

**California State University San Marcos  
COLLEGE OF EDUCATION**

Distinguished Teacher in Residence Program  
Assigned Time Grant Proposal submitted for AY 2011-12

**COVER SHEET**  
(Submit with Proposal)

Title of Grant Proposal: Conceptual Understanding of Mathematics as a Pathway to Higher-order Thinking

Involved Faculty: Rong-Ji Chen

Partnering District(s): Oceanside Unified School District

Number of units requested: 6

**SIGNATURE(S):**


  
CSUSM Faculty Member

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CSUSM Faculty Member

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CSUSM Faculty Member

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CSUSM Faculty Member

**ACKNOWLEDGEMENT OF PROPOSAL SUBMISSION:**

  
DTiR Consortium District Representative  
(See District Listing for eligible signatures)

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**Checklist**  
(Submit with Proposal)

Objectives are clearly stated and appropriate	X
Procedures are clearly stated and achievable	X
Clear explanation of how involved parties will benefit from the proposed assigned time in accordance with the COE mission statement	X
Timeline demonstrates a match between units requested and depth of work proposed	X
Clear description of an evaluation process that is likely to yield useful information about the project's effectiveness	X
Letters of support from teachers and/or administrators	X
If this is a continuing project, is there a clear explanation of why this grant should be refunded?	NA

DTiR grant for 10-11?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
If yes, is interim or final report attached?	<input checked="" type="checkbox"/> Interim <input type="checkbox"/> Final
DTiR grant for 09-10?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
If yes, has final report been submitted to Donna Matanane?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Attached
This is a new project	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
This is a continuing project	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Signature of acknowledgment from district representative is included	<input checked="" type="checkbox"/> Yes

# Conceptual Understanding of Mathematics as a Pathway to Higher-order Thinking

Distinguish Teacher in Residence Assigned Time Grant Proposal 2011-2012

Oceanside Unified School District

Respectfully submitted by Rong-Ji Chen

## Introduction

The proposed project is a collaboration between a group of fifth grade teachers at Oceanside Unified School District and Dr. Rong-Ji Chen. Together, the collaborative group will navigate among a nexus of research-based teaching practices, classroom realities, and student needs. The primary goal is to increase fifth grade students' conceptual understanding of mathematics (especially in fractions, decimals, and proportions) and smoothen their transition from elementary school to middle school where they are expected to do more higher-order thinking in mathematics.

The fifth grade teachers at Oceanside, a program improvement district, are caught in a dilemma. They are aware of the reform-minded approach to teaching that emphasizes students' conceptual understanding of mathematics and problem solving skills. They want to help students find meanings and connections in mathematics. However, in the current education climate of high stakes testing and centralized control, these teachers have a tendency to teach in a traditional manner characterized by teacher demonstration, textbook-centered instruction, and student practice of procedural skills with limited or no connection to conceptual understanding. Although they see a lack of students' deep understanding, the teachers just feel safe about the traditional, teacher-centered method. Although they see the potential value of inquiry-based learning, they are not sure to what extent the "new" method can help students perform on CSTs (California Standards Tests).

A viable way to help teachers resolve the dilemma is to organize a teacher inquiry team on which members work together to negotiate between theory (student inquiry) and reality (CST) and find a balance. The inquiry team will support one another in terms of (1) deepening mathematics understanding, (2) experimenting strategies for teaching through problem solving, and (3) reflecting on the effectiveness of such strategies on student learning. Such *collective* and *experiential* learning can help teachers find their niche in the dilemma.

## Objectives and Measures

The following objectives have been identified for the project:

- (1) *Increase participating teachers' knowledge and skills for teaching for conceptual understanding of mathematics.* This objective can be measured by the lesson plans and supporting materials teachers will produce, observation notes on teaching practices, and interview data.
- (2) *Increase fifth grade students' conceptual understanding of fractions, decimals, percents, and proportions.* This objective can be measured by students' work and other artifacts, performance on chapter tests and other assessments, observation notes on student learning, and survey data.

## **Project Activities and Timeline**

To achieve these goals, Dr. Chen will be working with a group of 4 to 5 fifth grade teachers at Nichols Elementary School in the following activities. The estimated amount of time of each activity in the project year, August 2011 to May 2012, is given in parenthesis.

- Meet **once a week** to plan instructional activities that focus on student thinking and problem solving, discuss the mathematics concepts involved in the lesson, and/or analyze students' work as a means to understand their thinking (90 hours)
- Collaborate on lesson implementation and collection of students' work (50 hours)
- Reflect on the strengths and limitations of lessons (30 hours)
- The goal is to complete at least **one cycle each month**. The cycle consists of studying math concepts, planning a lesson/unit, implementing and collecting student work, analyzing student work, and reflection and revision.
- Videotape a selected lesson **each month** for in-depth analysis (30 hours)
- Field data will be collected and analyzed in order to evaluate the effectiveness of the project (ongoing, 60 hours, see the Evaluation section below for detailed activities)
- Share experience and resources with other teachers (ongoing, 10 hours)

Four research-based principles will guide the inquiry team's activities: (1) children learn mathematics best when they are challenged to solve problems, not by following a set of prescribed procedures (Stigler & Hilbert, 1999); (2) instructional activities should provide opportunities for student thinking and communication (Van de Walle, 2007); (3) on-going collection and analysis of students' work are vital to support student learning (William, 2007); (4) students should be empowered agents in a classroom culture where they own the mathematics they do and see meanings in learning (Boaler & Humphreys, 2005).

Dr. Chen's primarily role in the project is to facilitate the formation and operation of a site-based inquiry team. He will join the collective lesson planning where he will discuss the mathematical concepts in the lesson (a particular need among elementary school teachers) and provide pedagogical suggestions. He will observe (passive role) lesson implementations or co-teach (active role) a few lessons with team members.

## **Mutual Benefits**

The above activities, guided by research-based principles, will help address the needs of Oceanside USD. First of all, the collaborative team will focus on providing students with opportunities for developing their conceptual understanding of mathematics and problem solving skills. Moreover, the project's focus on fifth grade students will address the need to better prepare them in the areas of rational numbers (fractions, decimals, and percents) and proportional thinking. A solid understanding in these mathematical topics is vital to students' learning in middle school, a time when many students alienate themselves from learning mathematics. The project will help Oceanside USD fulfill their educational and ethical obligations to educate students and prepare them for the next stage of their education journey.

The collaboration will also benefit Dr. Chen's work with teacher candidates and the COE's preparation of future (mathematics) teachers. He will gain field experience and knowledge

about teachers' lifeworlds and students' learning, which will increase his capacity to help future teachers navigate theories, realities, and student needs.

The project is also aligned with the COE Mission. The collaborative team will work together to change the current teaching practices and provide quality mathematics education to historically underserved students.

### **Evaluation**

In order to direct the project and to meet the above-identified objectives, both formative and summative data will be gathered to monitor and measure the effectiveness of the work.

Formative data will consist of:

- Lesson materials (e.g., lesson plans, reflections, videos, assignments)
- Written reflections and meeting minutes
- Informal interviews with teachers about teaching and student learning
- Student work (e.g., problem solving write-ups, reflection statements)
- Observations of classroom activities and field notes (attention will be given to classroom culture that supports student thinking and communication)

Summative data will include:

- Semi-structured interviews with teachers about student learning and collective lesson planning/teaching
- Student work near the end of the year (e.g., problem solving write-ups, reflections)
- Survey of students' beliefs of and attitudes toward mathematics learning

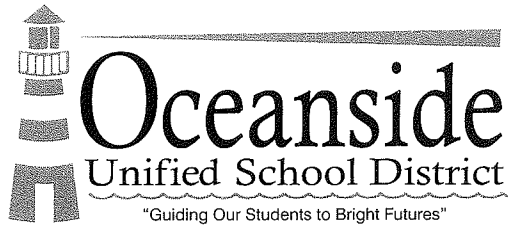
The formative assessments will be reviewed on an ongoing basis as part of the professional development models in use. This data will inform the instructional and coaching activity that follows. The data collected in both formative and summative manners of assessment will provide information about the mathematics teachers' shared understanding and implementation of the co-developed lessons for mathematics instruction.

### **Requested Assigned Time**

The estimated amount of time is given above. The estimates include preparation, implementation, data collection and analysis, report creation, and communication. The total is 270 hours. Therefore, I would like to request for 6 units of assigned time.

### **References:**

- Boaler, J., & Humphreys, C. (2005). *Connecting mathematical ideas: Middle school video cases to support teaching and learning*. Portsmouth, NH: Heinemann.
- Stigler, J. W., & Hiebert, J. (1999). *The teaching gap: Best ideas from the world's teachers for improving education in the classroom*. New York: The Free Press.
- Van de Walle, J. A. (2007). *Elementary and middle school mathematics: Teaching developmentally* (6th ed.). Boston: Pearson Education.
- William, D. (2007). Keeping learning on track: Classroom assessment and the regulation of learning. In F. K. Lester, Jr. (Ed.), *Second handbook of research on mathematics teaching and learning* (pp. 1053-1098). Charlotte, NC: Information Age.



Board of Education  
Lillian V. Adams  
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Larry Perondi, Superintendent

March 23, 2011

To Whom It May Concern:

It is with great pride that I am able to write this letter of support for the CSUSM Distinguished Teacher in Residence (DiTR) grant proposed to be implemented in the Oceanside Unified School District (OUSD) in Oceanside, California. Please understand that the district is in full support of the project and that the goals of the project directly address the district's needs.

There is a dire need for fifth grade students in Oceanside to build a deep conceptual understanding of mathematics, especially fractions, decimals, percent, and proportions. This knowledge is fundamentally important for daily living as well as a pathway to learning higher level mathematics.

The objectives of the project are to: (1) engage a group of fifth grade teachers in lesson study and teaching for conceptual understanding of mathematics, and, (2) increase fifth grade students' understanding of fractions, decimals, percents, and proportions.

To achieve these goals, a group of 4 to 5 fifth grade teachers will be working with Dr. Chen, a CSUSM faculty member, in the following activities:

- Meet once a week to plan instructional activities that focus on student thinking and problem solving
- Discuss the mathematics concepts involved in the lesson
- Collaborate on lesson implementation and collection of students' work
- Analyze students' work as a means to understand their thinking
- Reflect on the strengths and limitations of lessons
- Share experience with other teachers in the district

OUSD understands that the success of this grant is predicated upon collaboration between the university and the district, and on the professionalism of all involved. Dr. Chen, acting as mathematics coach, has committed to addressing the developmental readiness of the teachers in order to ensure an effective balance between the district leadership's stated goals and the teachers' specific needs.

With this, I am requesting that the OUSD be seriously considered as a 2011-12 DiTR grant recipient. If you should have any further questions please feel free to contact me at your convenience.

Respectfully,

Duane Coleman Ed.D.  
Associate Superintendent of Education Services

DC:mjb

**Office of the Superintendent**

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## **INTERIM REPORT – March 28, 2011**

### **Site-Based Self Study of Best Practices in Mathematics**

Distinguished Teacher in Residence Assigned Time Grant 2010-2011

Escondido Union School District

Rong-Ji Chen & Brian R. Lawler

This Distinguished Teacher in Residence Assigned Time Grant (DTiR-ATG) allowed for collaboration between Escondido Union School District (EUSD) and California State University San Marcos (CSUSM), DTiR partners. Through this grant, Drs. Rong-Ji Chen and Brian R. Lawler have built relationships with members of the district in the context of working to improve the teaching and learning of mathematics at the middle grades level in EUSD.

The specific objectives identified for the 2010-2011 school year were:

- Continue to formulate and strengthen a shared vision of Best Practices for teaching mathematics among the appropriate constituents involved in EUSD's middle schools. Teachers will be able to name and identify Best Practices for teaching mathematics. Teachers will begin to implement such practices in their classrooms.
- Continue to support the instructional coaching of principals toward the support of teacher implementation of these Best Practices. The principals will organize teams of mathematics teachers. The team members will observe and provide feedback to each other with respect to the efforts to implement Best Practices.
- Continue to build middle grade's lead mathematics teachers' capacity to facilitate the growth of the school site PLC, with a focus on these Best Practices.
- Continue to work with EUSD to shape professional development opportunities.
- Continue to collaborate with mathematics teachers at Hidden Valley MS and Mission MS sites in lesson design, implementation, and assessment. Teachers will implement Best Practices.

Our shared work toward these objectives will increase student mathematics comprehension, a EUSD district goal.

To date, the work that has been accomplished can be summarized in five key areas.

- 1) Drs. Chen and Lawler have developed a rapport and worked as members of the professional community among district-level employees. This includes the Assistant Superintendent and one teacher on special assignment (TOSA).
- 2) Drs. Chen and Lawler met with the district middle school principals once a month. At the meetings, we discussed the district's goals for all classrooms—teaching and learning—and to consider the particular ways these goals might be achieved in the mathematics classrooms. Connections were made from the district language to messages about “best practices” in mathematics teaching. Principals were asked to reflect on the professional development agenda in place in their schools for mathematics instruction, and to consider the ways their observations as instructional leaders can be utilized to influence positive change.
- 3) Drs. Chen and Lawler have continued a quarterly professional development activity with all 6<sup>th</sup> grade math teachers in the district. The focus has been on supporting their implementation of a new textbook, through the pedagogical structures suggested by the Best Practices framework organizing our larger district work.

- 4) Dr. Lawler collaborated with the 6<sup>th</sup> grade math team at Hidden Valley Middle School. His work began with becoming a part of the team, rather than a punishment for poor test performance. As time passed, he began provoking their learning community and teaching about Best Practices when invited. The relationship that evolved allowed for productive and powerful rounds of modified Lesson Study. The 6<sup>th</sup> grade team is currently setting goals for end of Spring work, and focus for the next school year.
- 5) Dr. Chen has worked closely with the 6<sup>th</sup> grade mathematics teachers at Mission Middle School. He observed teaching and learning activities in all sixth grade classrooms, paying special attention to students' conceptual understanding of mathematics. He discussed students' learning with the teachers and suggested strategies for providing further opportunities for student thinking and problem solving. He also maintained detailed observation notes and shared them with the teachers, which was a means for engaging the teachers in reflective practices.

Appropriate evaluation data has been collected to this point. Meeting notes and classroom field notes have been used to further refine the agenda for the year's work. A more formal analysis of this formative data, as well as final collection and analysis of summative data will be a key component of the work remaining for the Spring 2011. Drs. Chen and Lawler have obtained CSUSM IRB's approval to use the data in publications. They will analyze the data and seek journal publications.