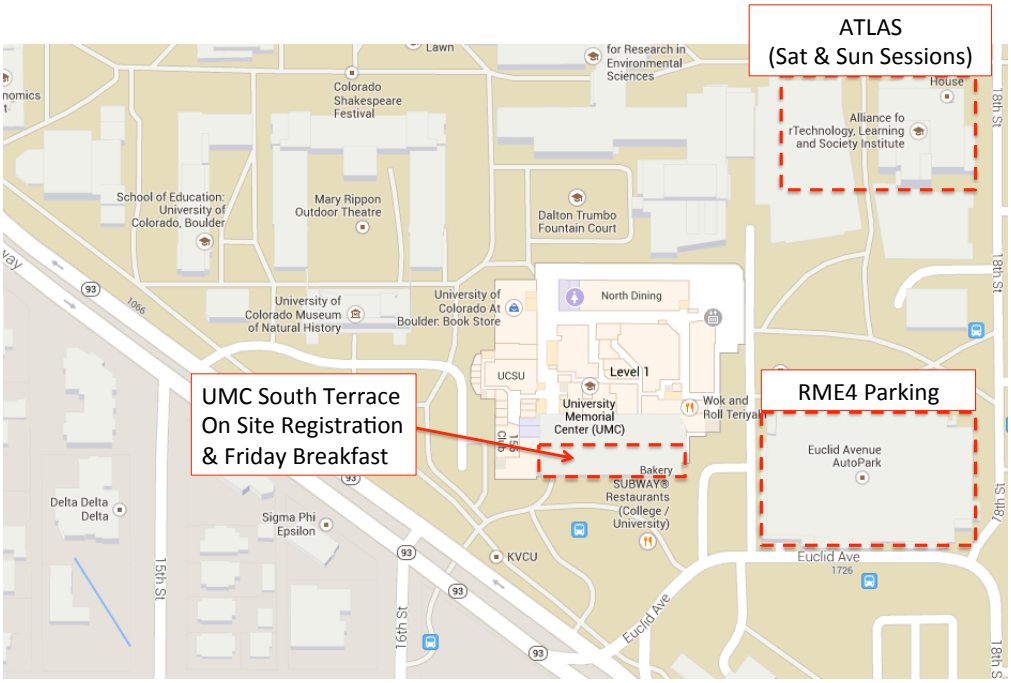
The Development of Mathematical and Scientific Reasoning through Contexts and Representations in Science, Technology & Mathematics

4th International Realistic Mathematics Education Conference
Program and Schedule

Friday, September 27th

08:00 – 08:40	Full breakfast **University Memorial Center – South Terrace**				
08:45 – 09:00	Welcome and opening **Glenn Miller Ballroom in the UMC**				David Webb
09:00 – 10:15	Keynote 1 **Glenn Miller Ballroom**	Towards coherence in STEM education: consequences for design			Harrie Eijkelhof
10:15 – 10:45	Break				
10:45 – 12:15 Parallel Sessions	Interactive 1 *Instructional Material Design*	Yutaka Saburi **UMC 425**	Marc North **UMC 245**	Berenice Michels & Harrie Eijkelhof **UMC 247**	Kim Bunning **UMC 382-386**
12:15 – 01:30	Lunch **University Memorial Center – South Terrace**				
01:30 – 03:00 Parallel Sessions	Interactive 2 *Student Learning*	Craig McBride **UMC 247**	Stacey Lowery Bretz **UMC 425**	Henk van der Kooij **UMC 245**	Karina Hensberry & Bryce Gruneich **UMC 382-386**
03:00 – 03:30	Break				
03:30 – 04:45	Keynote 2 **Glenn Miller Ballroom**	Building Capacity for Large Scale Instructional Improvement: Supporting Mathematics Teachers' Development of Ambitious Instructional Practices			Paul Cobb
04:45 – 05:00	Questions & Answers				



Saturday, September 28th

08:00 – 8:40	Full breakfast **ATLAS Building West Walkway**				
8:45 – 10:15 Parallel Sessions	Interactive 3 *Task Design*	Jesus Trespalacios & Lida Uribe-Flórez **ATLAS 1B31**	Paul Dickinson, Susan Hough & Steve Gough **ATLAS 1B29**	Takehiro Tsubokawa **ATLAS 1B25**	Sietske Tacoma **ATLAS 104**
10:15 – 10:45	Break				
10:45 – 12:00	Keynote 3 **ATLAS 100**	Inductive reasoning contexts for generating principles about effective practice and the natural world		Valerie Otero	
12:00 – 01:00	Lunch **ATLAS Building West Walkway**				
01:00 – 02:30 Parallel Sessions	Interactive 4 *Student Learning*	Valerie Otero **ATLAS 1B25**	Fred Peck **ATLAS 1B29**	John Hutchinson, Ashlyn Munson & Carrie Obenland **ATLAS 104**	Olga Shipulina, Peter Liljedahl, & David Smith **ATLAS 1B31**
02:30 – 03:00	Break				
03:00 – 04:30 Parallel Sessions	Interactive 5 *Teacher Learning and Professional Development*	Mary Pittman, Brian Sevier, Violeta Garcia & Joanna Bruno **ATLAS 1B25**	Frank Eade **ATLAS 1B29**	Kara Louise Imm **ATLAS 1B31**	

Sunday, September 29th

8:30 - 9:00	Full breakfast **ATLAS Building West Walkway**				
9:00 - 10:15	Keynote 4 **ATLAS 100**	"Excuse me, I need better Artificial Intelligence!" Igniting Students' Intrinsic Math Motivation through Game Design		Alex Repenning	
10:15 - 10:45	Break (NOTE: this break may be shorted to accommodate presenter travel schedules)				
10:45 - 12:15 Parallel Sessions	Interactive 6 *Open Topics*	Carlos LópezLeiva, Sylvia Celedón-Pattichis, Marios Pattichis, & Daniel Llamocca **ATLAS 104**	Sonia Palha, Jaap Schuitema, Carla van Boxtel & Thea Peetsma **ATLAS 1B29**	Heather Johnson, Evan McClintock & Jennifer Ahmed **ATLAS 1B31**	Anna DeJarnette **ATLAS 1B25**
12:15 - 1:30	Lunch **ATLAS Building West Walkway**				
01:30 - 3:00 Parallel Sessions	Interactive 7 *Open Topics*	Kevin Reins **ATLAS 1B25**	Fred Peck **ATLAS 1B29**	Vivian Lim & Luke Reinke **ATLAS 1B31**	
3:00 - 3:15	Break				
3:15 - 4:00	Closing Plenary **ATLAS 100**	Furthering the Conversation: Recognizing Tensions and Opportunities in Design Research Across the STEM Disciplines		David Webb & Henk van der Kooij	

Abstracts for Plenary Sessions

Towards coherence in STEM education: consequences for design

Harrie Eijkelhof, Freudenthal Institute for Science and Mathematics Education, Faculty of Science, Utrecht University, NL

It has long been argued that teaching separate sciences (such as physics, chemistry, biology and mathematics) does not assist students in understanding the real world nor prepare them for a career in interdisciplinary research. At the same time several factors hamper more coherent education and stakeholders seem to clash in views on this issue. Recently, developments in the field of international assessment (PISA), the revision of standards (in the US and elsewhere) and innovative curricula (NLT in the Netherlands) seem to offer opportunities for new ways of coherent education. In the presentation these developments will be outlined and evaluated, and some design principles for coherent math and science education will be suggested.

Building Capacity for Large Scale Instructional Improvement: Supporting Mathematics Teachers' Development of Ambitious Instructional Practices

Paul Cobb, Vanderbilt University

Instruction consistent with the principles of RME is an instance of what Lampert calls ambitious teaching in which the teacher builds on students' contributions to achieve a mathematical agenda. Although research on this type of mathematics teaching has made significant progress in recent years, has had only limited impact on instruction in most US classrooms. For the past six years, my colleagues and I have collaborated with mathematics teachers, school leaders, and district leaders in four large urban school districts to investigate what it takes to support improvement in the quality of mathematics instruction at scale. As part of this collaboration, we make recommendations based on the data we collect each year to leaders in each district about how they might revise their policies or strategies for instructional improvement to make them more effective.

In the course of this work, it has become apparent that research can currently provide only limited guidance to school and district leaders who are attempting to support mathematics teachers' development of ambitious instructional practices. The need for investigations that are designed to inform instructional improvement is even more urgent when the goal is to support teachers' development of classroom practices that are equitable as well as ambitious. I present the results of our work to this point by considering key aspects of a coherent theory of action for instructional improvement at scale. These elements include: curriculum materials and instructional guidance instruments such as district-developed curriculum frameworks; pull-out teacher professional development; teacher collaborative meetings; mathematics coaches' practices in providing job-embedded support for teachers' learning; school leaders' practices as instructional leaders in mathematics; and district leaders' practices in supporting the development of school-level capacity for instructional improvement. I conclude by discussing current work in which we are collaborating with leaders in one of the districts to co-design and co-lead coordinated professional development for teachers, coaches, and school leaders.

Inductive reasoning contexts for generating principles about effective practice and the natural world

Valerie Otero, University of Colorado Boulder

The *Teaching to Learn* philosophy is based on the ideas of Vygotsky and Dewey as well as on the basic principles of scientific induction. Learning is viewed as a social practice embodied in changing participation, identities, and institutional norms. A central mission of the project is educational transformation at all levels. In addition to attending to curricula and learning contexts for students, attention must be focused on and leveraged with learning environments suitable for K-12 teachers and university faculty. The *Teaching to Learn* project leverages environments for multiple stakeholders in math, science, and education (students, K-12 teachers, university faculty) in which participants have opportunities to experience the phenomenon of interest and then are provided adequate time and space for focused reflection and analysis of their experiences, with the goal of collaboratively inducing principles that govern the experience (whether the experience was a laboratory experiment in science class, an instructional intervention performed by a teacher, or large-enrollment, college course transformation). I present samples of these *Teaching to Learn* environments (as well as how they are leveraged with one another) for the stakeholders mentioned above. I support claims of effectiveness with data from our studies. I conclude with ideas about future directions for broader-scale transformation necessary for realizing our goals of engaging students in the process of conceptual and social learning.

"Excuse me, I need better Artificial Intelligence!" Igniting Students' Intrinsic Math Motivation through Game Design

Alex Repenning, University of Colorado Boulder

Games are argued to be the next educational revolution for many subjects including math education. Unfortunately, a common but somewhat dubious practice for educational game design employs a "chocolate coated broccoli" approach. Educational math games based on this approach would, for instance, have students shoot at numbers. Sadly, the message here is that math is intrinsically boring and only by adding gripping game concepts such as fighting or killing can we create an interesting educational activity. As part of the Scalable Game Design project we are studying a completely different approach in which we are not providing educational games to students but, instead, have them build their own games and STEM simulations. Our focus is to explore the notion of computational thinking including mathematical thinking. I will present results of the Scalable Game Design study with over 10,000 students from some of the toughest, poorest and most isolated schools in the USA and illustrate how game design can result in intrinsic math motivation without making trade offs between motivational and educational concerns.

Furthering the Conversation: Recognizing Tensions and Opportunities in Design Research Across the STEM Disciplines

David C. Webb, University of Colorado Boulder; Henk van der Kooij, Freudenthal Institute for Science and Mathematics Education, Faculty of Science, Utrecht University, NL

Using perspectives that have informed design in this closing plenary we will discuss the contributions of Realistic Mathematics Education vis-à-vis STEM education and current initiatives to improve teaching and learning in the sciences. Drawing from examples presented in RME4 plenary and parallel sessions we will highlight select aspects of design research in the sciences, and suggest how apparent similarities and differences in the disciplines contributes to tensions and opportunities that arise with discipline specific and integrated approaches to STEM education.

Abstracts for Interactive Breakout Sessions

~~ Friday Sessions ~~

Two geometry lessons with realistic contexts

Yutaka Saburi, University of Fukui, Japan

We will discuss two geometry lessons developed by classroom teachers in Fukui, Japan. One is for middle school grades, which helped students understand what logical demonstration is and also made them familiar with it, using examinations of propositions from wider categories including those from students' everyday life. Another is for early elementary grades which helped students develop the concepts of composing elements of solid figures through a stamping play. This lesson concerns the problem of representation as well. The developments of these lessons were very much narrative, and the teachers managed the lessons with their careful observations of students' activities and discussions. As part of this presentation, we invite further discussions with conference participants to deliberate how these lessons can be understood and developed using a Realistic Mathematics Education framework.

Nature, Life and Technology (NLT): an interdisciplinary upper secondary course, integrating science and mathematics.

Berenice Michels, Netherlands Institute for Curriculum Development, Netherlands; Harrie Eijkelhof, Freudenthal Institute for Science and Mathematics Education, Utrecht University, the Netherlands

Nature, Life and Technology is an upper secondary course, introduced in 2007 in the Netherlands. It is an elective course for students who take mathematics, chemistry, as well as physics and/or biology. The course is modular, where in every course module a realistic context is studied, using and extending the mathematical and scientific knowledge of the students. The study load for this course is comparable to the compulsory ones on math and sciences. In this session we present the way course modules are developed together by high school teachers and scientific experts.

A proposed method for identifying the criteria according to which knowledge and participation are legitimised in contextualised mathematics practices

Marc North, University of KwaZulu-Natal, Durban, South Africa

This presentation outlines a theoretically informed language for distinguishing between practices associated with contextualised mathematics problem situations and identifying the criteria according to which both knowledge and participation are legitimised within such problem situations. This interactive session will invite contributions from participants to critique the proposed method, related exemplars, and the empirical operationalization of the method.

Developing Algebraic Reasoning Using Progressive Formalization

Kim Bunning, University of Colorado Boulder

In this interactive session we will investigate how progressive formalization, and the use of select contexts and representations, is exemplified in the algebra strand of Mathematics in Context. Mathematical activities and solution strategies will be explored to highlight learning trajectories move students from informal to pre-formal to formal understanding. The role of the teacher and classroom discourse to support student learning with this approach will also be discussed.

Flipping an Introductory Statistics Class: Students' Attitudes About and Success with the use of Online Tools

Craig McBride, University of Washington, Tacoma

This study evaluates the effectiveness of flipping a college level Introductory Statistics course by assessing (N=40) students' scores compared to previous sections and concurrent sections taught traditionally and attitudes collected via anonymous online surveys and course evaluations. The class utilized Powerpoints and videos to deliver lectures, and class time utilized practice problems, group work, guided questions and "mini-lectures" that enabled more differentiated one-on-one instruction. Homework and quizzes voluntarily transitioned online midway through the term, allowing for comparisons of scores and attitudes to students who opted out. Results suggest flipping and online homework were both effective but online quizzes were not.

Measuring Student Understanding of Multiple Representations in Chemistry

Stacey Lowery Bretz, Miami University

Learning chemistry requires students to not only interpret information encoded in symbolic and particulate representations, but also to connect multiple representations of chemical phenomena. Failure to accurately interpret and connect such representations is one source of students' alternative conceptions. Our research group has designed a suite of measurement tools to advance our understanding of how students interpret representations for a variety of core concepts. Findings regarding alternative conceptions will be presented. Creating such measures has also presented multiple challenges with regard to establishing the reliability and validity (precision and accuracy) of the data. Emerging insights regarding the underlying assumptions and appropriateness of commonly used psychometrics will be discussed as well.

Math and sciences: different subjects, but one common goal for STEM

Henk van der Kooij, Freudenthal Institute for Science and Mathematics Education, Utrecht University, the Netherlands

In regular school practice around the world mathematics and the sciences are still taught as separate subjects. From a STEM perspective, this non-integrated approach is detrimental. In several projects in the Netherlands we have been quite successful in connecting mathematics and science, although there is still room for improvement. The innovative Nature, Life sciences and Technology (NLT) curriculum integrates the sciences and math (which will be addressed in greater detail in Eijkelhof's keynote and a break out session). In another project we tried to design materials using math and physics as individual but strongly interconnected subjects. We will look at the challenges that appeared when trying to bring the two subjects closer together to help students (and teachers!) see that the two subjects are two sides of just one coin. Some of these challenges are described in the chapter 'Algebra in science and engineering' of the book Secondary education in algebra' (see the website for this document, pp 203-226). In this session these challenges are presented and discussed along with related hands-on activities.

Designing PhET Interactive Simulations to Promote Mathematical and Scientific Reasoning

Karina Hensberry & Bryce Gruneich, University of Colorado Boulder

Since 2002, the PhET Interactive Simulations Project at University of Colorado Boulder has developed and studied the use of interactive computer-based simulations (sims) for teaching and learning STEM topics. These sims are available free of charge at http://phet.colorado.edu. In this session, we will explore PhET's research-based design principles in depth and discuss how these are used to create effective sims. We conclude with examples of how educators can use sims to support student learning in their classrooms. Participants will have opportunities to engage with sims themselves, so we encourage participants to bring laptops or tablet devices to the session.

~~ Saturday Sessions ~~

Using Manipulatives and Educational Animations to Support Students Reasoning on Measurement

Jesús Trespalacios, Boise State University

Lida J. Uribe-Flórez, New Mexico State University

This session describes an instructional sequence using manipulatives and animations to support fourth-grade students' understanding of measurement concept. Experiences during the activities confirm the relevance of designing realistic tasks using students' previous knowledge to support their ideas and interpretations as well as their growth to solve specific math problems related to the measurement. Instructional activities to solve problems related to measurement, with student work and video recordings, will be presented to exemplify how mathematical reasoning was developed through these activities. Recommendations related to the design and use of different materials will be discussed.

Designing RME based curriculum materials for 14 – 16 year olds in the United Kingdom

Paul Dickinson, Sue Hough & Steve Gough,
Manchester Metropolitan University, Manchester, United Kingdom

Staff at Manchester Metropolitan University (MMU) have been involved in a number of projects related to Realistic Mathematics Education, including writing materials for 14-16 year olds at the higher end of the attainment range. This presentation will focus on the development of these materials, and how we have interpreted the RME design principles of context, progressive formalization and interactivity for UK schools.

To make mathematics in higher education more enjoyable: An attempt to make students feel differential equations and Fourier series close

Takehiro Tsubokawa, Fukui National College of Technology, Japan

Differential equations can be described as the dominant peak in the mathematics range. If we focus on teaching how to solve them, we do not have enough time in class to demonstrate the joy and usefulness of differential equations. Using an approach involving the study of demographics based on UN World Population Census data, we provided students with strategies to tackle more complicated differential equations using a classic type of differential equation solved by variable separation methods. When teaching students Fourier series we have employed physical experiments. This presentation will include a discussion of the instructional tasks used and students' responses to the tasks.

Contexts and Representations in a Digital Mathematics Environment

Sietske Tacoma, Freudenthal Institute for Science and Mathematics Education,
Utrecht University, the Netherlands

The Freudenthal Institute's Digital Mathematics Environment (DME) offers a wide variety of digital applets and instructional sequences for use in mathematics classrooms, and includes many secondary mathematics topics. This environment contains a learner management system, which allows for saving and reviewing student work. Moreover, it contains a powerful authoring tool, in which contexts, representations and tools (i.e. graphing tool, diagrams) can be customized and combined into instructional sequences (i.e., modules) which can offer students meaningful problem situations to develop mathematical understanding. These modules can be used for exploration, instruction, training and assessment. Currently, we are investigating ways to expand the DME to other topics, such as chemistry and physics. This hands-on interactive session will provide an overview of the Digital Mathematics Environment and the ways it is being used in schools. Participants will be given the opportunity to experience several modules in the DME and the first version of the chemistry expansion. In these modules many examples can be found of the possibilities that technology offers for combining contexts, representations, tools and feedback options, to support mathematical and scientific reasoning.

Learning Environments and Tasks for Collaboratively Generating Disciplinary Principles: A sample from Physics and Everyday Thinking

Valerie Otero, University of Colorado Boulder

In this session, participants experience an activity from the Physics and Everyday Thinking (PET) Curriculum. No authoritative textbook is needed for a PET course. Instead, students abstract principles about the natural world on the basis of their guided, shared observations and sanction these principles through consensus discussions. Session participants will collect and interpret evidence about the natural world and analyze video of elementary and high school students and prospective teachers. The session goal is for participants to generate a set of design principles for establishing relevant tasks together with a social and material learning environment that supports students in the development of models and discipline-specific principles.

How does reinvention get distributed?

Fred Peck, Freudenthal Institute US, University of Colorado

In much of the RME literature, guided reinvention has been theorized as an individual or a social process. In this presentation I extend these ideas and discuss how reinvention is also a cultural process, distributed across people as well as material and ideational artifacts. Further, I will present data that show how reinvention gets distributed across actors and artifacts as students engage in activity. In doing so, I hope to reengage the RME community in a conversation – originated by Cobb, Gravemeijer, and others in the mid-1990s – about the cultural nature of reinvention and RME.

A Study of Silent versus Vocal Students in the Context of a Constructivist, Active-Learning Introductory Chemistry Course

John Hutchinson, Rice University; Ashlyn Munson, Pacific Lutheran University; Carrie Obenland, Rice University

We present results of a study of several large active learning Chemistry classrooms. Current research has demonstrated that vocal students benefit from active learning. The important question our study addresses is whether "silent" students, those who do not vocally participate in class, also benefit. This talk will present the Concept Development Study approach used in these classes, a constructivist method that we designed to accompany an active learning approach. Statistical analyses of learning gains and student motivations show that, while both vocal and silent student benefit from this learning context, vocal students experience greater learning gains than their silent classmates.

Virtual Environment: A Tool for Developing Students' Abilities to Apply Mathematics to Real-life Problems

Olga Shipulina & Peter Liljedahl, Simon Fraser University, British Columbia, Canada;
David Harris Smith, McMaster University

This research is devoted to utilization of a Virtual Environment (VE) simulation for developing students' abilities to apply mathematical knowledge obtained at school. The study explores how students, who had completed an AP calculus course, find the optimal path in a Second Life VE setting empirically and, after that, mathematically. The Realistic Mathematics Education (RME) theory was used as a theoretical framework for experimental design and for data examining. A new term, 'empirical mathematizing', is introduced and utilised in this research. The study demonstrates that students' empirical mathematizing fully determined their models-of the situational problem and consequently, their vertical activities.

By Teachers for Teachers: Engaging Colorado Educators as the Creators of 21st century STEM Curricula

Mary Pittman, Brian Sevier, Violeta Garcia & Joanna Bruno,
Colorado Department of Education

Over 500 teachers representing 61 school districts in Colorado have created curriculum for 10 content, including STEM integrated units. Data collected from design workshops include teacher surveys, interviews, workshop observations, and facilitator reflections. In this session, summary findings and examples of STEM resources created by the design teams will be shared and discussed. Emerging themes from project data suggest that real engagement in educational change can occur when the content of the reform matters to teachers and when they are treated not like but as professionals.

Introducing Mathematics Reform in the Cayman Islands: Focusing on Context and Visualization

Frank Eade, Ministry of Education, Cayman Islands

This session shares an approach used in the Cayman Islands to move teachers from a rule-laden approach to teaching mathematics to a problem solving approach involving use of context and visualization. The session will include presentation of changes in the ways in which teachers teach and students respond to problems, using video evidence of teacher practice and student responses to questions prior to and after the introduction of the reforms.

Learning to Mathematize: Designing a Professional Development Sequence for Teachers

Kara Louise Imm, City College, City University of New York (CUNY)

A greater appreciation for mathematical modeling by teachers will enable us to flip a familiar paradigm – guiding us away from telling students how important mathematics is in the world ("realizing mathematics") towards allowing students to investigate intriguing contexts on their own ("mathematizing a reality"). In this session participants will explore a carefully crafted professional development course on modeling – this will include characterizing teachers' understandings, making sense of conflicting notions of modeling, and studying the use of simulations, modeling tasks, and participants' student work

~~ Sunday Sessions ~~

Image Representation in a Middle School Afterschool Program

Carlos A. LópezLeiva, Sylvia Celedón-Pattichis, Marios S. Pattichis, and Daniel Llamocca
University of New Mexico

Acknowledging the lack of information that middle school students have about engineering, this interactive paper session presents promising results from the "Advancing Out-of-School Learning in Mathematics & Engineering" (AOLME) project in the implementation of its integrated (mathematics and engineering) curriculum through digital image and video representation with middle school students during two summer sessions. Results are used to contrast the pros and cons for students representing images using two different computer platforms and they also highlight the processes that best supported successful student understanding and image and video representation.

Providing structure in mathematical tasks and keeping challenge: but how!?

Sonia Palha, Jaap Schuitema, Carla van Boxtel and Thea Peetsma, University of Amsterdam, Research Institute of Child Development and Education, the Netherlands

Teachers can facilitate motivation and self-regulation by providing authentic learning tasks, opportunities for challenging and creative thinking and minimize the use of controlling behavior, such as providing answers and solutions. Also providing a structured learning environment (e.g. clear goals and expectations, appropriate strategies, guidance to solve the tasks and clear procedures to be followed) contribute to feelings of competence which is important for motivation. However, too much structure can also lead that students acquire a narrow view of scientific inquiry where the thinking is characteristically rote and low-level. The issue is how much structure do students need, when solving problems, in order that the challenging effect of the tasks remains? In this presentation we explore and discuss this issue within the context of RME and SDT (self-determination theory). We use learning tasks from a research project with 11th grade students regarding the integral calculus and trigonometric functions.

Supporting Students' Quantitative & Covariational Reasoning: Designing & Implementing Tasks Linking Dynamic Animations and Graphs

Heather Johnson, Evan McClintock & Jennifer Ahmed, University of Colorado Denver

This study investigates the following question: How do students coordinate linked dynamic graphical and pictorial representations of covarying quantities? Using purposefully designed mathematical tasks this research intends to support students' drawing on their informal reasoning to mathematize situations involving covarying quantities. The session will explore the interaction between task design in this domain and emergent student reasoning.

Mathematizing a Contextual Problem In Algebra II Using Etoys

Anna F. DeJarnette, University of Illinois at Urbana-Champaign

In this study I asked *How did students mathematize a contextual problem about modeling their height off the ground while riding a Ferris wheel? How did students use a Computer Programming Environment [CPE] called Etoys to mathematize*? The data for this study came from students' work in pairs over two days in Algebra II. I found that students performed mathematizing activities including looking for essentials, recognizing a situation as belonging to a family of situations, abbreviating initial strategies, and reflecting on their solutions. Students used Etoys in their mathematizing activities to experiment and examine the different parameters of the problem.

Exploiting box plots for a visual model of informal statistical inference

Kevin J. Reins, University of South Dakota

This session involves the elaboration of a hypothetical learning trajectory for comparative inferences about two populations. Student data from four sections of a middle school implementation of these materials, teacher reactions to the materials and recommendations for professional development will be shared and discussed.

Beyond rise over run: Contexts, representations, and a learning trajectory for slope and linear functions

Fred Peck, Freudenthal Institute US, University of Colorado

Despite its foundational nature in secondary and post-secondary mathematics, student understanding of slope is often formulaic and underdeveloped. To explore how students learn slope in a more robust way, we designed a curriculum for slope in which students mathematize situations involving rates of change. We designed the curriculum using RME principles, and tested and refined it in a design experiment. In this workshop, participants will engage in activities from the curriculum and I will discuss our design process. I will also discuss key findings, including how contexts and representations mediated student learning of slope.

Teaching Teachers about Realistic Mathematics Education

Vivian Lim & Luke Reinke, University of Pennsylvania

This study is an inquiry into our practice as designers and instructors of a course in which we introduce pre-service teachers to context-based mathematics education, including Realistic Mathematics Education. Our findings suggest that context-based mathematics education requires a two-pronged approach: 1) participants must grapple with the theoretical underpinnings of teaching mathematics through contexts, and 2) participants need clear frameworks to apply in practice. In this session we will share activities used in this course and discuss the findings and implications of our study.