

MECHANICS TEST DATA SURVEY FORM (3/20/97)
R.R. Hake, Emeritus Professor of Physics, Indiana University
24245 Hatteras St., Woodland Hills, CA 91367, <hake@ix.netcom.com>

NOTE #1: PLEASE FILL IN APPROPRIATE INFORMATION AFTER WORDS WHICH ARE FOLLOWED BY A COLON (:). ADD ADDITIONAL WORDS AS NECESSARY TO MAKE CLARIFYING COMMENTS.

NOTE #2: Abbreviations used:

FCI = Force Concept Inventory
MB = Mechanics Baseline test
FMCE = Force and Motion Conceptual
Evaluation

NOTE #3: This is intended as an "ethnographic" survey form. As such, similar questions are sometimes asked in different contexts.

0. Please indicate today's date:

1. INFORMATION ABOUT YOU

Name:

Institution:

Telephone:

Mailing address:

FAX:

e-mail:

highest academic degree:

college major:

How long have you been teaching physics?:

Is your educational work supported by

internal grants or special funding? (specify type):

external grants or special funding? (specify type):

Member of

APS:

APS Forum on Education:

APS Forum of Physics and Society:

APS Forum on History of Physics:

AAPT National:

AAPT State:

NSTA National:

NSTA State:

other professional groups (specify):

2. COURSE TYPE

2a. College or University

Credit Hours (specify semester or quarter or summer session):

Are you on the semester: or quarter: system?

Hours/week of

Lecture:

Recitation//Discussion:

Labs:

Other(specify):

Official Description (as in bulletin or catalogue):

Your Own Description :

Comments:

2b. High School

How many sections are you reporting on:

If you are reporting on more than one section then please type a code letter for each section (e.g., "H" for Honors, "AP" for Advanced Placement, "P" for college Prep, etc.) and then use the code letter in this form when it is necessary to distinguish the different types of data or circumstances):

Course length (days or weeks):

Periods/week:

Hours/period:

Lab Time/week:

Other Activity (specify activity)/week:

Official Description:

Your Own Description:

Comments:

2c. Prerequisites:

2d. Approximate % of Semester-equivalent (half-year) Course-Time Devoted to Newtonian Mechanics (including energy and momentum conservation):

2e. Did the course cover most of the material relevant to the FCI?:

2f. Did the course cover most of the material relevant to the MB?:

2g. Did the course cover most of the material relevant to the FMCE?:

3. TEST STATISTICS

3a. FCI pretest (29 questions - or if you used the 30-question

1995 Revision of the FCI [in "Peer Instruction: A User's Manual" by E. Mazur (Prentice Hall, 1997), and pass-word protected at <<http://modeling.la.asu/modeling.html>>] please put an X here:)

Date given (month/day/year):

Time allowed for students to complete test:

N (number of tests included in the average - should be same as no. of students who took FCI posttest since the scores of students who did not take the posttest should be omitted from the average):

Average No. of correct responses:

SD (Standard Deviation, please try to obtain this !):

KR20 {Kuder Richardson reliability coefficient, if available [see e.g., L.S. Feldt, in "Encyclopedia of Statistical Sciences" (Wiley, New York, 1982), Vol. 4, p. 417]}:

3b. FCI posttest (29 questions - or if you used the 30-question 1995 Revision, (see above in "3a") please put an X here:)

Date given (month/day/year):

Time allowed for students to complete test:

N (number of students taking test):

Average No. of correct responses:

SD (Standard Deviation, please try to obtain this !):

KR (Kuder Richardson reliability coefficient, if available):

3c. MB posttest (26 questions)

Date given (month/day/year):

Time allowed for students to complete test:

N (number of students taking test - should be same as number taking FCI posttest):

Average No. of correct responses:

SD (Standard Deviation, please try to obtain this !):

KR (Kuder Richardson reliability coefficient, if available):

3d. FMCE pretest (43 questions, copies are available from Center for Science and Mathematics Teaching, Tufts University, 4 Colby St., Medford, MA 02155)

Date given (month/day/year):

Time allowed for students to complete test:

N (number of students taking test - should be same as number taking FCI posttest, if the FCI was taken):

Average No. of correct responses:

SD (Standard Deviation, please try to obtain this !):
KR (Kuder Richardson reliability coefficient,if available):

- 3e. FMCE posttest (43 questions, Date given (month/day/year):
Time allowed for students to complete test:
N (number of students taking test - should be same as number taking FCI posttest, if the FCI was taken):
Average No. of correct responses:
SD (Standard Deviation, please try to obtain this !):
KR (Kuder Richardson reliability coefficient,if available):

3f. If all the above N's are not the same, please explain the reason(s): [Note that for an accurate comparison it's best to determine the FCI/FMCE pretest average and the MB posttest average only from the scores of those students who took the FCI/FMCE posttest.]

4. TEST CONDITIONS:

- 4a. To what extent do you think you were able to avoid "teaching to the test(s)" (i.e., going over experiments, questions, or problems identical or nearly identical to the test items)?:
- 4b. Do you think that your students exerted serious effort on the FCI pretest?:
- 4c. Did you give your students any inducements towards such effort? (explain):
- 4d. Do you think that your students exerted serious effort on the FMCE pretest?:
- 4e. Did you give your students any inducements towards such effort? (explain):
- 4f. Did the FCI posttest count as part of the final grade in your course? (if so give the approximate weighting factor):
- 4g. Did the FMCE posttest count as part of the final grade in your course? (if so give the approximate weighting factor):
- 4h. Did the MB posttest count as part of the final grade in your course? (if so give the approximate weighting factor):
- 4i. Did the FMCE posttest count as part of the final grade in your course? (if so give the approximate weighting factor):

5. TYPE OF INSTITUTION (place an X next to those that apply, with clarifying remarks if needed)

5a. High School

private:

public:

magnet:

science/math academy:

other types of high schools (specify):

5b. Post Secondary

private:

public:

Trade/Vocational School:

Junior college:

Two-year college:

Four-year college:

Community college:

Liberal Arts College:

University/College:

Research University:

Other types of post-secondary institutions (specify):

6. TYPE OF STUDENT (place an X next to those that apply, with clarifying remarks if needed)

6a. High School Student

advanced placement:

honors:

college bound:

non-college bound:

first physics course:

second physics course:

combined physics/math course:

"gifted" (specify criteria) (approx. %):

minority (approx. %):

non-native English speakers (approx. %):

"at-risk" (specify why) (approx. %):

physically handicapped (specify type of handicap) (approx. %):

disadvantaged (specify type of disadvantage)(approx. %):

in need of remediation (specify type of remediation)

(approx. %):

other types of high-school students (specify):

6c. Post-secondary Student (place an X next to those that apply, with clarifying remarks if needed)

approximate average age:

vocational (specify type):

science majors:

physics majors:
health professions:
required by major to take course:
non-science majors:
liberal arts:
professional (specify type):
engineers:
honors:
prospective teachers (indicate level of anticipated teaching
as preschool, elementary, middle, high school, college):
"gifted" (specify criteria) (approx. %):
minority (approx. %):
non-native English speakers (approx. %):
"at-risk" (specify why) (approx. %):
physically handicapped(specify type of handicap)(approx. %):
disadvantaged (specify type of disadvantage)(approx. %):
in need of remediation (specify type of remediation)
(approx. %):
other types of post-secondary students (specify):

7. INSTRUCTIONAL METHODS

Place an X next to those that apply, with clarifying remarks if needed; AND/OR

IF YOU THINK THAT YOUR INSTRUCTIONAL METHODS MAY BE MORE ACCURATELY CONVEYED BY A BRIEF PARAGRAPH, THEN PLEASE TYPE IT HERE (you may or may not want to also indicate detailed responses with X's in parts "a" - "e" below):

7a. Delivery

7a(1) Lecture Period (college) or Class Period (High School)

Activities -

discuss -

text material:

non-text material:

derivation of equations or principles:

illustrations of physical principles:

nature of science and scientific knowledge:

history of science:

relationship of physics to other fields:

problem-solving strategy:

learning strategy:

give outlines of crucial material:

relate physics to everyday life:

answer questions:

ask questions:

dialogue with students:

Socratic dialogue with students:
solve problems:
demonstrate:
show simulations:
show simulations plus students answer questions about
simulations on worksheets):
show films or videotape:
promote-
physics learning:
discussion:
critical thinking:
creative thinking:
effective decision making:
effective writing:
social awareness:
interactive engagement of students:
collaborative learning:
group activities:
order and discipline:
use computer(s) (specify type of usage):
give quizzes:
give exams:
distribute handouts:
administer the course:
other activities in lecture or class period (specify):

7a(2) Lab Emphasis

verifying principles:
experience with physical phenomena:
laboratory technique:
scientific research strategy/technique:
formal written lab report:
error analysis:
graphing:
spreadsheets:
learning about apparatus:
collaborative learning:
group activities:
Socratic dialogue with students:
discovery:
guided discovery:
inquiry:
student construction of knowledge
student guided to construct knowledge:
conceptual orientation:
predict outcome and then perform experiment:

learning cycle:
modeling cycle:
student research (specify extent of guidance):
student research plan:
student research report:
computer usage (specify type of usage):
other items emphasized (specify):
lab instruction by (specify type as, e.g., primary course teacher, volunteer adult helpers, volunteer high-school students, science specialists, undergraduates, graduate students, temporary faculty, professors):

7a(3) Recitation/Discussion Emphasis-
problem solving by instructor:
problem solving by students:
inducement of discussion:
minilectures:
Socratic dialogue with students:
collaborative learning:
group activities:
quizzes:
other items emphasized (specify):
recitation/discussion instruction by (specify type as, e.g., primary course teacher, volunteer adult helpers, volunteer high-school students, science specialists, undergraduates, graduate students, temporary faculty, professors):

7a(4) General Emphasis
use of current research results in -
physics:
physics education:
cognitive science:
visits/field trips (specify type as e.g., museums, amusement parks, research labs, universities):
physics olympics:
use of calculus:
writing:
presentations by visitors:
individual attention to most students:
science-math synthesis:
other general emphasis (specify):

7b. Your Own Pedagogical Orientation-

I attempt to enhance students'-

- conceptual understanding:
- knowledge of scientific laws and facts:
- understanding of the nature of knowledge:
- critical thinking:
- creative thinking:
- mathematical abilities:
- self-confidence:
- questioning of authority:
- self-discipline:
- self-regulation:
- knowledge of their own thought processes:

I try to-

- transmit knowledge:
- set an example;
- inspire:
- motivate:
- coach:
- challenge students:
- discipline students:
- become personally acquainted with students:

Students should -

- memorize:
- study on their own:
- do original research:
- drill and practice:
- solve problems:
- inquire:
- construct understanding:
- be guided to construct understanding:
- discover:
- be guided to discover:
- follow instructions:
- obey teachers:
- ask questions:
- question authority:
- be skeptical:
- take responsibility for their own learning:

My teaching methods emphasize -

- the learning cycle:
- the modeling cycle:
- the spiral approach:
- concept maps:

vee diagrams:
Piagetian ideas on student development:
idea first, name afterward:
How do we know? Why do we believe? What is the evidence?:
less is more:
hands-on:
heads-on:
Socratic dialogue:
modeling:
specific numerical solutions to problems:
general algebraic solutions to problems:
the importance of _
 diagrams in problem solving:
 evaluating problem solutions:
 problem solving strategies:
 facts (more than concepts):
 concepts (more than facts):
 facts and concepts about equally :

Other orientations (specify):

7c. Teaching Methods Used by You -

team teaching:
drill and practice:
students memorize some material:
interactive engagement of students:
Socratic dialogue with students:
collaborative learning:
group activities:
group tutoring:
individual tutoring:
coaching:
help sessions:
office hours:
electronic bulletin board:
problem solving:
student research:
apprenticeships:
distance learning:
networking:
use of education-research-based materials:
student portfolio:
other teaching methods used by you (specify):

7d. Your Special Concerns -

- student (pre/alternate/mis) conceptions of -
 - physics:
 - mathematics:
 - learning:
 - nature of science and scientific knowledge:
- anchoring conceptions:
- complete coverage of most introductory topics:
- effective use of equations:
- physical interpretation of equations:
- "reading" the equations:
- quantitative physics:
- qualitative physics:
- preparing students for -
 - college courses:
 - college entrance exams:
 - standardized tests such as the MCAT, GRE, AP:
 - state-mandated assessments:
 - getting a job:
 - contributing to society:
 - productive and fulfilling lives:
- classical physics:
- "modern" (post 1907) physics:
- leading-edge physics:
- symmetry in physics:
- significant figures:
- powers of ten:
- problem solving:
- Fermi questions:
- conceptual questions:
- scales of nature:
- critical thinking:
- creative thinking:
- mathematical thinking:
- modeling:
- science and society:
- science and technology:
- physics in everyday life:
- environmental physics:
- science illiteracy:
- history of science:
- mathematics:
- philosophy of science:
- other special concerns (specify):

7e. Course Assessment Methods (aside from FCI, MB, and FMCE exams)

- student evaluations for-
- rating instructors:
- diagnostic purposes:
- instructor portfolio:
- later success of students in
- follow-on courses:
- getting a job:
- admission to college:
- careers:
- peer instructor evaluation:
- feedback from parents:
- awards or special distinctions (specify type):
- class visitations by -
- peers:
- supervisors:
- parents:
- outside experts or consultants (specify type):
- performance of students on exams
- course:
- Advanced Placement:
- AAPT-NSTA High School Physics Exam:
- MCAT:
- TUG-K (kinematics test by R. Beichner):
- state-mandated:
- exit exams:
- exit interviews:
- credentialing committees:
- supervisor ratings:
- other assessment methods:

8. SPECIFIC RESOURCES USED BY YOU (place an "XX" next to those that your students actually see, and a "X" next to those that influence your teaching, with clarifying remarks if needed)

Text [specify author(s), title, edition of the COURSE TEXT]:

Physical Science Study Committee (PSSC):

Project Physics (F.J. Rutherford, G. Holton, F.L. Watson):

Microcomputer Based Laboratories (MBL) (Tinker, Thornton):

Mechanical Universe

- video:
- text (specify edition):
- high-school version of video:

Workshop Physics (P. Laws, R. Thornton):

Tools for Scientific Thinking (R. Thornton, D. Sokoloff):

Real Time Physics (D. Sokoloff, P. Laws, R. Thornton):

Modeling (D. Hestenes, M. Wells, G. Swackhamer):
 White Boards by which students show problem solutions
 and/or diagrams (Wells):
 Flash Cards (A, B, C, D, E) by which students answer MP
 questions (Meltzer & Manivannan):
 Active Learning Problem Sets (ALPS) & Overview Case Study
 (A. Van Heuvelen):
 Experiment Problems (A. Van Heuvelen):
 Context Rich Problems (Heller et al.):
 Concept Tests (E. Mazur):
 Socratic Dialogue Inducing (SDI) Labs (R.R. Hake):
 Physics for the Year 2000 (R.D. Knight):
 Minute Papers (C. Schwartz):
 Guttenberg Lecture Periods (R.T. Morrison):
 Moore Method (R.L. Moore):
 Concepts Through Problems (J. Mestre, W. Gerace):
 Ranking Tasks (D.P. Maloney):
 Conceptual Exercises (D.P. Maloney):
 Fill-in Problems (D.P. Maloney):
 Goal-less Problems (P. D'Alessandris)
 Material by -
 L.C. McDermott ("Tutorials in Introductory Physics"):
 L.C. McDermott ("Physics by Inquiry"):
 J.J. Clement & C.W. Camp ("Preconceptions in Mechanics"):
 A.B. Arons ("Guide to Introductory Physics Teaching"):
 A.B. Arons ("Homework and Test Questions")
 A.B. Arons ("Development of Concepts of Physics")
 A.B. Arons ("The Various Language: An Inquiry Approach to
 the Physical Sciences"):
 R.E. Gibbs ("Qualitative Problems for Intro. Physics"):
 F. Reif ("Understanding Basic Mechanics"-Text and
 Workbook):
 L. C. Epstein ("Thinking Physics"):
 J. Walker ("Flying Circle of Physics"):
 A. V. Baez ("The New College Physics"):
 E.M. Rogers ("Physics for the Inquiring Mind"):
 Eugene Hecht ("Physics"):
 Randy Knight ("Physics: A Contemporary Perspective"):
 Tom Moore ("Six Ideas that Shaped Physics"):
 Others (specify):
 National, State, and Local Programs (list under #10 below)-
 High Tech Resources (please list under "Technology Utilization,"
 #9 below)-
 Other specific resources used by you (specify):

9. TECHNOLOGY UTILIZATION (place an "X" next to those that you use, with clarifying remarks if needed)

Films:

Computer (specify how you use them and the make and models):

hand-held calculators :

hand-held graphing calculators (model):

camcorders (specify how you use them):

CD ROM:

video disk:

videotape analysis of motion:

copy machine:

camera:

MBL tools (as the sonic-motion detector):

InfoMall (Physics Teacher's CDROM Toolkit):

Cinema Classics:

Physics Academic Software (specify programs):

GoodStuff (R.H. Good's simulations):

Comprehensive Unified Physics Learning Environment (CUPLE):

Maryland University Project in Physics and Educational
Technology (M.U.P.P.E.T.):

WWW (specify browser, as Netscape, Internet Explorer, etc.):

File Transfer Protocol (FTP):

PINET (AIP):

LabNet (TERC):

networking:

electronic bulletin board:

Interactive Physics:

Electronic Classroom Communication Systems (ECCS) such as -

ClassTalk (student hand-held computers wired to
instructor's processing and display computer):

Wireless Systems (student hand-held key pad broadcasts to
instructor's processing and display computer):

Socratic Dialogue with ECCS:

Concept Tests with ECCS:

Other technology utilized:

10. EDUCATION PROGRAMS OF WHICH YOU OR YOUR COURSE ARE A PART

(place an X next to those that apply, with clarifying remarks if needed)

NATIONAL

Scope, Sequence, and Coordination (SSC) (NSTA):

Project 2060 (AAAS):

Physics Teachers Resource Agents (PTRA) (AAPT):

PTRA Plus (AAPT):

Powerful Ideas in Science (AIP, AAPT):

Constructing Physics Understanding (NSF, San Diego State Univ.)

Project Kaleidoscope:

National Diffusion Network:
 Paideia Program (M.J. Adler):
 Introductory University Physics Project (IUPP) (APS, AAPT):
 Technical Education Research Centers (TERC) Global Lab:
 Operation Physics:
 Principles of Technology (Ctr.for Occupational Research and
 Development):
 Coalition of Essential Schools (T.R. Sizer):
 Physics Resources and Instructional Strategies for
 Motivating Students (PRISMS) (R.D. Unruh):
 Science Teaching through Astronomy (STAR) (I. Shapiro):
 Physics - Teach to Learn (P.H. Williams):
 C3P - Comprehensive Conceptual Curriculum for Physics)
 (R.P Olenick, C.A. Rotter) :
 MUHSA - Mechanical Universe High School Adaptation (D.L.
 Goodstein, R.P. Olenick):
 PEPTC - Physics Enhancement Program for Two Year
 Colleges (NSF, Robert Clark and Tom O’Kuma):
 TYCWS - Two Year College Workshop Projects (NSF, Curtis
 Hieggelke and Tom O’Kuma):
 TYC21 - Two Year College in the Twenty-First Century:
 Breaking Down the Barriers (NSF and AAPT):

Other national programs of which you or your course is a
 part (specify):

STATE (specify):

LOCAL (specify):

11. YOUR OPINION OF THE FCI (e.g., strengths, weaknesses, suggestions for improvement):
12. YOUR OPINION OF THE MB (e.g., strengths, weaknesses, suggestions for improvement):
13. YOUR OPINION OF THE FMCE (e.g., strengths, weaknesses, suggestions for improvement):
14. DO WE HAVE PERMISSION FROM YOU TO
 - a. post your FCI/MB/FMCE results on electronic bulletin boards such as PHYS-L and PhysLrnR?:
 - b. associate your name with the above electronic posting(s):
 - c. publish your FCI/MBT/FMCE results in the physics literature as part of this survey?:
 - d. associate your name with the above literature publications?:
 - e. present your FCI/MBT/FMCE results at professional meetings?:
 - f. associate your name with the above presentations?:

g. do you have any special concerns with regard to distribution of your data and/or name? (please specify):

15. SUGGESTIONS FOR THE IMPROVEMENT OF THIS SURVEY FORM:

16. OTHER COMMENTS: