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PER: Identity and Student Engagement

AAPT | **Type:** Con | **Organizer:** AAPT

Description:

Call for Papers:

Abstracts Submitted (# 11)

Abstract Title: A Longitudinal Investigation of Informal Learning Community

Paper Type: Contributed

Author: Yuehai Yang
California State University, Chico
343 W 1st ave
Chico, CA 95926 United States
8134808960 (p)
yyang34@csuchico.edu

Speaker Order: CI05

In consecutive semesters, students from a second-semester introductory college physics course have been asked to report who they worked with on physics outside class time. In the first semester, the course was taught in a traditional lecture class setting. In the second semester the course was taught by the same instructor with similar class size, implementing aspects of Investigative Science Learning Environment (ISLE) where students worked collaboratively in group learning activities. Our study suggests that implementing an in-class interactive learning environment can help foster the informal learning community outside of the classroom. Using social network analysis, we have analyzed the relationship between students' positions in the informal learning communities formed outside the classroom with their performance in the course. Our results indicate that being integrated into the informal learning community outside of the classroom can help students, especially "weaker" ones, to succeed in their introductory physics courses.

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Abstract Title: Dealing with Stereotype Threat in Physics Identity Development
Paper Type: Contributed
Author: Sissi L. Li
California State University Fullerton
800 N. State College Blvd.
Fullerton, CA 92831-3547
657-278-7027 (p)
sissili314@gmail.com
Speaker Order: CI01

As part of a larger study on physics identity development, we have observed that students link their academic achievements and social interactions in physics to their sense of belonging in physics. For students who identify with underrepresented groups in physics, stereotype threats can be a significant obstacle to "feeling like a physicist" because students belong to multiple communities with identities that are often at odds with one another. As representatives of their community, these students have to deal with the added worry of confirming the stereotypes about their group. For example, female majors may feel that they have to prove that women aren't bad at math. Through interviews with upper-division physics majors, we examined coping strategies to deal with stereotype threat in a variety of settings. Our findings suggest that peers and mentors can play unexpected roles in helping students manage stereotype threat and succeed in becoming physicists.

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Abstract Title: Determining Strategies that Predict Physics Identity: Emphasizing Recognition and Interest
Paper Type: Contributed
Author: Robynne M. Lock
Texas A&M University-Commerce
PO Box 3011
Commerce, TX 75429
903-468-8767 (p)
robynne.lock@tamuc.edu
Speaker Order: CI04

Although the number of students earning bachelor's degrees in physics has increased, the percentage of those

degrees earned by women has not increased for more than 10 years. We use a physics identity framework to understand the factors that may impact physics career choice. Physics identity consists of three dimensions: recognition (perception of recognition by others), interest (desire to learn more), and performance/competence (perception of ability to understand). Our previous work has shown that recognition and interest are more significant predictors of physics career choice than performance/competence, and that women may require more recognition than men in order to choose physics careers. Therefore, teaching strategies that specifically target recognition and interest should be identified. Using data from a survey administered to a nationally representative sample of college students, we use regression models to determine which teaching strategies predict recognition and which strategies predict interest.

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Abstract Title: Developing SPOT: A Tool for Understanding Student Engagement STEM Classrooms

Paper Type: Contributed

Author: Katrina Roseler
San Jose State University
One Washington Square
San Jose, CA 95192-0001
408-924-5284 (p)
katrina.roseler@sjsu.edu

Speaker Order: CI11

While many instructors are interested in implementing student-centered practices in their classroom, few have access to data from their classroom to make informed instructional decisions. Our research team has developed the Student Participation Observation Tool (SPOT), an innovative web-based application, developed based on observable classroom actions aligned with research-based instructional practices. Using the SPOT, observers collect observational data that can be used by instructors to identify desirable classroom interaction sequences as well as illuminate areas for possible improvement. Armed with data, instructors are able to make informed decisions about their teaching practice and implement desired changes aligned with research-based best practices. This presentation describes the methods used to identify research about best practices in teaching as well as the process of distilling the observable actions and modes of engagement included in SPOT. We will also discuss how session participants can access the SPOT in order to try it out.

Footnotes: Cassandra Paul

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Abstract Title: Exploring Self-Efficacy and Growth Mindset Through Overlapping Interests Projects

Paper Type: Contributed

Author: Vashti A. Sawtelle
Michigan State University
867 Wilson Rd
East Lansing, MI 48824-1046
(517) 884-5177 (p)
vashti.sawtelle@gmail.com

Speaker Order: CI02

Educational psychology studies have linked self-belief constructs to success in STEM, including self-efficacy (the belief in one's ability to succeed at specific tasks) and growth mindset (seeing intelligence as something that can be developed through dedication and effort). However, most of the work with these constructs uses traditional psychology large-N quantitative studies that show that change happens without describing in qualitative detail the mechanism by which it happens. This presentation will focus on a likely place for students to have a self-efficacy and growth mindset building experience: an in-depth course project that students complete in conjunction with introductory physics. We present evidence of students who see themselves as competent in neuroscience or genetics, who identify as people who embrace challenge, but who still place physics in a category of special difficulty. We then explore how this overlapping interests project creates opportunities to impact self-efficacy and growth mindset in physics.

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Abstract Title: How Undergraduate Research Experiences Support More Central Participation in Physics

Paper Type: Contributed

Author: Gina M. Quan
University of Maryland
082 Regents Drive
College Park, MD 20740 United States
4088230123 (p)
gina.m.quan@gmail.com

Speaker Order: CI06

Undergraduate research has been recognized as a significant way to facilitate undergraduate students' more central participation in physics. In this talk, I will present a potential mechanism by which research experiences may impact undergraduate participation: changes in their beliefs about the nature of science coupled to changes in a sense of ability to contribute to authentic research. Students in the study were part of a research seminar at the University of Maryland in which they worked with faculty and graduate student research mentors on research projects. Class time was dedicated to developing research skills and supporting students through emotional hurdles associated with research. In videotaped interviews, we asked students to describe their experiences in research. Students developed nuanced views about how the research process works. They also perceive shifts in their sense of access to research, feeling like their contributions as novices mattered.

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Abstract Title: Implementing Spaced Recall in Introductory Physics

Paper Type: Contributed

Author: Eugene T. Torigoe
Thiel College
169 Reynolds Ave
Meadville, PA 16335
7174196392 (p)
etorigoe@thiel.edu

Speaker Order: CI10

Psychological research about human memory has shown the effectiveness of spaced recall.(1) This research has demonstrated that attempting to recall information leads to stronger memory, than being told of rereading the information. In this talk I will describe how I have tried to incorporate spaced recall in my classes, and the ways it aids me as an instructor to make pedagogical decisions. I will also speculate on the cognitive skills that may aid student recall.

Footnotes: 1. Brown, Peter C., Henry L. Roediger III, and Mark A. McDaniel. Make it stick. Harvard University Press, 2014.

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Abstract Title: Investigation of Physics Identity Within a Classroom Social Network
Paper Type: Contributed
Author: Eric A. Williams
Florida International University
11200 SW 8th St - CP 204
Miami, FL 33199 United States
305-348-2605 (p)
ewill085@fiu.edu
Speaker Order: CI03

Students from traditionally underrepresented backgrounds in the United States face unique challenges across the Science, Technology, Engineering, and Math (STEM) fields, but the situation in physics is especially concerning: of all the physics bachelor degrees awarded nationwide, only 4% go to Hispanic students. This problematic level of participation can be investigated through the construct of physics identity, or how strongly a student "feels like a physics person," which has been shown to be correlated with the likelihood of choosing a physics career. Because physics identity may be impacted by a student's social interactions, Network Analysis may be used to explore the relationship between a student's calculated centrality – a measure of how embedded or "central" a particular student is within the classroom social network – and their physics identity. In this study, we investigate this relationship for students in a collaborative-learning Modeling Instruction introductory physics course at Florida International University.

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Abstract Title: Research and Development of PhET Simulation-based Physics Tutorials
Paper Type: Contributed
Author: Vijay R. Kaul
University of Maryland, College Park
082 Regents Drive
College Park, MD 20742-2421 United States
3014056185 (p)
vijay@umd.edu
Speaker Order: CI07

Well-designed instructional simulations in the classroom can help students learn difficult concepts in an enjoyable way. The University of Colorado PhET simulations are some of the most widely used (15 million runs every year). We are investigating students' reasoning when working collaboratively on PhET simulations scaffolded by tutorial worksheets. We have developed a tutorial for the Gas Properties simulation for introductory physics students designed to solicit mechanistic reasoning about temperature and pressure in terms of molecular motion. However, in clinical and classroom settings, students working collaboratively on the tutorial used the ideal gas law to make predictions about situations in which an ideal gas is being compressed or heated and subsequently used the simulation to confirm their predictions. Many groups did not engage in discussing the temperature, pressure or work done in terms of the molecular motion. These results informed subsequent modifications. We will present preliminary results of our investigations.

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Abstract Title: Traditional Physics Versus IPLS: Comparing Student Interest and Engagement*

Paper Type: Contributed

Author: Tessa E. Williams**
Swarthmore College
500 College Ave
Swarthmore, PA 19081 PA Pennsylvania
360-201-7430 (p)
twillia4@swarthmore.edu

Speaker Order: CI08

Swarthmore College life science students take a traditional first semester physics course, but have the option of taking an innovative Introductory Physics for the Life Sciences (IPLS) course in the second semester. This curricular structure presents a unique opportunity to compare students' experiences across these different instructional environments. We have used multiple conceptual and attitudinal survey instruments, and have interviewed a number of students over the course of the year, in an effort to assess students' evolving relationship with physics across these two different experiences. In this talk we present some of our findings from these survey and interview data, comparing epistemological and affective features of students' experiences across the traditional and IPLS environments. This comparison allows us to identify some of the features that students find especially engaging about the IPLS course in particular.

Footnotes: *Work supported in part by Swarthmore College and by the Howard Hughes Medical Institute Science Education grant to Swarthmore College. **Sponsored by Catherine Crouch

Conflicts: If at all possible, we would like this talk to be coupled with Benjamin Geller's talk "Unpacking the source of student interest in an IPLS course" in the same session. Ideally, the two talks would be presented back to back, since they are highly connected. Thank you for your consideration.

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Abstract Title: Unpacking the Source of Student Interest in an IPLS Course

Paper Type: Contributed

Author: Benjamin Geller
Swarthmore College
500 College Ave
Swarthmore , PA 19070
7174970878 (p)
bgeller1@swarthmore.edu

Speaker Order: CI09

Effectively teaching an Introductory Physics for the Life Sciences (IPLS) course means engaging life science students in a subject for which they may not have considerable preexisting interest. We have found that the inclusion of authentic life science examples supports students whose initial interest in physics is less developed, but that different examples and models vary in their effectiveness at engaging student interest. In this talk we begin to unpack this variability, exploring why some life science examples may be more successful than others at sparking and sustaining student interest. By analyzing data from (1) survey instruments assessing student interest in particular life science examples, and (2) interviews conducted with students before and after instruction, we identify features of our IPLS course that appear to be particularly important for fostering student engagement. We suggest that some of these features might also foster student interest in more traditional introductory physics courses.

Conflicts: If at all possible, we would like this talk to be coupled with Tessa Williams' talk "Traditional physics versus IPLS: Comparing student interest and engagement" in the same session. Ideally, the two talks would be presented back to back, since they are highly connected. Thank you for your consideration.

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Date Last Updated: February 4, 2011