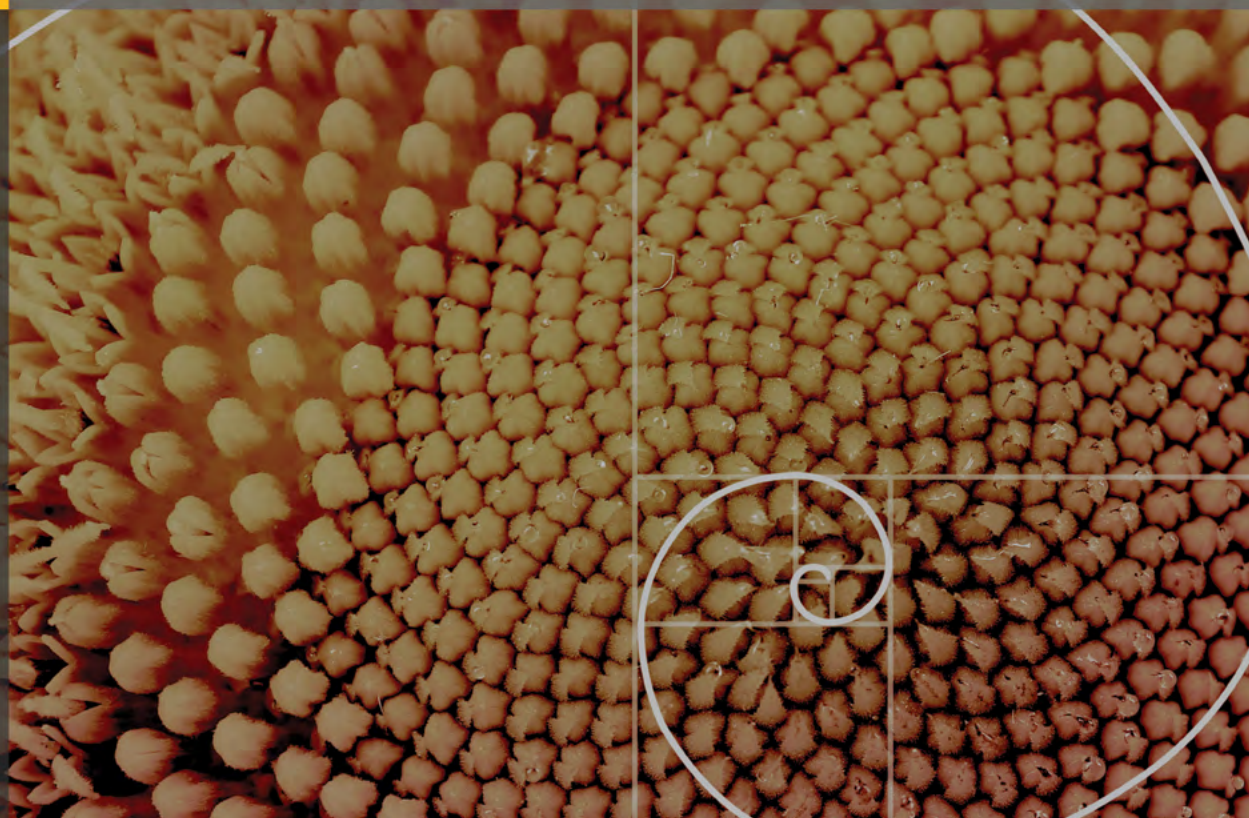
University of Idaho
Coeur d'Alene

IDAHO
REGIONAL MATHEMATICS CENTERS

Fall 2019

Region I

CENTER NEWS



IDAHO
REGIONAL MATHEMATICS CENTERS

REGION I FALL 2019 NEWSLETTER

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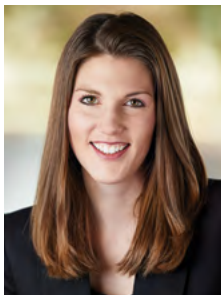

Dr. Julie Amador, Regional Director
Associate Professor of Mathematics Education
Julie teaches elementary/middle school mathematics and technology education at the University of Idaho, in the College of Education, Health and Human Science's department of Curriculum and Instruction. She researches lesson study and how teachers design and enact lessons, with a strong emphasis on what teachers notice about student thinking.

Dr. Abe Wallin
Regional Math Specialist
Abe teaches courses on mathematical thinking and provides curriculum and teaching support to area school districts. He has been working on designing a K-5 curriculum, assessment writing, and development of mathematical tasks with local teachers. In addition, Abe continues to conduct research on the use of video clubs with mathematics teachers.

Jode Keehr, M.S.
Program Coordinator
Jode's background is in design, advertising, and public relations. She is currently a graduate student in the human factors/experimental psychology doctoral program at the University of Idaho.

Chris Chilton
Administrative Specialist
With years of experience in video, design, and audio, Chris supports local teachers with multimedia data collection and works on various projects for the center. He holds a bachelor's degree in electronic media and film from Eastern Washington University in Cheney, Washington.

University of Idaho
Coeur d'Alene

Utilizing Universal Design for Learning

IDAHO COLLECTS A VARIETY OF DATA EACH YEAR TO ASSESS PROGRESS TOWARDS STATE-WIDE GOALS FOR IMPROVEMENT. TWO OF THE TOOLS USED BY THE IDAHO STATE DEPARTMENT OF EDUCATION ARE THE STUDENT ENGAGEMENT SURVEY AND THE PARENT SATISFACTION AND ENGAGEMENT SURVEY. THE DATA FROM THESE SURVEYS SUGGEST THAT SOME IMPROVEMENTS CAN BE MADE AND WE BELIEVE THAT UNIVERSAL DESIGN FOR LEARNING MAY BE ONE WAY TO ADDRESS STUDENT ENGAGEMENT WITHOUT DRAMATIC CHANGES TO INSTRUCTION.

Universal Design for Learning posits that when teachers design lessons for a variety of learners, including those who struggle the most, there is a positive impact on all students (Hall, Meyer, & Rose, 2012). Often thought of as a strategy for teaching students with disabilities, many of the tenants of this approach have broad application throughout instructional design. The majority of students will struggle at some time with mathematical content; it is the nature of the subject and something students need to be prepared for early in their mathematical career. Developing instruction with Universal Design for Learning in mind supports building all students' beliefs in themselves as learners and helps them pursue their own learning goals. Using contextual problems during mathematics teaching, fostering an environment for regular talk about mathematics, and encouraging students to be their own advocates for learning are three strategies to encourage students' engagement in mathematics.

USING CONTEXT

Using a rich variety of contextual problems is one way to support all students. Mathematics can become abstract quickly, which overwhelms some students and, for others, reinforces the idea that mathematics is a series of steps leading to a correct answer. Using word problems empowers both students and teachers to use the context to make sense of what is occurring. Connecting back to a specific situation during a lesson can surface precise questions from students, which can be generalized to a variety of applications. These discussions can then leave a "mathematical residue" (Hiebert et al., 1997) that is accessible to students later in their studies. Although many students fear word problems, teachers' commitment to using them can lead students to deeper conceptual and procedural understanding over time. Mathematics is a tool to analyze real world problems; good contextual tasks support the utility of the subject and address the question of "when will I ever need this."

MATHEMATICS IS A TOOL TO ANALYZE REAL WORLD PROBLEMS; GOOD CONTEXTUAL TASKS SUPPORT THE UTILITY OF THE SUBJECT AND ADDRESS THE QUESTION, "WHEN WILL I EVER NEED THIS?"

Connected to the use of contextual problems is the use of slow reveal problems and numberless word problems. In each of these examples calculation is delayed until all students are given a chance to think about appropriate solution strategies. Slow reveal problems (see figure 1) break a word problem into single sentences that are revealed one line at a time. These problems allow students to make predictions about the problem and think about information thoroughly before being presented with the actual question. Numberless word problems (see figure 2) reveal the full problem, but initially hide the numbers from students. In these situations classroom discussion can focus on strategy and structure without having students rush to find an answer.

MATH TALK

The requirement within the Idaho Content Standards for Mathematics that students communicate their thinking both verbally and in writing necessitates frequent opportunities to practice these skills. One suggestion from Kelemanik, Lucenta, and Creighton (2016) is the use of sentence starters as a way to hone these abilities. These short prompts (see figure 3) provide a structure for students to create coherent responses to mathematical questions. The staff of the Idaho Regional Mathematics Center at the University of Idaho Coeur d'Alene have been using sentence starters with students across Region 1 for the past three years. We have seen a significant increase in student confidence when they discuss their thinking. This simple scaffold has helped many students voice their mathematical thinking in classrooms with minimal effort on the part of teachers. In addition to the sentence starters, we often find it helpful to individually prepare students with specific questions before having them come to the board to present their thinking. This practice leads to more focused discussions that directly relate to the lesson objectives and reduces the anxiety of the students as they explain their mathematical thinking.

Many teachers now allocate an increased amount of instruction time for student discussions, either as a whole class or in a pair-share format. To increase engagement during these times it is useful to provide individual students private think time prior to initiating a conversation. Actual duration of time will vary, but giving students one to two minutes to think on their own can be helpful. From a Universal Design for learning perspective, this allows all students time to process the question being

Figure 1. Example of slow reveal word problem task.

Jimmy wants to buy a new video game.

Jimmy wants to buy a new video game.

The game costs $32.

Jimmy wants to buy a new video game.

The game costs $32.

Right now he has $19.

Jimmy wants to buy a new video game.

The game costs $32.

Right now he has $19.

How much more money will Jimmy need in order to buy the video game?

Figure 2. Example of numberless word problem.

SENTENCE STARTER EXAMPLES

I notice _____ which makes me think _____.

What I see makes me think _____.

What I read makes me think _____.

I saw that _____ relates to _____.

I notice _____ (changing/staying the same) each time, which makes me think _____.

I notice _____ (changing/staying the same) each time, which make me wonder _____.

I showed _____ by _____.

I used the relationship between _____ and _____ to _____.

A question I still have is _____.

I understand _____, but I am still wondering about _____.

Figure 3. Sentence Starters for more focused discussions related to lesson objectives.

asked and to formulate an appropriate response. When we rush to a sharing situation some of our students have not actually had time to think about what they would say. Additionally, this can lead to a belief that quick calculations are required to be good at mathematics. Students who have not been given adequate time to formulate a response may offload responsibilities to their more eager classmates. Implementing private think time spanning as little as one minute before discussions sends a message that everyone is capable of thinking about the problem.

STUDENTS AS ADVOCATES

One final suggestion is to empower students as advocates for their own learning. Students must be taught how to ask a good question about their own misunderstandings. Creating an environment in which student questions are valued affords an opportunity for both teachers and students. This has to be nurtured as many students eventually learn that when the teacher asks "Are there any questions?" it actually means it is time to move on to something else. Instead, the goal is to have students ask the questions they have and

make sure their understanding is clear. The use of exit tickets may be a way of addressing additional questions, allowing the teacher flexibility to decide how to best answer the students' questions. This could be integrated into whole class learning or on an individual basis. Seeing questions as an instructional asset and conveying this strengthens learning for all students.

CONCLUSION

Developing content and instruction from a Universal Design perspective does not have to be a major shift for teachers, instead minor adaptations can be implemented to support students learning mathematics. The benefits of implementing these changes may far outweigh the discomfort as students better understand the mathematics content appropriate for their grade level. Creating an environment with struggling students in mind benefits all students, which is a major theme in Universal Design. As most teachers would appreciate increased student engagement, we recommend implementing a Universal Design for Learning perspective when planning mathematics instruction.

References

Hall, T., Meyer, A., & Rose, D. (2012). Universal design for learning in the classroom: Practical applications. Guilford Press: New York, NY.

Heibert, J. et al. (1997). Making sense: Teaching and learning mathematics with understanding. Heinemann: Portsmouth, NH.

Kelemanik, G., Lucenta, A., & Creighton, S. (2016). Routines for reasoning: Fostering mathematical practice in all students. Heinemann: Portsmouth, NH.

The depth of knowledge required to develop a unit of study in mathematics is immense. Weighing both content and pedagogical considerations necessitates the ability to make immediate decisions in real time. To best utilize the power of formative assessment, teachers need specialized lessons that surface student thinking and a deep understanding of how to recognize what students know and what they do not.

Japanese lesson study is a multifaceted process for teachers to build deeper content knowledge as they collaboratively develop a lesson which is then publically taught, and reviewed. Kyozai-Kenkyu is the part of the lesson study process specifically associated with the research of teaching materials (Mizoguchi & Shinno, 2019). During this process teachers explore research on a topic and synthesize an understanding which normally focuses on a particular research question. This work then influences future classroom practice and instructional design.

The Idaho Regional Mathematics Center at the University of Idaho Coeur d'Alene is offering our own version of Kyozai-Kenkyu organized around exploring the fraction progression within the Idaho Content Standards for Mathematics. Our objectives will be to identify critical structures and models to support student development in grades three through five. We will study multiple resources including the standards progression document, materials from Fosnot and Dolk, practitioner articles from the National Council of Teachers of Mathematics, and other available research. The group will compile documents and plan on then sharing these regionally in our next newsletter.

Meetings will be held in Coeur d'Alene and virtually through a video conferencing format. For more details, please see www.uidaho.edu/irmc-events.

Idaho Regional Mathematics Center

UPCOMING EVENTS

Teaching Mathematical Thinking

Teaching Mathematical Thinking (TMT) fulfills the 3-credit MTI course requirement for Idaho teachers. This course provides an opportunity to study funda- mental mathematical theory underlying the content area of numbers and operations and student reasoning of numbers and operations topics within a framework of a student-centered, problem-based classroom.

The following TMT courses are offered in June:

Grades K-2: June 8-12, 2020
Grades 3-5: June 15-19, 2020
Grades 6-9: June 21-26, 2020

For more information, please visit our events page: www.uidaho.edu/irmc-events.

Teaching Mathematical Thinking for Instructional Leaders

This course provides an opportunity for instructional leaders to study fundamental mathematical theory underlying the content area of number and operation and student reasoning of number and operation topics within a framework of a student-centered, problem-based classroom. Topics will highlight the intersection of research-based pedagogy, content understanding, and assessment of student needs developed through a lens of examining instructional leaders' work in supporting classroom teachers. Specific focal areas will involve classroom observation protocols, evaluation instruments, instructional coaching techniques, attending to student thinking and reasoning through the use of discourse and questioning, professional noticing, and the effective use of various mathematical tools.

Dates of the TMT for Instructional Leaders Course are:

Thursday, Jan. 23; 4:00 - 8:00 pm
Thursday, Jan. 30; 4:00 - 8:00 pm
Saturday, Feb. 1; 8:30 - 5:00 pm
Thursday, Feb. 6; 4:00 - 8:00 pm
Thursday, Feb. 13; 4:00 - 8:00 pm
Thursday, Feb. 20; 4:00 - 8:00 pm
Thursday, Feb. 27; 4:00 - 8:00 pm
Saturday, Feb. 29; 8:30 - 5:00 pm
Thursday, March 5; 4:00 - 8:00 pm

For more information, please visit our events page: www.uidaho.edu/irmc-events.

Northern Idaho

Kyozai-Kenkyu

a subject study on fractions

Class may be attended virtually or in person at the University of Idaho Coeur d'Alene. Join us 4-8 p.m., Tuesdays, Dec 3, Jan 14, 21, Feb 4 & 18.

For more information, please visit our events page: www.uidaho.edu/irmc-events.

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We gratefully acknowledge contributions and support from Idaho's State Legislature and the Idaho State Department of Education, making these programs possible.

We Are Here To Support You

The Regional Mathematics Center is open year round. We are able to meet with teams of teachers during the summer months as well as during the school year. If your district is in need of mathematical support, please contact us. We are happy to work with teachers and administrators in developing instructional plans, conducting assessment reviews, or addressing other concerns at no cost.

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