated and implemented into undergraduate course: number theory, numeration systems, topology, measurement, probability and chance, statistics and data mining and geometry.
- The appropriateness and efficacy of the materials used in undergraduate courses will be assessed and evaluated.
- Changes in student and instructor attitudes towards Native American traditional mathematics and intellectual traditions will be assessed.
- Results will be widely disseminated.

# INTEGRATION INTO COLLEGE LEVEL MATHEMATICS COURSES

- Following is a list of Potential Undergraduate mathematics courses where the developed lessons may be integrated:
  - MATH 100 Applied Mathematics
  - MATH 102 Intermediate Algebra
  - MATH 111 College Algebra I
  - MATH 112 College Algebra II
  - MATH 103 University Algebra
  - MATH 212 Statistics I
  - MATH 213 Statistics II
  - MATH 335 Mathematical Probability
  - MATH 303 Fundamental Concepts in Elementary Mathematics
  - MATH 380 History of Mathematics
  - MATH 417 Foundations of Geometry
  - MATH 402 Logic and Geometry for the Secondary Teacher.

# LESSON PILOTING PROTOCOL

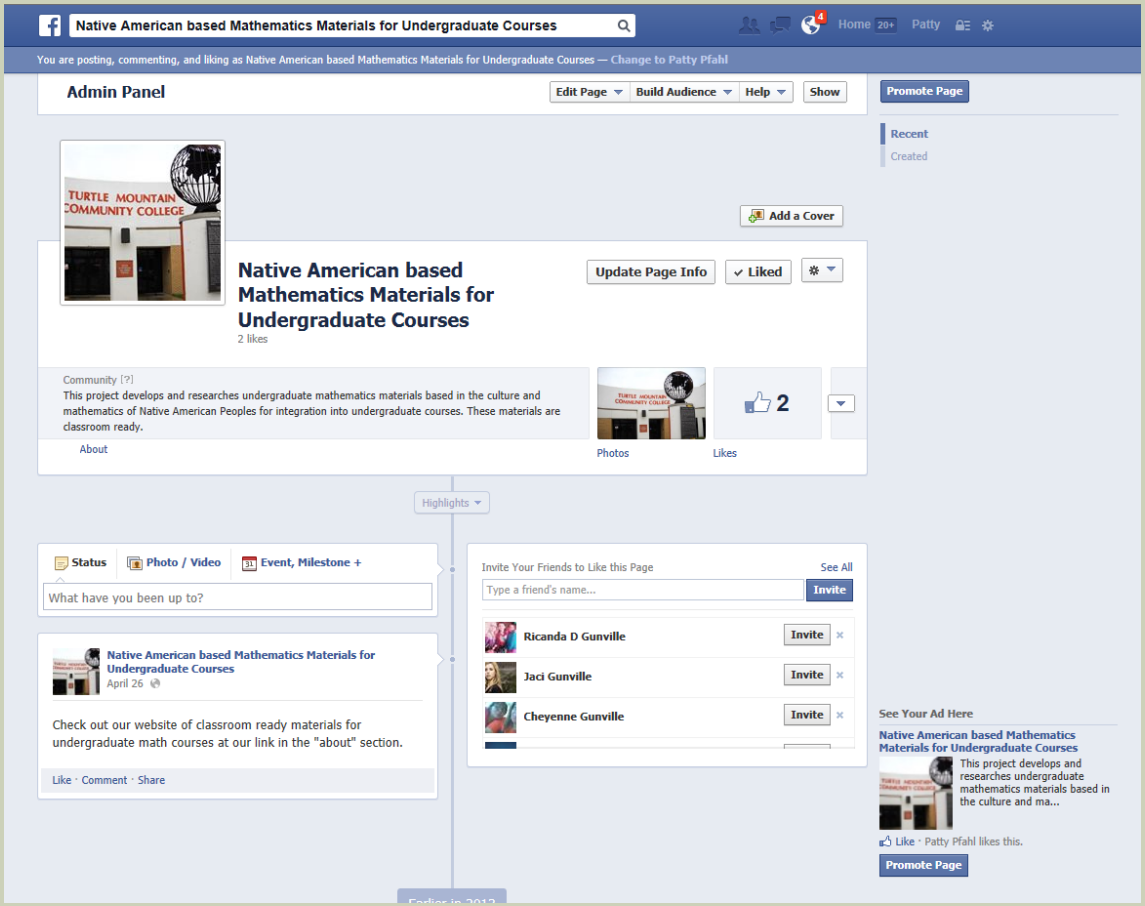
- Pre Attitude survey will be administered to the students participating in the project by faculty.
- Pre Attitude survey will be completed by the faculty member participating in the project.
- Post Attitude survey will be administered to both students and faculty participating in the project.
- A Post Student Focus Group session will be conducted after the lessons have been piloted.

Documents:

1. Survey Administration Instructions
2. Student Survey
3. Instructor Survey
4. Protocol for Student Focus Group

# FACEBOOK PAGE

www.facebook.com/NativeAmericanMathematicsMaterials



# THE PROJECT WEBSITE

http://math.fullerton.edu/cfunkhouser/

Native American-based Mathematics Materials

Departments of Mathematics, CSUF and TMCC

- Home
- Teaching
- Research
- Lessons
- FAQs

**2013-2014 Info:**

**Office:**
MH-157

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**Phone:**
206-300-3322

**Collaborators**
Charles Funkhouser, PI
Harriet Edwards, CoPI
Miles Pfahl CoPI (TMCC)
Patrick Weasel Head
Roberto Wheaton
Michael Little Crow

## Home

Hello! Here you'll find information on our NSF-sponsored DUE TUES Type 2 Project, "Native American-based Mathematics Materials for Integration into Undergraduate Courses," in partnership between California State University Fullerton (CSUF), and Turtle Mountain Community College (TMCC).

Information includes the cultural, mathematical and pedagogical stories behind the Project materials, the American Indian and mathematics personnel involved, and ongoing projects and opportunities for wider dissemination--and an invitation for your participation in our collaborative efforts. Information on current the types of materials being developed for this Project can be found on the **Teaching** page. More about the individual Project participants and their contact information can be found by clicking here at **Project Participants**.

Our collaborative efforts focus on finding connections between traditional and current Native American culture, and mathematics as it it taught in undergraduate courses at universities, and Tribal and community colleges. The results of our current research can be found on the **Research** page.

We also have collected some resources to help you begin using these culturally-based mathematics materials in a classroom setting or on your own. We encourage all undergraduate mathematics instructors and students, whether Native or non-Native, to explore the universal nature of mathematics presented here as products of our research. On the **Lessons** page, we have collected some files to help you to get started.



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Michael Little Crow

## Lessons

Below, you can download current versions of some of the materials that we've created!

### Some useful notes on these lessons:

Each of the twelve lessons has at least three components: 1) traditional Lesson Materials available in Word format for user duplication and modification, 2) a Power Point presentation to give an overview of the lesson to the instructor and students, and 3) a Solution Key/Teacher's Guide for instructor use.

**Lesson 1** *(Transformational Geometry/Native Design Materials)*

**Lesson 1 PPT** *(PowerPoint)*

**Lesson 1 Solutions** *(Solutions)*

**Lesson 2** *(Probability/Plumstone Game Materials)*

**Lesson 2 PPT** *(PowerPoint)*

**Lesson 2 Solutions** *(Solutions)*

**Lesson 3** *(Numeration/Gesture Counting Materials)*

**Lesson 3 PPT** *(PowerPoint)*

**Lesson 3 Solutions** *(Solutions)*

**Lesson 3 Tutorial** *(Salish Counting Tutorial)*

# THE 17 LESSONS

- Transformational Geometry - Native Design
- Probability - Plumstone Game
- Numeration - Gesture Counting
- Geometry - Medicine Wheel
- Geometry – Tepee Surface Area and Volume
- Probability – Stick Game
- Numeration – Beading
- Geometry – Arrowheads
- Geometry – Beadwork
- Measurement – Hand Games
- Linear Programming – Native Clothing
- Geometry – Wigwam Surface Area
- Geometry – Tessellations Star Quilts
- Statistics – Diabetes Rates
- Geometry – Tepee Oblique Surface Area and Volume
- Algebra – Blood Quantum
- Numeration – Chippewa Grammar of Numbers

# TAKE A LOOK AT A LESSON OR TWO

TURTLE MOUNTAIN COMMUNITY COLLEGE

*The Spirit Within Us!!*


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EST. '72

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