



**August 4-5, 2004  
California State  
University, Sacramento**

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***Targeted Poster Session: TP-C***

**Going Up? Learning Transfer among Students in Upper-Level Physics Courses**

**Organizers:**

***Chandralekha Singh* ([clsingh@pitt.edu](mailto:clsingh@pitt.edu)), University of Pittsburgh  
***Bradley Ambrose* ([ambroseb@gvsu.edu](mailto:ambroseb@gvsu.edu)), Grand Valley State University****

**Where: Lobby Suite**

**When: 8:15 – 9:45 & 1:45 – 3:15, Thursday, August 5**

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Targeted poster sessions combine the graphic display of materials with the opportunity for discussion of the research. Sessions are organized around a common theme or body of work. Presenters introduce their posters with brief opening statements and end the session with a panel discussion of the research. The remaining time allows attendees to visit posters. Although it is not a requirement, all targeted poster session presenters are urged to present their research from the perspective of transfer of learning.

**Goal:** It is well documented that introductory physics students find it difficult to take a physical concept covered in one context and apply it successfully to a different context. However, we expect that this kind of learning transfer would improve as one gains experience in physics. Thus a central research question we will explore and the complexity of which we hope the participants will appreciate is this: To what extent do students in upper-level physics courses demonstrate learning transfer? The presenters will discuss specific examples from their own research.

**Theme:** The theme of this targeted poster session is transfer of learning among students in upper-level physics courses. The theme is tied to the general theme of the conference. In this poster session the presenters define transfer of learning as the ability to apply a physical concept successfully to a

situation different from that in which the concept was introduced [1]. For students in first-year physics courses, previous research has shown that learning transfer is usually very difficult. For students in a particular upper-level course, the question of learning transfer becomes more complex in that the requisite concepts may have been covered at the introductory level (e.g., Newton's laws, energy conservation) or at an earlier stage in that same upper-level course. The presenters will use examples from their own research, conducted in a variety of upper division courses (e.g., modern physics, intermediate mechanics and thermal physics), to discuss the extent to which the students in those courses demonstrate transfer of learning. Some presenters will also discuss preliminary work in developing instructional strategies designed to improve transfer of learning, by combining qualitative (conceptual) and quantitative problem solving or by giving students explicit guidance in applying a particular concept in different contexts.

1. Transfer of learning: Contemporary research and applications. S. M. Cormier and J. D. Hagman (eds.), New York: Academic Press, 1987.

## Individual Poster Abstracts

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### TP-C3

#### **Student Learning in Upper-Level Thermal Physics: Comparisons and Contrasts with Students in Introductory Courses**

*David Meltzer (dem@iastate.edu) , Iowa State University*

**Abstract:** We found that students in an upper-level thermal physics course were in general quicker than introductory students at grasping and applying fundamental concepts. However, even quite capable upper-level students would falter unexpectedly and unpredictably on various conceptual difficulties that are common among introductory students. The unpredictable and inconsistent nature of this effect demonstrated that instructors must always be prepared to detect and address such difficulties in upper-level courses. Upper-level students seemed, in general, more receptive to employing qualitative reasoning using multiple representations, and capable of using it more effectively than introductory students. In addition, upper-level students were better able to utilize guided-inquiry curricular materials in the sense of reasoning with greater depth and grasping more subtle issues. However, although the overall level of preparation and ability was higher in the upper-level course, the broad range of preparation represented among the students presented various practical challenges to implementing active-learning instructional strategies.