

**Physics Education Seminar Monday January 26, 10:00 a.m. Tate room 157**

**Facilitating Case Reuse Strategies for Problem Solving in Algebra-Based Physics\***

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Case-based reasoning (CBR) is the process of solving a real-world problem based on precedent examples and problems. Case-reuse promotes CBR by employing problem pairs that share similarities in deep structure. We conducted 8 focus group learning interviews and 2 individual interviews with 10 students in an algebra-based introductory physics class. During each focus group session, participants were paired together, and each asked to work on a different problem. All problems shared deep structure similarities but had surface differences. After students solved these problems, they were asked to discuss their solutions with their partner briefly and discuss the similarities and differences between each of the problems. During individual interviews, students were asked to rate problem pairs of varying degrees of deep-structure and surface similarity. For this talk, I will present the observations made during the focus group interviews and the results and implications of the similarity ratings. Data were also collected from five multiple choice examinations taken during the semester. While most of the exams focused on traditional problem solving, the last three questions on each examination were non-traditional tasks: jeopardy, text editing and problem posing. Individual scores for each examination question were analyzed, and those results will also be presented for this talk.

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**Physics Education Seminar Friday January 30, 4:40 p.m. Tate room 157**

Title: What is Physics Education Research?

Speaker: Group Discussion

Abstract: We will have a group discussion on research topics in Physics Education both locally and at other institutions, including the current "hot topics" in the field.

(e-mail)  
Hello all,

The topic of this Friday's Physics Education Research seminar is "What is Physics Education Research?" We will meet at 4:40 p.m. in Tate room 157 for a group discussion about current research in the field and try to develop some overarching themes and/or a list of "hot topics". At last week's meeting we decided to list several institutions that have PER groups and each pick out a few institutions to look up on the Web before Friday.

A list of PER Groups & Web links is on our UMN web site:

<http://groups.physics.umn.edu/physed/#PERLinks>

And some more are on compadre:

<http://www.compadre.org/per/programs/index.cfm>

Here is a list of the PER groups that are taken:

Brita: University of Washington & Iowa State University

Paul: University of Colorado at Boulder & MIT

Kawin: The Ohio State University & University of Maine

Qing: University of Maryland & North Carolina State University

Jen: University of Illinois Urbana-Champaign & Kansas State Univ.

Mandy: Arizona State University & Montana State University

Please let me know if you plan to attend and would like to look up an institution in preparation for Friday. Each person will give a brief summary (5-7 minutes?) of the institution(s) they looked up and the research done there in physics education.

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### **Physics Education Seminar Friday Feb. 6, 4:40 p.m. Tate room 157**

Title: What is Physics Education Research? (Part 2)

Speaker: Group Discussion

Abstract: We will continue last week's discussion on research topics in Physics Education both here at Minnesota and at other institutions, including an overview of current "hot topics" in the field.

Institutions discussed at last week's seminar:

University of Washington

Iowa State University

Arizona State University

North Carolina State University

Preliminary Themes (What do PER groups do? What are hot topics in the field?)

- Research to improve student understanding / learning of physics (research on conceptual difficulties, problem solving behaviors, attitudes and beliefs...)

- Development and assessment of instructional strategies & resources (curricula for lecture, lab, recitation, demos, computer simulations, computer coaches, etc.; changes to the classroom environment such as Studio / SCALE-UP)

- Professional development and support for teachers (workshops, etc.)

- development and validation of assessment instruments

- theoretical research on cognition and learning (developing models for conceptual change, problem solving, etc.)

- hot topics??

We'll expand on this list tomorrow and hear more summaries of research at PER groups in the U.S. See you there!

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Hello,

There has been a change to the time and place for this week's Physics Education Seminar. It will take place on Friday at 2:30 p.m. in room 236A. (This is the typical time/place for the TA seminar, so I believe this move is to encourage attendance by first-year TAs). Ken Heller will give a preview of his talk for the AAPT winter meeting...and perhaps provide some additional comments about the pre-post diagnostic tests given routinely at UMN (Force Concept Inventory, Math test, attitude surveys).

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Physics Education Seminar  
Friday February 13, 2009 2:30 p.m. Tate room 236A

Speaker: Ken Heller, University of Minnesota  
Title: Predicting Introductory Physics Performance

Instructors often wonder whether there is a diagnostic test or some other information that can be used to determine a student's readiness for introductory college physics. To investigate this, we examine the correlation of pre-test scores from both the Force Concept Inventory and a Mathematics Skills Test with grades in introductory physics courses. Data is analyzed separately for males and females to test for gender differences in the predictive power of these diagnostic exams.

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### **Physics Education Seminar Friday February 20, 2009**

Jennifer Docktor  
Applying a Simple Rubric to Assess Student Problem Solving

Problem solving is a complex skill that is important for learning physics. Unfortunately, there is no standard way to evaluate problem solving. An assessment tool commonly used for complex processes such as problem solving is a rubric, which divides a skill into multiple categories and defines criteria met to attain a score in each. Such rubrics are often difficult and time-consuming to use. I will report progress on the development of a general physics problem-solving rubric and give examples of its application to student solutions from a calculus-based introductory physics course for science and engineering students. I will also examine the rubric's usefulness for different types of problems and solutions that span the multiple physics topics within a first-semester course.

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**Physics Education Seminar Friday February 27, 2009**

4:40 p.m. Tate room 157

David Parent, Physics Teacher at Irondale High School  
Modeling Instruction in High School Physics

The Modeling Instruction Program at Arizona State University (<http://modeling.asu.edu>) has been rated as one of the top programs for research-based reform to K-12 science education. What is "Modeling" all about? What does it look like in the classroom? Dave will share his insights about the ASU program and describe how he uses Modeling Instruction in his high school physics classes.

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Hello all,

At this week's Physics Education seminar we're planning to discuss the recent article in Science called "Learning and Scientific Reasoning" which compares the performance of physics students in the U.S. and China on multiple choice tests (the FCI, BEMA, and Lawson test). This is also an opportunity to discuss the Lawson test of scientific reasoning. I encourage you to visit the links below to access the article and a copy of the Lawson test before Friday's seminar. We'll meet at the usual time and place, 4:40 p.m. in Tate Lab of Physics room 157.

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**Physics Education Seminar Friday March 6, 2009**

4:40 p.m. Tate room 157

Group Discussion: Learning Physics in China and the U.S.

A recent study published in Science and featured on NPR's Science Friday radio program reported that Chinese students outperform U.S. students on tests of physics content knowledge, but both groups perform equally on a test of scientific reasoning skills. As a group we will discuss the study's findings, differences in the China and U.S. education systems, and the implications of this study for science education.

Article in Science (January 30, 2009) "Learning and Scientific Reasoning"

<http://www.sciencemag.org/cgi/content/full/323/5914/586>

Science Friday radio program featuring guest Lei Bao:

<http://www.sciencefriday.com/program/archives/200901305>

To listen, click on the podcast or mp3 link on the left.

Lawson test of scientific reasoning:

<http://www.public.asu.edu/~anton1/AAssessArticles/Assessments/Science%20Assessments/Scientific%20Reasoning%20Test.pdf>

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**Physics Education Seminar Friday March 13, 2009**

2:30 p.m. Tate room 236A

Brita Nellermeoe, University of Minnesota

The Force Concept Inventory

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**Physics Education Seminar Friday March 27, 2009**

4:40 p.m. Tate room 157

Jon Anderson & Cindy Cattell, University of Minnesota

Update on the UM PhysTEC Program: LAs and Peer Groups

Description: The PhysTEC Program at the U of M is finishing its second year. We will discuss how the program has changed and grown during this time and will also consider what the future may hold for PhysTEC. A key component of this program has been the use of Learning Assistants (LAs). Their roles will be defined and discussed as well. Prior to the seminar, interested participants may want to read the feature article on PhysTEC in the February 2009 issue of "Physics Today". It can be found at:

<http://www.phystec.org/PhysicsToday.pdf>

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**Physics Education Seminar Friday April 3, 2009**

4:40 p.m. Tate room 157

Teaching physics in Thailand

Kawin Chaumklang, U of MN Department of Curriculum and Instruction, will be presenting data from his Preliminary Dissertation study on the perceptions of student-centered teaching and learning among high school Physics teachers in Thailand.

Brita Nellermeoe, U of MN Department of Curriculum and Instruction, will be presenting a summary of her experience with the Teaching Internship in Thailand in the summer of 2007, where she spent 3 1/2 weeks teaching Physics at a Thai High School.

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**Physics Education Seminar Friday April 10, 2009**

NO SEMINAR (holiday weekend)

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**Physics Education Seminar Friday April 17, 2009**

NO SEMINAR (NARST annual conference)

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**Physics Education Seminar Friday April 24, 2009**

4:40 p.m. Tate Lab of Physics room 157

Paul Knutson, University of Minnesota (Ph.D. Candidate in Science Education)  
Qualitative Problem Solving Skills in Introductory Labs

The introductory physics labs at the University of Minnesota are cooperative problem solving labs that deal with context rich problems. Qualitative and quantitative skills are two components of problem solving. Is it possible to obtain some measurements of the qualitative skill levels of students in these labs? Do these skill levels change during a two hour lab period? Do they change from one lab to the next over a one or two week time interval? These questions will be discussed and some preliminary data will be presented.

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**Physics Education Seminar Friday May 1, 2009**

4:40 p.m. Tate Lab of Physics room 157

Brita Nellermeoe, University of Minnesota (Doctoral student in the Curriculum & Instruction Science Education program)

Accurately Measuring Faculty Perceptions of Teaching and Learning in Higher Education Physics Departments

Individual perceptions of teaching and learning shape a teacher's behavior in the classroom. Accurately measuring faculty perceptions of teaching and learning is a complex, and often inaccurate, process. This seminar will discuss current methods used in studying perceptions among Physics Faculty and will include a discussion about Ms. Nellermeoe's doctoral study methodology.

Article to read before seminar:

Trigwell, K., & Prosser, M. (2004). Development and use of the Approaches to Teaching Inventory. *Educational Psychology Review*, 16(4), 409-424.

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**Physics Education Seminar Friday May 8, 2009**

4:40 p.m. Tate Lab of physics room 157

Leon Hsu, University of Minnesota Dept. of Postsecondary Teaching and Learning

Using Computers as Problem-Solving Coaches for Students

The Physics Education Research group at the University of Minnesota is designing web-based coaches to help students develop competent problem-solving skills in an introductory physics course. Based on the cognitive apprenticeship model, the coaches provide students with individualized guidance and feedback as they practice using an expert-like problem-solving framework to solve problems. This talk will describe an ongoing effort to develop and assess these computer coaches.

This work is supported by the National Science Foundation through DUE-0715615.