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PER: Diverse Investigations III

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Abstracts Submitted (# 7)

Abstract Title: A Seventeenth-Century Analogue to Contemporary Physics Education Reform

Paper Type: Contributed

Author: James Reardon
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Speaker Order: GD01

Already in 1630 we find an author noting that learners are liable to respond "by rote, as parrots." If we would avoid this in our teaching, we should imitate the method of questioning used by Socrates: "Some dialogues in Plato were worth the reading, where the singular dexterity of Socrates in this kind may be observed and imitated." The author is George Herbert, the work is "A Priest to the Temple: the Country Parson, His Character, and rule of Holy Life", and the activity at hand is catechizing the faithful. I am fascinated that Herbert addresses an issue still important to contemporary reformers of Physics education, using the same words. In this brief talk I try to establish analogues between ecclesiastical educational practices in 1630 England and contemporary USA, and translate Herbert's advice for reform into terms suitable for the training of physics teachers.

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Abstract Title: Andragogy or Pedagogy When Modeling Learning Experiences for Adult Learners?
Paper Type: Contributed
Author: C. Dianne Phillips
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Speaker Order: GD02

Andragogy is the "art and science" of teaching adults. Is it necessary to distinguish between Pedagogy and Andragogy when modeling learning experiences specifically for the adult learner? The EMPACTS (Educationally Managed Projects Advancing Curriculum, Technology and Service) project-based learning model was developed specifically for the unique needs of the adult learner. Courses that employ the EMPACTS delivery system, use the EMPACTS project to enhance the learning of course content as adult learners transition from a socialized "passive" learning experience to one of "active," self-directed ownership in the process. Pedagogical frameworks are historically designed for K-12 learners who need structure, direction and greater facilitation in the learning process. Adult learners learn best if they are allowed to use their own knowledge and life experiences as they apply specific course content to real world problems. The EMPACTS model encourages collaboration and the use of technology as adult learners design and complete semester long projects.

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Abstract Title: Characteristics of Well-Propagated Instructional Strategies and Materials Across STEM Disciplines
Paper Type: Contributed
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Speaker Order: GD03

While the STEM education community has developed many new pedagogies and materials, not many have been successful in reaching a wide audience. This study is part of a larger effort to understand how new pedagogies and materials can become widely used, by learning more about those that have become well-propagated. Experts across STEM disciplines were asked to identify well-propagated instructional strategies and materials in their disciplines. We created a categorization scheme for the strategies and materials and gathered evidence to evaluate the extent to which the innovations they suggested had propagated. This presentation will discuss the general characteristics of well-propagated instructional strategies and materials. Most have been funded by multiple grants over time and emphasize changes in approaches to instruction, not changes to content. Further, their propagation strategies were adapted to the resources and degree of collaboration with colleagues required by the instructional strategy.

Footnotes: Supported, in part, by NSF#1122446.

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Abstract Title: From Idea to Implementation: Initiating Studio-style Reforms in Academic Departments

Paper Type: Contributed

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Speaker Order: GD04

Successful pedagogical change in an institution is often built on a foundation of prior efforts and can have a non-linear trajectory. North Carolina State University's Student-Centered Active Learning Environment with Upside-down Pedagogies (SCALE-UP) is a studio-style instructional approach that modifies the classroom structure and pedagogy to promote interaction. There can be challenges when adopting this radical reform, which reconceptualizes the role of teacher and student in a novel learning environment. Using case studies of SCALE-UP secondary implementers, we explore the beginnings of SCALE-UP within departments in a variety of institutions and STEM disciplines. We examine the context of these departments and institutions prior to SCALE-UP, the key players who drive the change, and the events and strategies that lead to implementation. This talk notes commonalities and differences that occurred in successful SCALE-UP implementations. Does successful educational change follow a strategic plan or does serendipity play a significant role?

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Abstract Title: Further Investigations into the Effectiveness of Collaborative Group Exams

Paper Type: Contributed

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Speaker Order: GD07

I will report on two years of results of a study designed to measure the effectiveness of an instructional strategy known as two-stage exams or collaborative group exams. This exam format first has the students take the exam individually. Once all the students have handed in their individual exams, they organize into collaborative groups of three or four and take the same exam again with only a single copy of the exam being given to each group. Different versions of the group exam feature different subsets of the questions from the individual exam. Questions isomorphic to the exam questions were administered on the end-of-course diagnostic and comparisons, using the relevant isomorphic question, are made between the students that saw a given question on the group exam and those that did not.

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Abstract Title: Negotiating Positionings within Small Groups in Introductory Physics

Paper Type: Contributed

Author: May H. Lee
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Speaker Order: GD06

To provide opportunities for students to engage meaningfully with core disciplinary concepts and practices in physics, an introductory calculus-based mechanics course was designed so that students collaborated in small

groups to solve complex story problems. Our research focuses on how collaboration between group members affects their opportunities to learn and do physics. Qualitative methods were used to analyze video-recorded small group discussions over a three-week period. The dynamics of the social interactions between group members were analyzed through positioning theory (Davies & Harré, 1990). Preliminary findings indicate that group members seemed to position themselves as capable of doing physics. Additionally, each group member was positioned by his or her peers and/or instructor as either more or less knowledgeable in doing physics. As a work in progress, we report on how students negotiate these positionings from multiple sources.

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Abstract Title: Updating Physics Labs for First-Year Medical Students

Paper Type: Contributed

Author: Stephen W. Peterson
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Speaker Order: GD05

The medical degree at the University of Cape Town is a six-year undergraduate degree, including a one semester physics course (PHY1025) during the first year. In previous years students have often expressed negative sentiments toward the laboratory component of the course – in which a fairly rigorous approach to measurement had been adopted – viewing it as disconnected from the theory or simply as irrelevant to their medical training. This has led to revising the laboratory curriculum, focusing on two goals (1) improving the connection between lab and lectures and (2) highlighting skills that are relevant for a future as a medical doctor. As part of the evaluation of the new labs (being piloted for the first time) we are using E-CLASS to measure student attitude at the start (February) and the end of the course (May). We briefly describe the new laboratory curriculum and then present our results.

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