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TYC PHYSICS TEACHER Newsletter

An AAPT supported Newsletter for Physics Teachers at Two-Year Colleges

Letter on Tech Prep

Joe Baughman
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Greetings! I received and enjoyed the TYC Physics Teacher Newsletter. I was especially interested in the article on cooperative learning, one of the many techniques I'm experimenting with in class.

You also noted the dearth of comments on Tech Prep--so here is my two cents.

1) The 58 community colleges in NC teach quite a few one year vocational programs and two year technical programs for students who will not go on to a four year school. Only about 20-30% on NC community college students enter with the intention of transferring to a four year school. And in fact, only about 5% actually transfer to a four year school. Thus we must meet the needs of a non-four year school student.

2) Tech Prep involves a lot more than Physics. Tech Prep is a High School/Community College joint venture to train vocational and technical students for the job market. It involves receiving community college credit for work while in high school, so that duplication costs are less. The legislature in NC loves this concept! Thus, the HS/CC consortium in NC has a mandate to make Tech Prep successful.

Tech Prep covers any and all vocational and technical courses in high school, from secretarial skills to health occupations: from auto mechanics to electronics: from. . . to. . .(you name it).

3) Tech Prep expects to give the student very practi-

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INSIDE...

A Perspective On Science Teaching—

from Lillian McDermott's talk
at the Joliet Junior College(IL), Lee College(TX),
NSF sponsored
CE/OCS Physics Workshop
at Green River CC (Oct 93)

"Science is a way to teach how something gets to be known, what is not known, to what extent things are known (for nothing is known absolutely), how to handle doubt and uncertainty, what the rules of evidence are, how to think about things so that judgments can be made, how to distinguish truth from fraud, and from show." Richard Feynman as quoted in *Genius* by James Gleick

Minutes of the Meeting of the AAPT Committee on Physics in Two-Year Colleges (CPTYC) January 5, 1993

1. Chair Curt Hieggelke called the meeting to order (4:15 p.m.) with introductions of the committee members and visitors. In attendance were the following committee members: Curt Hieggelke, Sandy Fabella, Gordon Johnson, Bob Speers, Ken Stepnitz and Myra West. Visitors included: John Hubisz, Tom O'Kuma, Willie Newell, Larry Hess, Tom Damon, Alex Dickison, Bill Forest, Gerhard Salinger, Baher Hanna, Rubin Alley, Marvin Nelson, Jack Hehn and Mary Beth Monroe.
2. The minutes from the August 12, 1992 meeting in Orono, Maine were corrected (#5, organizer of the session "Impact of SPS in Two-Year Colleges" was Myra West) and approved.
3. The Chair's report included the following:

a. Introduction of new committee members in attendance (Sandy Fabella and Bob Speers) and recognition of the outgoing committee members (Leslie Dickie, Curt Hieggelke, Janet Landato, and Mary Beth Monroe).

b. Since programs for the AAPT meetings have a broad mission for all persons teaching physics and also since the AAPT is the only organized structure for persons teaching physics in two-year colleges, a question was raised as to the interest or need to form a separate group affiliated with the AAPT. No need or interest was indicated by those in attendance.

c. The TYC Special Recognition Award was not approved by the Executive Board because it was packaged in with the High School and the Undergraduate recognition awards. A motion to endorse the concept of the TYC award and to forward to the AAPT Awards Committee the written proposal of August 12, 1992 as a model was made by Mary Beth Monroe and seconded by Bob Speers. The motion passed.

d. The TYC Newsletter is in the works. Solicitation for contributions was made.

e. NSF sponsored TYC Workshops schedule was made available. The Microcomputer-Based laboratory Workshop will be held March 23-27 at Lenoir Community College in Kinston, NC and July 15-17 at San Jose Community College in San Jose, CA. A Follow-Up Workshop will be held September 23-25 at Joliet Jr. College in Joliet, IL. The Conceptual Exercises/Overview Case-Studies Workshop will be held sometime Fall 1993 at a site to be determined. A Follow-Up Workshop will be held June 24-26, at Lee College in Baytown, TX.

f. A brief report of the NSF sponsored conference on the Role of Professional Societies in Two-Year College Science, Mathematics, and Engineering Education held in Washington, D.C. on October 29-30, 1992 was given. Topics covered at the conference included scholarship, grant proposal writing, and leadership development in the professional societies. Ways to increase the visibility of physics in two-year colleges was discussed. A motion made by Alex Dickison and seconded by Sandy Fabella to solicit and collect articles about physics in TYC for The Physics Teacher was approved.

g. Interest in a TYC Physics Critical Issues Follow-Up Conference have been expressed. A motion made by Mary Beth Monroe and second by Gordon Johnson to endorse the idea and to form a planning committee was approved.

4. Other reports included:

a. John Hubisz and Jack Hehn reported from the AAPT that the chairs of physics at TYC are being invited to attend the chairs (of all Physics Departments) meeting sponsored by AAPT. Also of interest for TYC is a national conference on high school and undergraduate laboratories to be held August 5-7 in Boise, ID immediately preceding the 1993 Summer meeting. A critical issues conference on the recruitment and retention of minority students will be held November 5-7, 1993.

b. Library holdings will now be chaired by Gordon Johnson

c. History of the CPTYC will be provided by Marv Nelson at the summer meeting.

d. Mary Beth Monroe will make a list of TYC people who have won AAPT awards.

5. Program Planning for future AAPT meetings included:

a. 1993 summer meeting in August at Boise State University Workshops:

"Electricity for the Right Side of the Brain (Marv Nelson)

"Problem Solving" (Curt Hieggelke)

"Introduction to Camcorders" (Bob Speers)

Contributed and Invited Paper Sessions:

"Introductory Physics - Trends and Developments" (Curt Hieggelke)

"Usage of Computers in Introductory Physics - Trends and Developments (Tom O'Kuma)

Open House - Discussed whether to include demonstrations or some "Ideas to Go"

b. 1994 Winter meeting in January in San Diego

Workshop - "Electricity for the Right Side of the Brain" (Marv Nelson)

Video Workshop (?)

Contributed and Invited Paper Session - "Electronic Telecommunications" (Bob Speers)

6. The meeting adjourned at 6:00 p.m.

Submitted by Myra West

Student to Student Science

Marie Plumb
Jamestown Community College
Jamestown, NY

Each year for the past three years Jamestown Community College second year science students have been involved in a project to share science with third grade children at a local elementary school. The Samuel G. Love School, which has been our cooperating elementary school, could be classified as an "inner city" school. The "Love School Project" has been an overwhelming success.

The project spans the spring semester. The JCC students visit the elementary school once every other week armed with science equipment of all kinds. Each student is responsible for the lesson for at least one of the weeks. On intervening weeks we meet to discuss and plan how the lesson will be presented. The lessons must involve hands on discoveries with the children. Topics we have studied include, magnetism, rocks and fossils, rotational motion, lights and lasers (a favorite), how to build a weather station, animal habitats, and using microscopes. In most cases we bring JCC equipment to use for the afternoon. We do have the cooperation of a local community group which is also involved with this particular school. The group gives us a small budget which we use to buy equipment for the projects which are then left at the school. Two years ago for one lesson we had the children build seven different habitats. One of the habitats was for hermit crabs. The crabs are still alive and well. Learning how to care for them is now an integral part of the curriculum.

The JJC students are selected by the science faculty. They receive one credit for the course. (The course is a part of the instructor's teaching load.) The qualifications which we seek in the JCC students are a desire to work with children and a firm sense of responsibility. The elementary teacher, is selected by the school principal, and has been wonderful. She has followed through on all the projects. She has reported that the librarian is very busy after our visits as the children try to find out "more about it." A close bonding develops between the JCC students and the children. Everyone learns more about science! The JCC students discover that the best way to learn something is to teach it to someone else; the elementary teacher gets ideas for follow-up projects, and of course the children absorb the new ideas like sponges. Third graders are still curious and adventuresome. They consistently amaze us.

The culminating lesson is a visit by the children to our campus. We let them visit the labs where we have experiments set up for them. We also take them on a nature walk through our college park, one hundred acres of woodland adjacent to our campus.

Each year the JCC students are required to write a critique of the experience. The response has always been positve. Some have admitted to being reluctant at the outset. Most were surprised at the amount of time and effort it required. All have agreed that it became the highlight of the semester.

Conference on the Introductory Physics Course

Tom O'Kuma
Lee College
Baytown, TX

Curtis Hieggelke
Joliet Junior College
Joliet, IL

The following are our recollections and opinions taken from notes during the Conference on the Introductory Physics Course held at Rensselaer Polytechnic Institute in Troy, New York in May1993. The conference was interesting, but tiring. As usual, much of the worthwhile information were comments during the answer and questions portions of the talks and during discussion before and after the sessions. It is expected that the proceedings will be published and will be read by many physics educators. The two-year college community was represented by about 10 participants, but had no involvement in the planning or the presentation of the sessions. There were no concurrent sessions, so everybody heard the same information.

Thursday evening started with welcoming comments from the Rensselaer people and they noted that Robert Resnick was retiring (this Conference was in part recognition of his extensive contributions to introductory physics—not only his textbooks but also service to AAPT as an officer). This was followed by an invited talk by Leon Lederman.

On Friday, Robert Resnick, Rensselaer Polytechnic Institute, discussed "Retrospective and Prospective". In 1959, he felt as a "young" faculty member that there were several common criticisms of most of the introductory textbooks. They were for example the: lack of modern physics, inadequate problems, lack of unity between topics in the textbook and nothing on computer and computational physics. He wanted to emphasize that the textbook is not the course. He thought the following ought to be done:

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Special relativity should be treated as part of classical physics, probably right after mechanics and mechanical waves.

Instructors should select fewer topics in order to get more depth - "less is more"

Instructors should put emphasis on how to teach and who teaches to whom, not merely on what to teach.

Aim for diversity of courses, not a consensus course - "stir the pot of reform."

Arnold Arons, Professor Emeritus at University of Washington, talked about "Uses of the Past: Reflections on Physics Curriculum Activities of the 1960's". He noted that in 1946, Francis Sears of MIT published his book on the "Principles of Physics", three volumes, for the engineering student designed to be a two year sequence of courses. Arons gave us some valuable insights into the curriculum reform during the late 50s and early 60s. He provided one of the best lines regarding the major curriculum efforts of the past as being "complex projects — costs are real and results are imaginary."

Jack Wilson, Rensselaer Polytechnic Institute, next discussed "Some Possible Futures for the Introductory Physics Course". He mentioned several areas that needed to be addressed concerning the introductory physics course. In cognition research, some of the "key" players include Arons, Fuller, Goldberg, Minstrell, Mazur, and Tobias (NOTE: he did not mention Maloney, Van Heuvelen, Thornton/Laws/Sokoloff, and others). Some of the contemporary issues in introductory physics include some of the following projects: IUPP, Merzbacher, MUPPET, Moore, Miami group, Holbrow. and Aubrecht (NOTE: again he did not mention projects such as Workshop Physics, Tools for Scientific Thinking, Real Time Physics, and the TYC Project.) Other areas include modeling, spreadsheets, MBL, video and text. In the area of multimedia, one would need to improve the : video/audio quality; integration of tools; the acquisition, analysis, visualization, and storage of data.

Lillian McDermott, University of Washington, talked on "How Research Can Guide Us". She discussed the gap in what we teach and what students learn. The challenge, she felt, is to close the gap with a strategy that is practical, flexible, and sustainable with the characteristic of the active mental engagement of students. Lillian says her "data indicates that lecture does not matter." (NOTE: this is another confirmation of the lack of enduring influence of the lecture mode of instruction). One example she gave of a pre-test item is the following-

Compare force by string #1 on Block A with force by string #2 on Block B.

The general post results were very poor for both introductory students and TAs. Lillian's suggestion on misconceptions were the following:

To address misconceptions:

Generate conceptual conflict - elicit then confront then resolve

Reinforce conceptual change - apply then reflect then generalize

To develop scientific reasoning skills

Ask qualitative questions that involve multi-step reasoning

Require explanations of reasoning

Emphasize the role of reasoning (throughout entire course, include examinations).

She ended by noting again that "teaching by telling is an ineffective mode of instruction."

There was a panel discussion on "Laboratories" including R. Hilborn (Amherst College) as Chair, Raphael Littauer (Cornell Univ.), Pat Cooney (Millersville C.), and Richard Peterson (Bethel College - MN). Hilborn stated that in the mid-1800's, Hall (of Hall effect fame) established the practice of having a laboratory as part of the college course. Dick Peterson wants the laboratory to teach and reinforce concepts; to teach experimental analysis and skills; and to teach and to give students an opportunity to experience the experiment method. Raphael Littauer discussed frustration index for students and felt that it should be somewhere between 0 (none) to 1 (total dropout). Pat Cooney stated his goals for the laboratories were: (1) to provide relevant concrete experiences; (2) to provide a structure for expression by students; (3) to provide a chance to do modeling; (4) to develop transferable skills; and (5) to provide a setting to create an environment for students. One comment noted from the audience was that students should only do probably 3 or 4 experiments during a semester. Each experiment would give them a chance to investigate, analysis, re-do the experiment, re-analysis, and continue this process until they had finished a "good" experiment.

E. F. "Joe" Redish (University of Maryland) presented his ideas on "What Can You Do With a Computer". Joe started with the statement that "students think differently than we do!" Telling is not enough, i.e., "have to "do", not just "hands-on", need to be "brains-on". He wants the students to construct knowledge. He then addressed the question on "How can the computer help?" He thought this could be done by the computer providing tools: for seeing the real world— MBL & video; for video which can help make the link to the real world; and for building mental models - self controlled images (He pointed out an interesting E field program is called "EMField" from Academic Software). He finished with a "nice" warning quote, "You can spend a lot of time on fancy physics, and forget about the student."

Ron Thornton discussed the "Microcomputer-Based Labs and Interactive Demonstrations: Learning Physics Concepts Using New Technologies and New Approaches to Learning." He suggested teaching dynamics using the Tools for Scientific Thinking approach so that student understands Newton's Laws well. Ron made specific recommendations if one had not worked out a specific plan on their own. He suggested that one use the TST, Workshop Physics or Real Time Physics approach in the introductory course - at least in the la-

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boratory if not the whole course. He posed the question "Why Change?". One compelling reason, he stated, was that "traditional" lectures only improved student understanding by 10%. Several studies have shown this result to be true. He further stated "data is very convincing that students who do not understand velocity and acceleration, can not (and do not) understand dynamics and/or forces." He proceeded to show the results from several studies to support this argument. He also indicated that calculus-based and trig-based students perform about the same (with calbased about 10% better) and improved about the same.

The next part of the program was a panel discussion on "How Will Technology Change the Classroom?" John Risley (North Carolina State University) was the chair. Cindy Schwartz (Vassar College) discussed the use of Interactive Physics II in the classroom. She assigns two student projects a semester using the IP2 as the design tool. David Sokoloff (University of Oregon) gave some examples of TST-like activities and talked a little about the new circuit sensors and activities. Priscilla Laws (Dickinson College) discussed how should technology changes affect the classroom. One powerful way was to have similar tools so that students did not have to learn a new piece of equipment each week. Bruce Sherwood (Carnegie-Mellon University) discussed three developments which has changed the classroom for him, which are: high quality of desktop publishing programs; good demonstration, such as a beat demonstration; and computer generated video visualization segment, such as one of the magnetic field around a wire. Ron Thornton (Tufts University) presented more data to support MBL use in the classroom/laboratory. He also proposed a course for humanists to get more students at least aware of science. John Risley finished the session with some general comments on what Academic Physics software is trying to accomplish in computer software to support the teaching of physics in the classroom.

Yun Ying (Southeast University in China) started the Saturday's activities with a talk on "Reforming and Constructing the Introductory Physics Course in China". She said that there were 1,000 universities and colleges in China, divided into three types - comprehensive universities (for science majors), institutes of technology (engineering majors), and normal colleges (for teachers). There were 36 key universities in China. The typical physics major started the university with a 2 yr. sequence of introductory physics comprising 300 hours of instruction. Engineering majors took 200 hrs (140 hrs. lecture, 60 hrs lab work) in a one year sequence of introductory physics. A reform movement in the introductory physics sequence occurred during 1987-1993. Some results/areas investigated include: (1) textbook; (2) interposed video tape (she showed three tapes, one on rotating motion vector showing both circular motion and then SHM by rotating the circular motion perpendicular to the viewing plane; a second tape on the center of mass using a rectangular plate with several cylindrical recesses filled with ink- one recess being at the center of mass- launch the plate with a force not through the center so that it travels over a horizontal surface with the plate rotating; a third tape on a precessing bicycle wheel; (3) computer; and (4) guide book for students and teachers. A good new book was "New Concept Physics" by Zhao that changed the approach in the introductory course from Newton's Three Laws of Motion to the Three Conversation Laws - linear momentum, energy, and angular momentum. (This book focused around fostering the student's ability of intuition.) A second part of this reform movement was the reform in the laboratory. This has led to the following: physics majors perform 31 fundamental experiments and 18 selected experiments in the introductory lab with the engineers doing roughly the same number of experiments adjusted for a one year sequence.

Sheila Tobias (associated with Arizona State University) next talked on "Moving the Mountain: How Do We Get the Physics Community to Change?" She claimed that the "Ideology of Science" included the following aspects:

Elitism - We only want the Best
Predestinarianism - Talent will show up early if at all
Science is a "Calling" - Unwavering, single-minded commitment to it
Solipsism - Extrapolating from our own experience.

She also discussed the Master Learner as Auditor concept where you obtain a "master learner" to evaluate your course and program. If you are really interested in improving your course, you may want to consider having your students elect a student representative. Other items that she discussed were: quality management - a department based audit; what is within our control to change and to improve; what is outside of our control to change and to improve; and what can we do tomorrow to improve our program.

A panel discussion followed on "The High School-College Interface" chaired by Karen Johnston (North Carolina State University). Jim Minstrell (Mercer Island H.S., Washington) spoke on what high school physics teachers could do in preparing their students to learn physics. He felt that high school physics teachers should worry less about what universities want and more about what students can learn (and learn well) in a given year in high school. Robert Morse (St. Albans School in Washington D.C.) discussed what the high school physics teacher can do, but may not be able to do because of a lack of preparation and knowledge on how to do it. Sandra Harpole (Mississippi State University) spoke about the many opportunities that college faculty could engage in not with just high school physics teachers, but with primary and middle school teachers as well. Gerhard Salinger (of the National Science Foundation) was the first speaker to even mention two year colleges in the entire conference. Salinger stated that 25% of high school students go to four year colleges; 35% of high school students go to two year colleges and that 40% of high school students do not go to college. He also mentioned that

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more than 50% of introductory physics at the college level is taught at the two year college. He suggested that any curriculum reform should include the two year college faculty as well.

The first session in the afternoon featured Eric Mazur (Harvard University) who discussed "Understanding or Memorization: Are We Teaching the Right Thing?" He first addressed the "problem" which was that even Harvard students did not understand introductory physics material, even if it was carefully planned and vigorously delivered. After administering the Force Concept Inventory to his class of 200 + students, his students did well, but not spectacularly. The "cause" seem to be, in part, due to the traditional lecture mode of instruction. His students needed the advantage of active participation during the class. His "remedy" was to institute "one on one" instruction. Although this helped some, it did not substantially improve his class understanding of fundamental concepts. He next tried "small group instruction", but this still did not improve class performance to the level he thought Harvard students should be. The third trial was "peer instruction" which he did in the following way:

prerequisites - make sure student had them
lecture - discuss the relevant ideas with minimal examples and derivations
concept tests - would pose a question, give them 1 minute to reflect individually, vote on the answer, then 1 minute to present their view to their neighbor, then a second vote which he would tally and record
feedback - then he would present a mini-lecture/ discussion of the concept and discuss the correct answer

He felt his results were much better than before. He has developed dozens of these "concept tests" that he is using in his introductory class.

The next presentation was a panel discussion on "Future of Text and Electronic Publishing" in which Robert Fuller (University of Nebraska) was chair. Susan Saltrick (of John Wiley and Sons) gave an elegant and humorous presentation on an editor's view. She thought there would be major changes in publication, but that printed materials would have a place even in the future. Kenneth Krane (Oregon State University) thought more specifically that the textbook would still be an integral part of the course for many years. Joe Redish (University of Maryland) thought printed materials may have a place, but some electronic media (maybe not the CD ROM) would carry the brunt of information to the "consumer". The classroom of the future may be your own home with interactive media being the presentation mode. Fuller thought maybe the "infomall" may be the answer.

In the last session, Priscilla Laws (Dickinson College) presented "A New Order for Mechanics". Priscilla proceeded to present the New Mechanics Sequence of Topics which is what we now call Real Time Physics. One of the new features is to work on 1-dimensional extensively and then to deal with 2 dimensional motion (which includes problems on an inclined plane as well as the traditional ones). Priscilla felt that this was a very obtainable sequence for a normal one-semester course.

The final panel discussion was on "What Modern Physics?" which was chaired by John Rigden (American Institute of Physics). Panelists were Gordon Aubrecht (Ohio State University), and Charles Holbrow (Colgate University). The panelist discussed what topics of modern physics should be included in the introductory physics course. There was no consensus, particularly between and among the audience and the panelists.

There were informal discussions in the evening and workshops were available after the conference. The proceedings are supposed to be published quickly.

1993 AAPT CPTYC)

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What Is Tech Prep?

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Tech prep is envisioned as a four year program starting with the junior year in high school and finishing with an A.A. degree at a community college. It is intended to serve the middle 50% of high school students. The rationale is that the top 25% of high school students go on to 4-yr colleges and the bottom 25% receive attention in the form of extra counseling and remedial courses. The tech prep goal is to teach students about the physics of technology and teach them problem solving skills so that they are immediately employable in industry in technician-type positions. Besides the physics, there are also tech prep courses teaching applied English (communications) and applied math.

Tech prep is offered in pockets across the country. California is the first state to buy into the program statewide. There have been pilot programs in high schools for the last 3 years. Now there is an effort to implement Tech Prep statewide. In California, the tech prep effort is organized around consortia. One consortium consists of a community college and the nearby high schools.

Tech Prep Junior Year High School Program:

Unit	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Topic	**Force**	**Work**	**Rate**	**Resistance**	**Energy**	**Power**	**Force Transformers**

Tech Prep Senior Year High School Program:

Unit	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Topic	**Momentum**	**Waves & Vibration**	**Energy Converters**	**Transducers**	**Radiation**	**Light & Optics**	**Time Constants**

I attended a "train the teacher" workshop in Fresno, Calif. during the week of Monday 6/27/93 for the physics course, which is called "Principles of Technology". This was specifically for training high school tech prep teachers. My participation as a community college instructor was to become familiar with the program so that I could assist my high school team members when questions and problems arise. During my workshop we covered the material presented in the first 5 units during the first year of tech prep (junior year in high school).

Each unit is broken into four subunits. Each subunit applies the main topic to one of four different types of systems: mechanical, fluid, electrical, and thermal.

The format of each subunit is:

1. An overview - unit objectives, general learning approach, summary of main ideas.
2. Introduction to the terminology, concepts, and equations with detailed worked out examples.
3. Student exercises - a fill-in-the-blank format for reviewing the terminology and some very simple numerical problems.
4. Math skills introduction, examples, and exercises.
5. Laboratory experiment - usually four experiments; one with each type of system.

There are 8 to 10 minute video tapes that introduce each unit and each subunit. They give a lot of on the job examples of the ideas to be studied in each unit.

There are standard experiments for each subunit. Hardware can be purchased on your own or thru one of several vendors who assemble and package the equipment necessary for each experiment. The most economical approach would probably be to buy a complete set of hardware for one lab station, use it, then look for alternate sources. Much of the hardware and instrumentation can be purchased from other vendors.

These materials were developed by The Center for Occupational Research and Development (CORD), 601 C Lake Air Drive, Waco, TX 76710

My evaluation of the program in a nutshell: it is a worthwhile program that is attempting to correct a gaping hole in the education system. The curricular materials can and should be used as-is with rewriting done after use. However, the material has many pedagogical flaws. The curriculum needs to be rewritten to make it more accurate in its use of physics terms and concepts. This can be done while still keeping the presentation simple enough for the non-academic student.

It will be two full years and probably three years before enough high school students have gone thru the tech prep curriculum to warrant offering the rest of the physics of technology sequence at Chaffey Community College. During the 95-96 academic year I will look at implementation of the Principle of Technology community college course. To do that I will need the complete curriculum developed by CORD for community colleges that is called Unified Technical Concepts. If someone asks you to become involved in tech prep, I would demand a complete copy of the curricular ma-

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terials for both high school (Principles of Technology) and community college (Unified Technical Concepts) before I did anything.

I should add that I have declined to participate in the coordination effort with the high schools. My reasons why are explained below in an excerp from my letter to the director of our tech prep consortium. From the letter: My priorities are:

1. my health - physical and mental

2. my family

3. my job.

At my job my priorities are:

a. provide my students with the best possible learning environment,
b. I am physics department head with responsibilities that include equipment and administrative responsibilities.
c. furthering of physics education in my community and thru activities with the American Association of Physics Teachers.
d. other things, such as Tech Prep.

In the last year and a half, I have attended three workshops (sponsored by the National Science Foundation) that delt with how to do a better job teaching physics. This is my number one job priority. It will take me a minimum of two academic years to fully incorporate the material from those workshops into my courses. This work alone will require all of my time. I do the minimum as physics department head, which is entirely uncompensated. Occasionally I attend physics education meetings and go to local schools to promote science education. My point is that by the time I get to 3d on my list of priorities, I have no time left.

If I were compensated at a reasonable rate ($35 per hour) then I might reorder my priorities. But since participation in Tech Prep (other than implementation of the community college course) is poorly compensated, I decline to participate. The idea of having high schools and community colleges work together to implement Tech Prep is good. However, I see an open-ended committment of my time with no intent to compensate me for my time.

There appears to be some money for everything in the Tech Prep budget except pay for teachers. This is consistent with the California approach to education which is to have the teachers do more and more but never offer them additional compensation for their time.

TYC Physics Workshop Project*

Directed by
Curtis Hieggelke, Joliet Junior College (IL) and
Tom O'Kuma, Lee College (TX)

***NSF Grant USE # 9150334, USE #9154271, DUE # 9255466**

Three NSF, Joliet Junior College, and Lee College supported programs have provided twelve faculty and curriculum development workshops over the past several years for CC physics teachers around the country. In total, 252 participants from 142 TYCs from 33 states and territories have attended these workshops.

There have been two kinds of workshops: one on using microcomputer-based laboratories (MBL) and the other on conceptual exercises (CE) and overview case-studies (OCS). Professors Ron Thornton, Tufts University; Priscilla Laws, Dickinson College; David Maloney, Indiana University-Purdue University at Fort Wayne; and Alan Van Heuvelen, Ohio State University led these workshops. Both of these workshops presented details on teaching/learning strategies that are based on developments in physics education research.

The most recent efforts in 1993 provided for three introductory workshops (Lenoir CC-NC, San Jose CC-CA, Green River CC-WA) and two follow-up workshops (MBL at Joliet and CE/OCS at Lee College). They involved over 100 participants from approximately 80 two-year colleges located in different 25 states/territories (CA-16, NC-8, TX-7, FL-7, WA-6, NY-5).

Another NSF grant has been awarded to continue these workshops and the 1994 schedule has been set as follows-

Introductory Level

CE/OCS	April 7-9	Seminole CC Sanford, FL
MBL(Mac)	July 28-30	Pikes Peak CC Colorado Springs, CO
MBL(MS-DOS)	Sept. 22-24	Chaffey CC Alta Loma, CA

Follow-Up

CE/OCS	June 24-26	Joliet Junior C Joliet, IL
MBL	Nov. 17-19	Lee College Baytown, TX

For the short application form, write TYC '94 Physics Workshops, Natural Science Department, Joliet Junior College, Joliet, IL 60436 or call 815-729-9020 x 2603 or 800-728-1050. Write also if you would like a copy of the newWinter 93/94 *CaFD*.

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cal experience in specific job training . All the courses are lab orientated and stress computer training whenever possible. Thus, Tech Prep courses do not heavily stress theory or general abstract knowledge about technical applications.

4) Concerning Physics: CORD (Waco, TX) developed "Principles of Technology" (PT) as a two year high school physics course with heavy emphasis on laboratory experience using materials found in industry. CORD also has a PT publication expended for community college vocational students and I use this material in our vocational Applied Physics courses.

A third publication (Wiley), "Physics For Technicians--A Systemic Approach", follows the PT outline, but has significantly more depth and a lot of graphical analysis (treatment of lab data) of industrial applications.

CORD has received continuous government support since 1978 to develop the PT materials, especially the lab exercises. They have also developed a comprehensive, lab based math stressing applied mathematics up to (but not including) calculus.

5) Learning Labs (Calhoun, GA), has computer assisted lab modules for PT physics--an easy lead into the techniques noted in the Microcomputer Based Laboratories Workshop. A real advantage for the instructor (especially the part time instructor) and student is the short lab set-up and break-down time. Classroom management (grading, progress tracking, etc.) is enhanced by the computer. Since PT is lab orientated, techniques uncovered in the workshop on Conceptual Exercises and Overview Case-Studies are a natural.

6) Why is PT so different from the classical physics?

PT uses a systems approach. For instance, the first chapter covers Force. Force (I use Newton's Laws as an introduction) causes change. Thus force causes change in

a) linear mechanical applications
b) rotational mechanical applications
c) thermal applications
d) electrical applications
e) fluid applications.

A force concept is introduced in each application:

a) linear mechanics: Force (F)
b) rotational mechanics: Torque(τ)
c) thermal: Temperature Difference (ΔT)
d) electrical: Voltage (V)
e) fluid: Pressure Difference (ΔP)

Chapter Two (Work) introduces the change that takes place in an object when a force acts upon it.

a) linear: $W=F \bullet d$
b) rotational: $W=\tau \bullet \theta$
c) thermal: $W=\Delta T \bullet Q$ (Q is heat energy)
d) electrical: $W=V \bullet Q$ (Q is charge in coulombs)
e) fluid: $W=P \bullet \Delta V$ (V is volume)

Thus, already you can detect differences between PT and the classical physics approach: differences which seem to offend instructors of classical physics. I think the primary cause of criticism of PT by (for example) (1) Mary Beth Todd Monroe in the recent *TYC Physics Teacher Newsletter*, pg. 8 and (2) Tom O'Kuma, in a private conversation held in Florida last October, is based on the vast difference between classical and PT physics. PT stretched concepts to make force act on an object resulting in work in all the five systems noted.

The PT for technicians course outline continues using

Ch 3 Rate (time ratios)

Ch 4 Momentum

Ch 5 Resistance

Ch 6 Potential & Kinetic Energy

Ch 7 Power

Ch 8 Force Transformers (includes simple machine applications, an important concept to vocational and technical students)

Ch 9 Energy Convertors

Ch 10 Transducers

Ch 11 Vibrations & Waves

Ch 12 Exponential Constants of Linear Systems

Ch 13 Radiation

Ch 14 Optics and Optical Systems

I am excited about implementing the PT physics into a College Transfer physics course--using the same PT lab emphasis and equipment in place of the lecture. I remember well the comment in the Workshop-"Lectures answer questions the student never asked." Hopefully, the lab and the workshop techniques on conceptual exercises will elicit questions from the student.

This is a brief idea of PT— and yet too long for you to use. Feel free to do anything with these comments that you wish—including spilling coffee on them and casting them into the basket.

Curtis, thank you for the ideas and the opportunities you and Tom have opened up for me. I appreciate your efforts.

From the editor.....

The views expressed in *TYC PT Newsletter* are those of the authors and not necessary those of the American Association of Physics Teachers (AAPT) or Joliet Junior College. Permission is granted to use materials provided appropriate credit is given to the author and this publication.

Responses and other submissions are encouraged and should be sent to:*TYC PT Newsletter*, c/o Curtis Hieggelke, Natural Science Dept., Joliet Junior College, 1216 Houbolt, Joliet, IL 60436 or e-mail cjh@AIP.ORG.

Support for this newsletter was provided by AAPT and Joliet Junior College (Joliet, IL) as well as those individuals who submitted items to share with us. Please send articles for the next issue.

Not included with this issue is the latest edition of the *CaFD* newsletter, if you want a copy write us.

Bits and Pieces...

Going to the Notre Dame meeting in August? If you are you should consider spending a day or two in the Chicago area. Things to see include the Museum of Science and Industry, FermiLab, Argonne National Lab, and perhaps even Joliet Junior College. Also, if you like camping and swimming, Warren Dunes State Park in Michigan or Indiana Dunes National Park have excellent facilities-call early to get reservations.

Myra West (Kent State University-Stark, Canton, OH 44720, 216-499-6900 x444) has replaced Linda Stamper as chair of the CPTYC. Linda had a great opportunity and has left physics teaching. Joing the CPTYC in January will be Mark Bunge from San Jose City College (CA) and George Tucker from Sage Junior College (Albany, NY).

Did you notice the new proposed project TYC21 in the December *Announcer*? See page 125 and also the abstract BI on page 62. Expect to hear more about this in the future.

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