

***PHYSICS 429.03: Modeling Method of Instruction Mini Workshop
(Mechanics)***

SYLLABUS

June 13-15 and June 18-20, 2012
Department of Physics Illinois State University

Catalog Description:

Physics 429.03 *Modeling Method of Instruction*, 0-3 semester hours credit, summer semester

Workshop designed to outfit in-service physics and physical science teachers with the tools, experiences, and background needed to improve their physics instruction.

Prerequisites: In-service physics teacher full time teaching position at an Illinois high school or undergraduate science teaching major.

NOTE: Graduate programs at ISU will not accept PHY 429.03 credit for completion of graduation requirements as the workshop has not gone through the usual course proposal vetting process. Independent study credit is available, however, that will satisfy most graduate program requirements. While tuition waivers may be used, there are fees associated with course credit.

Instructor of Record:

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Meeting Days/Times/Location:

There will be two independent but nearly identical workshops each lasting three days. Each workshop is a basic introduction to the Modeling Method of Instruction that focuses on mechanics (scientific reasoning in the experimental setting, constant motion, and accelerated motion). The first workshop will take place Wednesday through Friday, June 13-15. The second workshop will take place Monday through Wednesday, June 18-20. Sessions run from 10:00 a.m. to 5:00 p.m. the first day and from 8:00 a.m. to 4:30 p.m. on the second and third days. We will be meeting Moulton Hall, room 204, on the ISU campus. See the campus map (<http://maps.illinoisstate.edu/>) for building location and public parking.

Overview:

Secondary-level physical science teachers will participate in three (3) days of workshop training in the Modeling Method of Instruction. The Modeling Method of Instruction has been shown to be a highly effective extension of the traditional 3-step learning cycle (observe, generalize, apply). The modeling cycle addresses the deficiencies of the learning cycle by assisting students construct understanding from observations, by confronting student preconceptions, and by examining student thought processes through “whiteboarding” and Socratic dialogues. Participants will receive an abbreviated Modeling Method Handbook (Mechanics curriculum Units I-IV or similar, a CD with the entire Modeling curriculum and more, 6 Tumble Buggies with 3 battery blocks, and a number of 24”x32” whiteboards. The workshop will consist of 21 hours of contact time.

Professional Practice Goals:

The goal of this Modeling Method workshop is to provide a meaningful form of professional development for in-service teachers who are looking for new ways to teach or inadequately prepared to teach physical science using student-centered, inquiry-based, constructivist practices. Real change in instructional practice will come about only when master teachers demonstrate new ways of teaching, allow less experienced teachers to practice the new method, and then help them to improve their efforts. This workshop will do just that. The principles learned here can be readily transferred to any other sort of classroom instruction. Resources for implementation of Modeling Method in physical science (integrating science, math, and technology) classroom will be provided through the complimentary CD.

CEUs, CPDUs, and Undergraduate Credit: This free course has associated with it optional CEUs and CPDUs.

Up to 21 hours of CPDUs (0 semester hours of graduate credit only) will be provided at no cost by the Illinois Section of the American Association of Physics Teachers (ISAAPT) courtesy of the ISU Physics Department that is funding these free workshops. Official CPDU paperwork will be provided at the conclusion of the workshops. There is no fee associated with CPDUs provided by the ISAAPT. Full CPDU credit requires attendance at and participation in all workshop activities, completion of all Modeling worksheets addressed in class, and completion of a notebook that will include guidance for teaching Modeling Instruction as seen from both student and teacher perspectives. No essays are required for CPDU credit only.

CEUs ranging from 1-3 semester hours of graduate credit are available to those wishing to enroll. Students who are currently enrolled at ISU as graduate students and those applying for admission to as graduate students-at-large (no major) may register for graduate credit on the first day of class. New graduate students will have to pay the associated \$40 application fee for admission as a graduate student-at-large and may register the first day of class as well. A summer graduate tuition and fee schedule is available at the following URL:

http://www.comptroller.ilstu.edu/studentaccounts/tuition-rates/graduate_table.shtml

Undergraduate teacher education majors may also register for PHY 287 *Independent Study* for 1-3 semester hours of credit.

The required assessments for the different numbers of credit hours can be found below.

Required Student Tasks:

Students enrolled in PHYSICS 429.03 *Modeling Method of Instruction* (or an independent study) **for one (1) semester hour of credit** will be required to complete the following tasks; additional tasks are required of those enrolling for 2 or 3 hours of credit.

Participation/Attendance (50% of course grade)

Participation will be judged on the basis of daily attendance, active participation being assumed. Half-time participation will result in a 50% of all available participation points, unless arrangements are made in advance for missed contact hours.

Binder Check (15% of course grade)

Teachers will complete all Modeling exercises directed by the workshop leaders. The binder containing Units I-IV of Modeling mechanics instruction must be made available for inspection by the instructor of record at the end of the second day of the workshop.

Teacher Notebook (10% of course grade)

Teachers will use time during the workshop and following daily activities to write reflections in a provided notebook about how best to teach the Modeling Method of Instruction (mechanics) from both teacher and student perspectives.

Essay (25% of course grade)

Students will one 3-to 4-page (1-inch borders, double spaced, 12 point Times font) essay that reflects their understanding of a selection of the following topics:

Required Essay 1 – Teachers must write an summarizing essay that deals with the following three questions: 1) What have I learned as a teacher?, 2) What have I learned as a student of physics?, and 3) How has what I have learned going to change my teaching during the coming school year? See criteria for essays below.

Students **enrolling for two (2) semester hours of credit** must complete all activities above as well as **Required Essay 2**. See criteria for essays below. Please note that the relative weights of assignments will be adjusted for those enrolling at higher credit hour options. See course instructor of record for details.

Required Essay 2 – Teachers enrolled for 2 semester hours of credit also must write a second 3-to-4-page essay that deals with *one* of the four following topics available from the following URL:
<http://www.phy.ilstu.edu/pte/publications/>

- Identifying, confronting, and resolving student misconceptions (start by reading **Dealing more effectively with alternative conceptions in science**. *Journal of Physics Teacher Education Online*, 5(1), Summer 2008, pp. 11-19.)
- Implementing Socratic questioning (start by reading **Engaging students in conducting Socratic dialogues: Suggestions for science teachers**. *Journal of Physics Teacher Education Online*, 4(1), Autumn 2006, pp. 10-13 and **Whiteboarding and Socratic dialogues: Questions and answers**. *Journal of Physics Teacher Education Online*, 3(1), September 2005, pp. 3-10.)
- Teaching the nature of science (start by reading **A framework for teaching the nature of science**. *Journal of Physics Teacher Education Online*, 3(3), March 2006, pp. 3-10.)
- The role of climate setting (start by reading **Minimizing resistance to inquiry-oriented instruction: The importance of climate setting**. *Journal of Physics Teacher Education Online*, 3(2), December 2005, pp. 10-15.)

Students **enrolling for three (3) semester hours of credit** must complete all activities above as well as **Required Essay 3**. See criteria for essays below.

Required Essay 3 – Teachers enrolled for 3 s.h. of credit also must write a third 3-to-4-page

essay that deals with the following series of articles:

1. Read all four of the following journal articles; see:
<http://www.phy.ilstu.edu/pte/publications/index.html>
 - [Levels of inquiry: Hierarchies of pedagogical practices and inquiry processes](#). *Journal of Physics Teacher Education Online*, 2(3), February 2005, pp. 3-11 (revised edition 2/2012)
 - [Levels of inquiry: Using inquiry spectrum learning sequences to teach science](#). *Journal of Physics Teacher Education Online*, 5(4), Summer 2010, pp. 11-20 (revised edition 1/2012)
 - [The Levels of Inquiry Model of Science Teaching](#). *Journal of Physics Teacher Education Online*, 6(2), Summer 2011, 9-16 (revised edition 1/23/2012)
 - [Sample learning sequences based on the Levels of Inquiry Model of Science Teaching including Appendix](#). (with Manzoor Ali Khan). *Journal of Physics Teacher Education Online*, 6(2), Summer 2011, 17-30.
2. Critically review Units I-IV of the Modeling Method of Instruction and determine if and to what extent they satisfy the criteria of the six levels of inquiry in the Levels of Inquiry Method of Science Teaching. Make suggestions for extending Units II-IV to include missing levels of inquiry.

Criteria for Essays 1 and 2:

Essays 1 and 2 will consist of three parts: (1) a brief summary of the content of the associated reading(s), (2) a summary of any problems that the teacher has encountered in relation to the subject matter of the essay, and (3) a reflection about how the content of the associated reading(s) might affect future teaching practices. Required readings are available at <http://www.phy.ilstu.edu/pte/publications/>.

Criteria for all Essays:

Each essay will be scored using a rubric available at the following URL:

http://www.phy.ilstu.edu/pte/Essay_Scoring_Rubric.pdf

Course Grade:

Grades will be determined on the basis of the following scale:

[90% -100%] of all normalized points = A
[80% -90%) of all normalized points = B
[70% -80%) of all normalized points = C
[65% -70%) of all normalized points = D
[0% -65%) of all normalized points = F

Essay Due Dates:

FINALIZED ESSAYS MUST BE RECEIVED NO LATER THAN FRIDAY, JULY 29th. (If sending by US Mail, send at least 5 days in advance of this date to: Carl J. Wenning, 4560 Physics Department, Illinois State University, Normal, IL 61790-4560) OR IF E-MAILED NO LATER THAN FRIDAY, JULY 29th. (Email to: wenning@phy.ilstu.edu). You may send *electronic* draft copies earlier for review if you like. I'll be happy to provide written suggestions for improvement. Please give me at least 2 weekdays of turn around time. Please send only MSWord (.doc or .docx) or rich text format (.rtf) files. I generally cannot read other formats, and cannot readily provide electronic comments on PDF versions.