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Summer 00

Curriculum **a**nd **F**aculty **D**evelopment Newsletter for Two-Year College Physics Teachers

Two-Year College Workshop Project

Supported by the

National Science Foundation,

Joliet Junior College (IL),

and

Lee College (TX)

http://tycphysics.org

Editor's Note: Most of this newsletter is focused on the IPC4 conference that was held last summer. It features the results of the group participant projects.

IPC4 Group Project Reports

Tom O'Kuma
Lee College
Baytown, TX

One of the most exciting activities at the Introductory Physics Conference 4 (IPC4) was the group projects that the participants created while at this conference. The participants were assigned to a group ranging in size from 2 to 4 members. Each group was charged to create an activity appropriate for their introductory physics students using internet and Web tools such as the instructional design and course information structure of the Blackboard system as well as the tools and templates of the Just in Time Teaching (JiTT) approach. Each group was also encouraged to develop and use TIPERs (Tasks Inspired by Physics Education Research) in their projects.

The groups were formed on Thursday evening after participating in sessions on the Blackboard system, JiTT activities and approach, how to make Web pages, and recent physics education research results. During the next day and a half, approximately seven hours were allocated for group work on these projects. The groups continually worked on their projects during this part of the conference, incorporating ideas from new sessions that provided additional ideas and tools. Many groups spent additional hours outside of the conference schedule to collect their ideas, design their presentation, and construct their presentation into a Web-ready format.

In this article, I will present a brief overview of each of the eight group projects in the same random order they presented their work at the end of the conference. I think the group projects produced excellent materials that are almost ready to use.

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IPC4 Overview

Curtis Hieggelke
Joliet Junior College
Joliet, IL

The fourth TYC Introductory Physics Conference (IPC4) was held at Joliet Junior College from June 9 to June 12, 1999. This working conference served as a follow-up activity to our earlier workshops on Workshop Physics and Microcomputer-Based Laboratories (MBL), Conceptual Exercises and Active Learning Problem Solving (CE/ALPS), and Microcomputer Physics Simulations (PS) workshops. IPC4 was funded by residual funds from the TYC Physics Workshop Project and Joliet Junior College. Twenty-four participants (see page 11) representing sixteen states from California to North Carolina attended the conference.

The general focus of this conference was the Internet and Web Connected Introductory Physics Courses. We looked at what we could and might be doing with this new tool in teaching physics, what are some of the problems and challenges in this area, and what works and what doesn't. The goal of the IPC4 was to provide participants with useful information and hands-on experiences relevant to physics at two-year colleges (TYCs) using the Internet and/or Web. This conference covered to some degree the various aspects of this area running from supplemental activities and opportunities to offering online courses.

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Many of the materials developed are available at the Web site for this project: http://www.tycphysics.org/. To find the materials, go to the "Past Workshop and Conferences" section and then select the "IPC4."

Web Page Support for Project Based Instruction

Alex Azima, Lansing Community College, Lansing, MI
Chad Davies, Cloud County Community College, Concordia, KS
John Griffith, Linn-Benton Community College, Albany, OR
Paul Marquard, Casper College, Casper, WY

This group presented two related projects. The first was taking an existing curriculum piece and making it into a Web augmented activity. The second was taking a portion of the first project and making a stand-alone curriculum piece.

The first project was a project-based component of the calculus-based course taught at Cloud County Community College (but adaptable to any college) known as the University Physics Project (UPP). The group took the existing Web pages for this component and added a number of JiTT activities and links. The UPP is comprised of three projects that the calculus-based students do during the semester. Two of these projects were modified during the IPC4.

The first student project is "Designing the Perfect Airplane." This project is designed to be class-as-a-whole project (i.e., the whole class does the project). It starts with the "Project Description" that gives an overview of the project criteria. The goal was to design the "best" paper airplane as a group. Each group could submit up to 3 different planes into the competition, but the best plane's performance was used to determine the group's grade. The only instructor imposed limitation was that each airplane had to be constructed from one sheet of paper.

The "Possible Evaluation Criteria" link gives the student an overview of the possible criteria considered for the project. "The Preflight Homework" is a JiTT activity developed by the group members.

This "preflight" activity should be done and submitted before the next class by the students for the instructor to consider in designing the next class. The questions developed were:

a. What do you think would be MOST important in determining the best paper airplane out of a group? [open response]
b. How would you measure the above? [open response]
c. Which of the following factors do you think will have the greatest effect on the criteria you selected in question 1? [multiple choice]

Another group-developed Web page was "Paper Airplane Design Ideas." The group was able to find four excellent links to existing Web sites on the Internet. The final section on this Web page is the "Uncertainty and Error" which contains excellent descriptions of the uncertainty and error involved in an activity like this.

The second project is "The Rocket Launch" which is designed to be a team project with everyone on the team getting the same grade.

This project starts with a "Mission Briefing." Each team is to build, test, and fire a 2-liter bottle rocket meeting the following criteria. The rocket will be filled with 1 liter of water and pressurized with a pressure between 80 and 120 pounds per square inch. The rocket must travel to a target 300 feet away and go at least a height of 100 ft. The rocket must carry an egg to the target undamaged. The rocket must be launched at an angle from 0° to 40° from a standard launcher. Each group has a maximum of 3 launches either with a single rocket or with multiple rockets.

Students can look at some background information in the "Sounding Rockets" link.
The "Preflight homework" has two activities developed. "Activity #1", a JiTT preflight activity, has these questions:

a. What are the primary advantages of using a sounding rocket? [open response]
b. You wish to launch a projectile 100m with an initial velocity of 30 m/s. One person tells you to launch at an angle of x degrees and another tells you to launch at an angle of y degrees. Which person, if either, do you listen to. Give a detailed explanation for your answer. [open response]
c. Which of the following physical factors do you think will have the greatest affect on the distance your rocket flies? [multiple choice]

"Activity #2" was a new activity designed primarily by Paul Marquard and Alex Azima. This JiTT activity has some TIPERs associated with the 3 questions. After running the physlet that simulates the path of "the little rocket that couldn't."

a. Which of the following motion diagrams best represents the upward

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motion of the rocket? Be sure to explain your reasoning in detail in the text box below. [Physlet, multiple choice, and open response]

b. Please determine the maximum speed of the rocket. [open response]

c. What is the physical process that explains the motion? (i.e. What is going on that causes the rocket to have this motion?) [open response]

d. What is the initial thrust of the rocket if its mass is 500 g? [open response]

Another part of this project page that was not completed is a section on "Video Capture Notes." This page is intended to explain how to do the video capture of the rocket.

JiTT for GEO

Oscar Grant, Mississippi County Community College, Blytheville, AR

Todd Leif, Cloud County Community College, Concordia, KS

The first part of this project was designed to be used with geology, physical science, and perhaps conceptual physics. It is an exercise in scientific reasoning built around a JiTT preflight activity called "Geology and the Scientific Method." In this preflight activity, these questions were posed to students:

a. Study the first five diagrams to the left (not shown here). Discuss five pieces of evidence needed to reach the conclusions that Wagner reached in his continental drift theory. These pieces of scientific evidence should be different than the most apparent "jigsaw puzzle" fit of the continents as seen in the present day view of the world. [open response]

In this question, the five diagrams were global views of the continents during the Permian era, Triassic era, Jurassic era, Cretaceous era, and the present era.

b. "In the space of one hundred and seventy-six years, the Lower Mississippi has shortened itself by two hundred and forty-two miles. That is an average of a trifle over one mile and a third per year. Therefore, any calm person, who is not blind or idiotic, can see that in the Old Oolitic Silurian Period, 'just a million years ago next November,' the Lower Mississippi River was upwards of one million three hundred thousand miles long, and stuck out over the Gulf of Mexico like a fishing-rod. And by the same token any person can see that seven hundred and forty-two years from now the Lower Mississippi will be only a mile and three-quarters long, and Cairo and New Orleans will have joined their streets together, and be plodding comfortably along under a single mayor and a mutual board of aldermen. There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact."

Discuss the apparent fallacies in Mark Twain's argument in reaching the conclusion that he reached in the poem above, which is from "Life on the Mississippi." Also discuss the pieces of evidence he needed to have had to reach his conclusions. [open response]

c. The Scientific Method is best defined as …? [multiple choice]

d. Below is a space for your thoughts, including general comments about today's assignment (what seemed impossible, what reading didn't make sense, what we should spend class time on, what was "cool", etc.) [open response]

In assessing what was presented during IPC4, Todd stated that JiTT was a time management program (to manage students' time outside of class); Blackboard was a course management program (to manage our time outside of class); and Logal and physlets are a way of delivering content. What was missing was evaluation.

This group developed a new evaluation tool, called After Class Evaluation (ACE). ACE is an extension of JiTT and is a form to create and present ranking tasks. Todd demonstrated his ACE ranking task and went through several examples. This first one is an optics ranking task. The second ACE is a Newton's Cradle ranking task. The third, and last ACE, is a transformer ranking task which is the JiTT template.

The optics ACE ranking task asks the question "Below are pictures (not shown) of six convex lens demonstration apparatus, each of which have different focal lengths. Rank the situations based upon image location if the given values of object location are as shown. Rank them from highest to lowest, based upon the distance from the center of the lens and place your ranking into the text box below where the system will automatically place your answer into the instructor's mailbox." Todd discussed how to draw the figures and how to go to the code to change the labels on each picture. Two modifications that Todd made to the ranking task

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template was first to change the "How sure are you of your answers" to multiple choices. The second change was adding a comment section (open response) at the end of each ACE task.

To set up the momentum ACE ranking task, the group used an applet for the Newton's cradle. The question posed was "Below are pictures (not shown) of eight 'Newton's Cradle' momentum demonstration apparatus, each of which have the same total number of balls hanging from the cradle (8 of them).

Rank the number of balls that were displaced from the right end of the cradle if in each situation shown the number of input balls increased by one. i.e. Picture A one ball into, How many out? Picture B two balls into, How many out?

Rank the following from highest to lowest, based upon the number of balls that come out from the right end on the apparatus, and place your ranking into the text box below where the system will automatically place your answer into the instructor's mailbox."

To set up the transformer ACE ranking task (really the template), the group imported a figure into the JiTT template. The question posed was "This is the place where you need to put your instructions for the ranking task you create. Rank the following information based upon the following standards and the given pictures and information. Carefully write instructions for your students to analyze, be sure to make your ranking task instructions explicit so that the students will have to search their minds for various patterns and methods to solve the problems. A final statement that says.... Rank the following from highest to lowest, and place your ranking into the text box below where the system will automatically place your answer into the instructor's mailbox."

To find the latest ACE developed by Todd Lief look at
http://www.cloudccc.cc.ks.us/dept/science/T3Grantstuff/trlacephys.htm.

"A List of Physlets"

Bob Eshelman, Henry Ford Community College, Dearborn, MI
Dierk Hofteiter, Illinois Central College, East Peoria, IL
Bill Keller, St. Petersburg Junior College, Clearwater, FL
Alex Neubert, SUNY College of Technology at Canton, Canton, NY

This group wanted to list all the physlets (physics applets) that they could locate. Since there are so many, they elected to categorize sites by physics topics that have physlets.

The Web sites of the physlets listed below are arranged by topic. Most Web sites contain more than one type of physlet. Consequently, Web sites are often listed under more than one topic heading. A good introduction to physlets can be found at Wolfgang Christian's Web site at Davidson College at
http://webphysics.davidson.edu/Applets/Applets.html.

The following sites contain a number of good physics applets that are suitable for introductory physics teaching.

Mechanics

http://pathfinder.esu2.k12.ne.us/java/physics/physengl/physengl.htm
http://www.physics.nwu.edu/vpl
http://jersey.uoregon.edu/vlab/
http://www.developer.com/directories/pages/dir.java.educational.physics.html
http://odin.cbu.edu/~jvarrian/Appcol.htm
http://www3.adnc.com/~topquark/fun/applets.html
http://java.sun.com/contest/winners.html
http://webphysics.ph.msstate.edu/javamirror/
http://pathfinder.esu2.k12.ne.us/java/physics/physengl/physengl.htm
http://webphysics.davidson.edu/Applets/Applets.html
http://galileoandeinstein.phys.virginia.edu/
http://home.augsburg.baynet.de/walter.fendt/physengl/physengl.htm
http://monet.physik.unibas.ch/~elmer/pendulum/lab.htm
http://www.phy.ntnu.edu.tw/~hwang/
http://www.gamelan.com/directories/pages/dir.java.educational.physics.html
http://icpr.snu.ac.kr/education/applet.html
http://www.phy.syr.edu/courses/java-suite/crosspro.html
http://plabpc.csustan.edu/java/
http://comp.uark.edu/~jgeabana/progr.html

Thermodynamics

http://webphysics.davidson.edu/Applets/TaiwanUniv/index.html
http://jersey.uoregon.edu/vlab/
http://galileoandeinstein.phys.virginia.edu/

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http://www.gamelan.com/directories/pages/dir.java.educational.physics.html
http://plabpc.csustan.edu/java/
http://comp.uark.edu/~jgeabana/progr.html

Electricity and Magnetism

http://pathfinder.esu2.k12.ne.us/java/physics/physengl/physengl.htm
http://webphysics.davidson.edu/Applets/TaiwanUniv/index.html
http://jersey.uoregon.edu/vlab/
http://www.developer.com/directories/pages/dir.java.educational.physics.html
http://odin.cbu.edu/~jvarrian/Appcol.htm
http://shakti.trincoll.edu/~bwalden/phys231.html
http://www3.adnc.com/~topquark/fun/applets.html
http://webphysics.ph.msstate.edu/javamirror/
http://pathfinder.esu2.k12.ne.us/java/physics/physengl/physengl.htm
http://www.Colorado.EDU/physics/2000/
http://webphysics.davidson.edu/Applets/Applets.html
http://home.augsburg.baynet.de/walter.fendt/physengl/physengl.htm
http://www.phy.ntnu.edu.tw/~hwang/
http://www.public.usit.net/wiarda/index.html
http://www.gamelan.com/directories/pages/dir.java.educational.physics.html
http://www.crs4.it/~mameli/JAVA/LibLabE.html
http://icpr.snu.ac.kr/education/applet.html
http://plabpc.csustan.edu/java/

Optics

http://pathfinder.esu2.k12.ne.us/java/physics/physengl/physengl.htm
http://webphysics.davidson.edu/Applets/TaiwanUniv/index.html
http://www.physics.nwu.edu/vpl
http://jersey.uoregon.edu/vlab/
http://odin.cbu.edu/~jvarrian/Appcol.htm
http://webphysics.ph.msstate.edu/javamirror/
http://pathfinder.esu2.k12.ne.us/java/physics/physengl/physengl.htm
http://www.Colorado.EDU/physics/2000/
http://galileoandeinstein.phys.virginia.edu/
http://home.augsburg.baynet.de/walter.fendt/physengl/physengl.htm
http://www.phy.ntnu.edu.tw/~hwang/
http://www.gamelan.com/directories/pages/dir.java.educational.physics.html
http://www.crs4.it/~mameli/JAVA/LibLabE.html
http://icpr.snu.ac.kr/education/applet.html
http://plabpc.csustan.edu/java/

Waves

http://webphysics.davidson.edu/Applets/TaiwanUniv/index.html
http://odin.cbu.edu/~jvarrian/Appcol.htm
http://webphysics.ph.msstate.edu/javamirror/
http://pathfinder.esu2.k12.ne.us/java/physics/physengl/physengl.htm
http://www.Colorado.EDU/physics/2000/
http://webphysics.davidson.edu/Applets/Applets.html
http://members.xoom.com/Surendranath/Applets.html
http://home.augsburg.baynet.de/walter.fendt/physengl/physengl.htm
http://www.phy.ntnu.edu.tw/~hwang/
http://www.gamelan.com/directories/pages/dir.java.educational.physics.html
http://plabpc.csustan.edu/java/
http://physics.ham.muohio.edu/fall98/phy171/wave.htm

Other

http://pathfinder.esu2.k12.ne.us/java/physics/physengl/physengl.htm
http://webphysics.davidson.edu/Applets/TaiwanUniv/index.html
http://www.physics.nwu.edu/vpl
http://jersey.uoregon.edu/vlab/
http://java.sun.com/contest/winners.html
http://webphysics.ph.msstate.edu/javamirror/
http://pathfinder.esu2.k12.ne.us/java/physics/physengl/physengl.htm
http://www.Colorado.EDU/physics/2000/
http://webphysics.davidson.edu/Applets/Applets.html
http://home.augsburg.baynet.de/walter.fendt/physengl/physengl.htm
http://www.phy.ntnu.edu.tw/~hwang/
http://www.public.usit.net/wiarda/index.html
http://www.gamelan.com/directories/pages/dir.java.educational.physics.html
http://www.crs4.it/~mameli/JAVA/LibLabE.html
http://icpr.snu.ac.kr/education/applet.html
http://plabpc.csustan.edu/java

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The Web site at http://java.sun.com/docs/books/tutorial/index.html provides a JAVA tutorial for writing applets.

Kinematics Using Modified Physlets

Don Anderson, Ivy Tech State College, Kokomo, IN
Bill Hogan, Joliet Junior College, Joliet, IL
Mark Winslow, Independence Community College, Independence, KS

This group created a series of pages that were JiTT-like using Front Page as their Web page generator. The Warm-Up activities involved 2 problems and a simulation. After viewing the demo (a Physlet imported to this page that involves the motion of a ball at constant velocity), there are 3 questions:

a. Describe the motion of the ball. [open response]
b. Describe how you would drive your car to mimic the motion of the animator above. [open response]
c. What is the sign of the acceleration of the ball? [multiple choice]

"Problem 2 Warm-Up" is a demo (another Physlet imported to this JiTT page that involves the motion of a ball undergoing constant acceleration). There are three new questions to be answered:

a. Describe the motion of the ball. [open response]
b. Describe how you would drive your car to mimic the motion of the animator above. [open response]
c. What is the sign of the acceleration of the ball? [multiple choice]

"Simulation Warm-Up" is a variable physlet where the student can type in the acceleration rate and then watch the demo. This physlet will allow the student to watch the entire demo or step through the motion of the ball frame by frame. The initial velocity of the demo is controlled by the program script.

This series of Web pages should help students visualize the various motions of the ball and build kinematics understanding. A record of the input of the student responses to the problems and simulation is acknowledged. This Web page displays the student responses to the open response and multiple choice questions.

Mark Winslow also showed his Web page and how he receives student input/submissions via the Web. His Web page is located at:

http://www.indy.cc.ks.us/science/mathsciwin.htm.

How to Use Physlets/JiTT as Warm-Up on Blackboard.com

Beta Keramati, Holmes Community College, Goodman, MS
Bill Gene Smith, South Florida Community College, Avon Park, FL
HC Snyder, St. Clair County Community College, Port Huron, MI
Bo Wessell, Wayne Community College, Goldsboro, NC

This group used the Blackboard.com site to set up their presentation. Their presentation was "Introductory Physics Online." They imported JiTT templates and physlets into the Blackboard.com Web site. By setting up a temporary course and having instructor privileges, they could build their course. When you entered the course title and password into Blackboard's main page, the student is led to the Assignment section. They imported the JiTT warmup format into the assignment page and embedded a physlet within the warm-up exercise. A student would then click on the "Homework Assignment" which would take them to a page where the physlet was located. Once the physlet was added, the group modified the script controlling the physlet animation to design their "Projectiles on Planets." This modified physlet involved the projectile motion of two objects, one on the earth and one on the moon, but the student was not told which motion was on which planet/moon. Instead, the student was asked to answer the question:

a. Which demonstration, 1 or 2, represents the path of the projectile on the earth and which represents the path on the moon? Explain your answer. [open response]

At this point the student could go back to the warm-up page and continue answering the questions (2 open response and 1 multiple choice) that were set up there. Some of the technical problems that the group encountered were associated with importing into the Blackboard pages. The script would import, but the team had to separately import the figures and the animation. Additional problems were getting everything to work on the two major Web browsers.

There was considerable discussion on how to do what this group has done, i.e., how you can use the Blackboard site to embed the JiTT warm-ups and physlets (to start building your own course). Another discussed question was how one can make what you have done accessible?

Since the conference, Beta has expanded the work started by the group to use in her general physics course. To see some of this

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work, access Beta's Blackboard course at:
http://www.holmes.cc.ms.us/mathscience/physics/index.html.
Go to PHY2414 and then Blackboard.com at the bottom of the page and enter as a Guest.

Welcome to Physics Just In Time Teaching Warm-up Questions

Emile Bernard, Piedmont Community College, Roxboro, NC
Bob Henscheid, Clark State Community College, Springfield, OH
Nick Nicholson, Central Alabama Community College, Alexander City, AL

This group described their project which was combining the JiTT templates with HTML code, CGI, HyperCard stacks, and a word program to setup their Web pages.

On their warm-up template, the questions asked were:

a. A large ball and a small ball are dropped from the same height at the same time, which hits the ground first? What needs to be considered in order to correctly answer this question? [open response]
b. Estimate the volume of the body. [open response]
c. Two identical wagons (except for color), race down a hill. Six kids are riding the red one, but only one kid is in the blue one. The wagon that wins the race will be: [multiple choice]

They then had a number of general information questions.

For honors credit, the group also asked the question

d. The space shuttle is to be occupied for a week by six astronauts. Estimate how much water should be stored on board to accommodate them for this trip.

There was a fairly involved discussion on the mechanics of doing what this group wanted to do.

Their updated work can be downloaded from the web site at
http://207.157.12.149
in the section labled "Emile, Nick, and Bob's Introductory Physics Conference 4 Materials."

Momentum Exercise

Mark Bunge, San Jose City College, San Jose, CA
Butch Diesslin, Vermilion Community College, Ely, MN
Carlos La Rosa, Colegio Regional De La Montana, UPR

This group designed a JiTT warm-up exercise on momentum titled "Action-Reaction." The team imported a gif picture of an airbag for this exercise. The questions in the warm up were:

a. All automobiles sold in the United States are now required to have airbags. The purpose of the airbags is to reduce the severity of injuries during a collision. (a) Explain, in terms of physics principles, how the airbags reduce the injuries. [open response]
b. Suppose the astronaut working on the Hubble telescope got completely loose of the shuttle and threw away a 2 kg hammer at 2 m/s. Could the astronaut remain at rest? If not, how fast would the astronaut be moving? How could the astronaut stop from drifting away? [open response]
c. An airbag reduces the injuries to a person during a collision by reducing: [multiple choice]

In addition to this warm up activity, the group designed a preview JiTT-like activity. The questions were slightly different:

a. Air bags are now required in all automobiles sold in the United States. The air bags act to reduce the severity of injury during a collision. Identify the physics concepts that describe how air bags reduce the severity of injuries during a collision. [open response]
b. How does the force exerted on the person by the air bag compare to the force on the air bag? [open response]
c. The front seat air bags are designed to inflate when the automobile is involved in a front- end collision. The sensor used to trigger the inflation of the air bag must sense conditions that would only occur during a front-end collision. Which motion quantity (or quantities) of the automobile should the air bag triggering sensor monitor to determine if a collision is occurring? [open response]
d. An automobile is cruising down a highway with an initial speed of 35 meters per second when the driver sees an impending collision and slams on the brakes. The brakes will cause the automobile to accelerate at a rate of -10 meters per second per second. Compared to the acceleration of the automobile, the acceleration of the passenger in the automobile is: [multiple choice]

The group had imported an applet to show collisions between two objects. They discussed the control features for the applet

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along with possible questions and variations that one could generate concerning the motion depicted in the applet.

The group also discussed the process of submitting student responses and retrieving the data by the instructor.

Conceptual Physics on Blackboard vs. Homebrew Conceptual Physics

Martin Mason, College of the Desert, Palm Desert, CA
Ashok Vaseashta, Wytheville Community College, Wytheville, VA

This group presented a contrast between using a commercial system (Blackboard) to develop your Web pages and/or Web course and creating your own homebrew Web pages and/or Web courses. Both Ashok and Martin have developed an online conceptual physics course.

Ashok has developed his conceptual physics course using the Blackboard system. He walked the conference participants through some of the features in his online course. Ashok uses the "Announcement" page for general announcements, but he also includes quiz materials and other features as the need arises. By clicking on "Course Information," students can see a brief course description, a list of instructional methods, grading policy, and any other information included in the course outline. Under "Staff Information," Ashok has a photograph of himself and relevant faculty information. Under "Course Documents," he has a number of course document folders. Each folder is linked to contents within each folder.

The "Assignments" section has assignments posted here, with links to files, MCT, essay/survey tests, and others. By clicking on "Communication," Ashok has a communications center. To illustrate the use of this section, Ashok showed his current "Discussion Board" that includes basic description of its purpose and existing discussion threads and links to relevant sites. Under "External Links," Ashok has set up a number of physics links that he believes would be relevant for his students. Ashok's conceptual course can be found at: http://www.blackboard.com/courses/PHY155/index.html.

Martin described his Web pages and Web course. His pages were created using Front Page. The first page shown was his general schedule page. At the IPC4 conference, Martin was able to add applets to his course site. By accessing http://desert.cc.ca.us/faculty/mmason/java/, Martin described how he used the JiTT-like warm-up exercise format to build (using an applet) his "Introduction to 2D Motion" exercise using FrontPage.

Martin's conceptual course can be found at: http://desert.cc.ca.us/faculty/mmason/physics1online/index.html . His intent was to keep the Web pages simple. His major sections of the page are: Home, Schedule, Forum, Chat, Links, Tests, and FAQ. He described all of the various parts of the Web site. All sections had hot linked parts. He pointed out that all this could be done by the instructor without using a commercial product. It was time consuming, but was manageable for him. He suggested that one should explore his online site to see if its what one wants.

Technical Physics Problems

Ali Yazdi
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The purpose of this NSF ATE supported project is to produce algebra-based physics problems for technology students using actual industrial work situations that students are likely to encounter.

To develop such problems, a development team consisting of an engineer, a technology instructor, a physics instructor (PI), a technology student and a representative from the local industry selected for visitation was set up. Industrial processes are observed and situations that lend themselves to problem development are identified by the team. Sketches and photographs were then made by a technology student who would later in the process use CAD software to produce accurate and detailed representations of the equipment and the problem situation.

Following the visit, the problem development team discusses the situation and each member drafts problems for consideration by the PI and the team. After approval by the PI, the team members and the industry representative, the problems are published (on paper and electronically) for field testing by other technical physics teachers. The goal of this project is to develop 20-30 such problems with 80-120 variations. These problems will encompass the areas of Motion, Force, Torque and Electricity.

I need to develop more of these problems, so I am open to suggestions from anyone. To see what has been done, please visit my Web site at
http://www.jscc.cc.al.us/~ayazdi.

ACE: AFTER CLASS EVALUATION
A New Feedback Loop for Just-in-Time Teaching

Todd R. Leif
Cloud County CC
Concordia, KS

The Introductory Physics Conference IV was held at Joliet Junior College in Joliet, Illinois, last summer. It was the site of origin for my latest venture in physics education reform efforts here at Cloud County Community College in Concordia, KS. The summer conference, which was hosted by the TYC Physics Workshop Project, led by Curtis Hieggelke and Thomas O'Kuma, emphasized recent innovations in using the World Wide Web as an instructional aid in the teaching and learning of physics. Headlining the program were the Just-in-Time Teaching (JiTT) developers, Gregor Novak and Evelyn Patterson. Their discussions and presentations involved the application of Just-in-Time Teaching into the introductory physics course. It was during the presentations that it occurred to me, the JiTT philosophy was just the neat little educational "tweak" I needed to solidify my other efforts at incorporating active learning into my physics and physical science classroom. However, I thought that it was missing or lacking the "*direction*" of post instructional evaluation that would make it successful for me at my institution. This missing link is what I called "*ACE- After Class Evaluation.*"

ACE is a method to assist my students in maintaining their focus in their science classes after each daily instructional session was over. It was a time management method, as well as a mind management method that allows for reflection and processing of ideas during time after classes. It is a summative evaluation tool that allowed me an opportunity to develop a better understanding of where my students were, and what direction my learning activities were taking them. Ultimately, it provides information in a quick and easy way to both teacher and student. This information helps guide the broadening of instructional and learning opportunities in introductory physics courses at Cloud County Community College.

At the foundation of ACE is the idea that student self-assessment and self-regulation is really the heart of everybody's learning. Research literature leads us to believe that this fundamental method behind student learning is greatly improved when a student has to face disequillibrating experiences which would cause an uprooting within their current cognitive thought structure. Without adequate opportunities to examine prior knowledge, students maintain their deeply rooted ideas and might leave physics class without ever changing them. These are ideas that they have held for nearly a lifetime and they need the self-regulation to form cognitive change.

How did ACE work? Basically, students were asked to participate in our normal 2-hour lab/lecture block. After such participation and within 6 hours of completing this instructional activity, they were required to log onto the course web-based home page and complete one of a number of ACE activities associated with the material that had been previously examined that day. The major types of activities that were included in the ACE Suite were the ACE Minute Essay, the ACE Ranking Tasks, The ACE Reasoning Tasks, and the ACE Evaluation Tasks. Each of these evaluation methods had a specific reason behind them and produced different types of rapid and manageable feedback for the instructor via an e-mail delivery process. A very simple html form was developed during the IPC 4 and is available at my web site: http://www.cloudccc.cc.ks.us/dept/science/T3Grantstuff/trlacephys.htm. After receiving the feedback information from my students, I was able to tailor my next sessions activities to include material that would address any concerns or problems that arose from these e-mails.

The difference in this process over the JiTT format is the fact that my students needed to do this activity after their instruction rather than before. This gave me information at least 24 hours before our next class meeting. Being at a community college, my schedule wasn't as flexible as the Novak's and Patterson's schedules. The JiTT presenters allowed for feedback a couple of hours before class, and their adjustments could be made "on the fly" before class. With their graduate teaching assistants and lab/lecture preparation help this is possible, but in a "one man" show this is less likely, and hence an adaptation such as ACE was needed.

The ACE Minute Essay idea came from research published by Patricia Cross and Thomas Angelo in *Classroom Assessment Techniques: A Handbook for College Teachers* (1994) where the active assessment technique known as the Minute Essay is discussed. The two basic questions that are usually addressed via the Minute Essay are

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"What was the most important thing that you learned in class?" and *"What important questions remain unanswered?"*

The ideas for the ACE Ranking Tasks came from the TYC Physics Workshop in *Ranking Task Exercises in Physics* book edited by the TYC Physics Workshop Project leaders Curtis Hieggelke and Tom O'Kuma along with collaborator David Maloney and published by Prentice Hall in their "Textbook Series in Educational Innovation." Each of these exercises was either a direct copy of these exercises or an adaptation of materials from previous workshop experiences at the TYC Physics workshops. The use of this material was consistent with the ideas discussed in Maloney's paper "Ranking Tasks, a new type of test item" which was discussed and distributed at the TYC "Overview Case Study and Conceptual Exercises" workshop. Many of these ranking tasks were simple "cut and pasted" into the existing form making creation of new exercises a minor task at most.

The third in the series of exercises with the ACE Suite, and the ones that are the most original ideas in the project include the Reasoning tasks. A number of problems were created as "mind teasers" or "puzzles" that would reinforce methods of problem solving not always addressed in a standard physics course. These problems were created during the semester usually after reading something interesting or hearing a unique quote or idea at a meeting or conference. One example is a reasoning "wheel" that Piaget used during his early research in cognitive development. The wheel assignment asked students to examine 5 of 6 pieces in a pie shape. After such examination, the students were to reason what the missing piece was and why. The problem actually used Roman numerals/English letters as a basis for a solution. These problems were used mainly in a physical science course as part of the unit on Science History and the Scientific Method. Other exercises included proportionate reasoning problems and some essays on specifics of the scientific approach to problem solving. A few of these ideas were "borrowed" from the *Peer Instruction* book written by Eric Mazur, also a part of the Prentice Hall Education Innovation Series. These questions were concept test questions that Mazur uses to break up his lectures to introduce "think-pair-share" active learning experiences.

The final part of the ACE Suite was the Evaluation Tasks. These problems were based on a number of different examples that I had read about during a literature search on techniques that the University of Washington Physics Education Research (PER) group used to "tease out" misconceptions and then develop their research-based curriculums. For one example, I saw in Pamela Krauss's dissertation where she used the monkey hunter problem to determine what the "learning methods" were for a group of students. The evaluation questions she asked were related to the classic Monkey Hunter problem with only minor adaptations that probed into the student's thought process. I formed an ACE exercise using the same questions. First as a means of verification of Krauss's research findings, and secondly to test and see if this web method might be as affective in finding out students' thoughts, as the very time intensive interviews that the University of Washington PER Group uses to do their research. This section of the ACE materials is in the early development stage at the moment. It is my intention to use this section to eventually test a number of ideas related to magnetism misconceptions — a topic in which very little physics education research has been published.

To address the question of how it worked, I would have to say that my data isn't conclusive but I think that it didn't hurt or cause less learning to occur. Some positives would be that I gained a greater amount of communication with my students. A number of them mentioned that they felt that I was tailoring examples and problems to their needs, as requested in the ACE comments. I also found that students seemed to be better prepared to ask questions during class as a result of their homework or the ACE assessment exercises. A negative to the project was the fact that not all students were able to get to a computer when they needed it. I also received comments about ACE being just another piece of busy work that took up time that could be spent working on other classes. In two semesters of testing I found that the second semester went more smoothly and the use of "credit points" made the participation in the activity more effective. One other interesting point was that students enjoyed the communication link, but were disappointed that the "feedback" reply wasn't immediate. This immediacy is something that I am definitely going to address in the revisions of the ACE Suite.

The evaluation comments alone have given me the charge to create a smoother transition and delivery method of the ACE experiences for my students. My 2000 summer project is to create a more effective course Web page that not only hosts the ACE Suite but also makes available any daily lecture notes, active learning activities, lab handouts and assignments. Participation in a Department of Education "Teaching Teachers

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IPC 4 Participants

Don	Anderson	Ivy Tech State College	Kokomo	IN
Alex	Azima	Lansing Community College	Lansing	MI
Emile	Bernard	Piedmont Community College	Roxboro	NC
Mark	Bunge	San Jose City College	San Jose	CA
Chad	Davies	Cloud County Community College	Concordia	KS
Butch	Diesslin	Vermilion Community College	Ely	MN
Bob	Eshelman	Henry Ford Community College	Dearborn	MI
Oscar	Grant	Mississippi County Community College	Blytheville	AR
John	Griffith	Linn-Benton Community College	Albany	OR
Bob	Henscheid	Clark State Community College	Springfield	OH
Dierk	Hofreiter	Illinois Central College	East Peoria	IL
Bill	Hogan	Joliet Junior College	Joliet	IL
Bill	Keller	St. Petersburg Jr. College	Clearwater	FL
Beta	Keramati	Holmes Community College	Goodman	MS
Carlos	La Rosa	Colegio Regional De La Montana.UPR	Utuado	PR
Todd	Leif	Cloud County Community College	Concordia	KS
Paul	Marquard	Casper College	Casper	WY
Martin	Mason	College of the Desert	Palm Desert	CA
Alex	Neubert	SUNY College of Tech at Canton	Canton	NY
Nick	Nicholson	Central Alabama Community College	Alexander City	AL
Bill Gene	Smith	South Florida Community College	Avon Park	FL
HC	Snyder	St. Clair County Community College	Port Huron	MI
Ashok	Vaseashta	Wytheville Community College	Wytheville	VA
Bo	Wessell	Wayne Community College	Goldsboro	NC
Mark	Winslow	Independence Community College	Independence	KS

IPC 4 Presenters

Barry	Berman	Logal Software, Inc.	Altanta	GA
Curtis	Hieggelke	Joliet Junior College	Joliet	IL
John	Griffith	Linn-Benton Community College	Albany	OR
David	Maloney	Indiana -Purdue University at Fort Wayne	Fort Wayne	IN
Gregor	Novak	Indiana -Purdue University at Indianapolis	Indianapolis	IN
Tom	O'Kuma	Lee College	Baytown	TX
Evelyn	Patterson	US Air Force Academy	Colorado Springs	CO
Scott	Wennerdahl	Joliet Junior College	Joliet	IL

IPC 4 Schedule

Wednesday		
3:00 pm	Welcome and Introductions	Curtis Hieggelke & Tom O’Kuma
3:30 pm	Instructional Design and Blackboard’s CourseInfo	Scott Wennerdahl
6:30 pm	Making Web Pages	John Griffin
9:30 pm	End of workshop day	
Thursday		
8:30 am	Session I on JiTT	Evelyn Patterson & Gregor Novak
1:00 pm	Session II on JiTT	Evelyn Patterson & Gregor Novak
5:00 pm	Conceptual Survey on Electricity & Magnetism Results	Tom O’Kuma
7:30 pm	Discussion Session	
8:30 pm	Group Projects Session	
9:30 pm	End of workshop day	
Friday		
8:30 am	Web Simulations Session	Barry Berman
1:00 pm	Session on PER Issues	David Maloney
3:00 pm	Group Work Session	
7:30 pm	Participant Sharing and Group Work Session	
9:30 pm	End of workshop day	
Saturday		
8:30 am	Group Work Session	
1:00 pm	Group Project Reports/Sharing	
4:00 pm	Conference Summary and Evaluation	Curtis Hieggelke & Tom O’Kuma
4:30 pm	End of workshop day	

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VideoPoint Activities for the Conceptual Physics Student

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VideoPoint™ is a video analysis software package for computers (Mac and Windows) that allows one to collect position and time data from digital video images in the form of "video points." Data is collected by clicking on the moving objects of interest for each frame of a QuickTime™ movie. These "video points" can be combined to form other calculations such as center of mass locations and distances between points. Furthermore, multiple reference frames can be used to analyze relative motion.

VideoPoint was developed by Priscilla Laws and company at Dickinson College. The software is available from Lenox Softworks, Inc. In addition to being an extremely accurate data acquisition tool, VideoPoint features data scaling, equation modeling on graphs, multiple ways to display movie data, and polar and Cartesian coordinates.

Concepts that can be taught using VideoPoint include one or two-dimensional motion, collisions, momentum, electrostatic interactions, conservation of energy, nonlinear motion, projectile motion, pendulums, springs, harmonic motion, and rotating disks. Complex human body motions can also be studied, and data can be exported to spreadsheets or to a text file. Currently, the software features a movie browser with over 200 video clips that can be used for classroom analysis.

More detailed information about the VideoPoint software, its features, and updates can be obtained from the Lenox Softworks, Inc. at http://www.lsw.com/videopoint.

Possibilities for the creative use of VideoPoint in introductory or upper-level physics courses are unlimited. At Forsyth Technical Community College, students in my *Conceptual Physics* course have used the software to analyze their own movies made with a simple video camcorder. The whole process of getting the students to design a motion experiment, using the video camera, recording the resulting "physics", transferring the video data to computer, making and editing a QuickTime movie, then performing a VideoPoint analysis of their project requires the students to think critically about what they are doing during each phase of the process.

Two VideoPoint projects that met with remarkable success this past semester involved projects dealing with simple one-dimensional kinematics and two-dimensional projectile motion. The first activity required a student to determine his or her hang-time by measuring one's vertical jump height, while the second activity investigated the liftoff of a rocket "fueled" by a 2-liter plastic soda pop bottle that contained a mixture of compressed air and water. These two activities will now be described in some detail.

Hang-Time Calculation

Basketball players, ballet dancers, gymnasts, and other gifted athletes with rather unique jumping abilities seem to defy gravity and "hang" effortlessly in the air for extended periods of time. "Hang-time" is the amount of time such an individual spends in the air with his feet off the ground. Many students have the misconception that a basketball player like Michael Jordan has a hang-time of 4 to 9 seconds, where in reality, the hang-time of the greatest jumpers is almost always less than one second! Our misperception of this phenomenon can be cleared with an application of some basic physics.

The distance an object falls when it is free of all constraints (i.e., there is no friction or air resistance slowing the object's fall, or any howling winds or damping forces) is given by the equation

$$d = \frac{1}{2}gt^2$$

where d=the distance (m) the object travels during the time t, g=the acceleration due to gravity (m/s^2), and t=the amount of time the object falls (s).

In the above equation, the object is assumed to fall under the influence of gravity alone; no other external force acts on the body. An object that moves in this manner is said to be in a state of *free fall*. The same equation also applies to a body that rises to a height of d during the time t.

The vertical distance d a student can jump is easily determined. Have a student stand flatfooted next to a wall, then make a mark at the highest point the student can reach.

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Then have the student jump vertically and mark his highest point. The distance between these two marks is his vertical jumping distance, *d*. The amount of time *t* the student spends in the air from the beginning of his jump to the top of his jump can be found by solving the above equation for the time, *t*:

$$t = \sqrt{\frac{2d}{g}}$$

The student's hang-time will be twice the above value of *t*, because one has to account for both the amount of time it takes the student to leave the floor and reach his maximum height *d*, as well as the time it takes to fall from this maximum height back to the floor. As a result, the hang-time is calculated as

$$Hang-Time = 2t = 2\sqrt{\frac{2d}{g}}$$

To determine student hang-times, students' jumps are first videotaped outdoors; the brick wall of the physics building serves as a nice stationary backdrop. For scaling purposes, a meter stick is placed on the ground and leaned vertically against the wall. After recording a series of jumps, each student makes his own QuickTime movie which can then be analyzed with the VideoPoint software. At Forsyth Tech, I use the VideoPoint software to determine a student's hang-time in two different ways:

1) VideoPoint allows the user to analyze motion frame-by-frame, and it is fairly easy to judge which frames highlight the student's "take-off" and "landing". To determine the amount of time the student stays in the air, one simply subtracts the "take-off time" from the "landing time" of the jump.

2) A more analytical approach can be used to determine hang-time if one has the student use the VideoPoint software to determine his maximum vertical jump height, d. To determine this distance, one simply subtracts the "peak height" from the "take-off height" of the jump. The hang-time is readily determined by substituting this value of d into the equation

$$Hang-Time = 2\sqrt{\frac{2d}{g}}$$

Although these two exercises may seem to be a bit simplistic, one has to realize that they are incorporated into a larger activity that, from my experience, really captivates the imagination of the student. Most students obtain fairly comparable hang-time results for themselves using the above two methods. This gives them some justification and confidence in applying equations to other motion problems. Additionally, most students are startled to discover that hang-times in excess of one second are just not possible by even the best jumpers!

As a way to showcase this last point, consider an individual that has a vertical jump height of d = 1.25 m. Taking g = 10 m/s^2, one can readily show that

$$Hang-Time = 2\sqrt{\frac{2d}{g}} = 2\sqrt{\frac{2(1.25m)}{10m/s^2}} =$$

$$= 2\sqrt{\frac{2.50m)}{10m/s^2}} = 2\sqrt{\frac{1}{4}}s = 1.0s$$

Most students will not exceed a vertical jump height of d = 0.6 m which translates into a hang-time of about 0.7 seconds.

I have found that when put in front of a camera, students will really "ham it up." Consequently, the jumps that are recorded may include arms and legs that wiggle and squirm in all sorts of directions. The "perfect" vertical jump is seldom recorded, but as long as one uses the jumper's belly button or head or other suitable center-of-mass reference point, good results are obtainable.

So let the students break loose and jump up and down in the name of fun physics!

Water-Bottle Rockets: Launch Analysis

This VideoPoint activity investigated the lift-off of a rocket "fueled" by a 2-liter plastic soda-pop bottle that contained a mixture of compressed air and water. Several of the scientific supply catalogs sell both single and dual "bottle rocket launchers" that really help this project get off the ground.

The launchers are fairly simple devices that use a set of metal jaws to clamp an inverted plastic soda-pop bottle into an upright position. A rubber stopper fits into the neck of the bottle, which is typically filled half-full with water. A hose connects an opening in the rubber stopper to a bicycle pump; the bicycle pump is then used to supply compressed air to the water in the bottle. After the bottle is pressurized, a string is pulled which allows the clamps to release, thus permitting the compressed air and water mixture to propel the bottle skyward.

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This project has an endless number of variations! Students at Forsyth Tech built various rockets out of cardboard and duct tape that would accommodate in the bottom of each rocket a plastic soda-pop bottle. Fins, nosecones, and payload areas are added for stability and guidance effects.

The plastic soda-pop bottles can be of almost any size as long as the launcher's rubber stopper fits into the neck of the bottle. We have used 16 oz, 20 oz, 1-liter, and 2-liter bottles with great success. Fuel mixtures have ranged from the ordinary (water) to the extraordinary (soda pop, baking soda and vinegar, corn syrup, motor oil, and shaving cream). One can also vary the amounts of liquid fuel as well as the amount of air pressure in the bottle.

It should be evident that this project lends itself well to parametric studies, as well as a real appreciation for the scientific method — discovering "what works," and "what does not work." One can readily measure a rocket's maximum altitude, range, and flight time by changing any one of these variables, as well as studying the influence of launch angle.

Two of the features we had an interest in measuring were a rocket's initial velocity and acceleration at liftoff. The VideoPoint software lends itself to such studies since the velocity and acceleration can be readily determined from the position and time data that the video camcorder obtains during a launch.

One of the major problems we discovered in our initial launch studies was the fact that we only recorded 3 or 4 frames of data before a rocket left the field-of-vision of our camera. Our camcorder only had a film speed of roughly 30 frames per second, which was not fast enough to record enough flight data for reliable analyses. The rockets were moving so fast at liftoff our camera literally could not keep up! It should be noted that these water-bottle rocket launchers reportedly produce velocities in excess of 150 mph during the first 2 meters of liftoff. That's fast!

During a second series of launches, we positioned our video camera on the roof of the physics building. The principle behind this was to increase our viewing angle, and hence capture more video frames for analysis. Although we had several noteworthy launches, our inexperienced cameraman made the mistake of panning the camera during each launch, following the trajectory of each rocket from liftoff to landing. In such a manner, none of our VideoPoint analyses led to credible results because one needs a stationary background to properly record a moving projectile in the foreground. Due to other class needs, we decided to tally our results as a learning experience and move on to other areas that the course required. Even though our VideoPoint results were flawed by our filming errors, the class was still able to complete this activity and accomplish the learning goals that I had established.

Impact of IPC4

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It's a long story but the IPC4 had an impact on the community college system in the whole state of Mississippi.

Here is what happened: In the past several years, Mississippi community colleges have been trying to put together a virtual community college, and a group of "experts" have been working toward developing software for delivering online classes.

A couple of months after I got back from the workshop, I was sent to a conference to take a look at this new software. Well, it turned out that the software still had lots of bugs in it and it was clear that it would not be ready for use in spring 2000 (that was the designated time for initiating the virtual community college). So, I suggested to them to take a look at Blackboard's CourseInfo. At that time, I was using Blackboard's software myself to prepare for my classes in the fall, and I felt comfortable giving them a quick tour.

Anyway, to make a long story short, the State Board of Community and Junior Colleges purchased the Blackboard CourseInfo software and is now using it statewide for online classes. I certainly don't mean to take all the credit for that, but I think I was at the right place, at the right time, and was able to say the right thing thanks to IPC4.

During the spring semester I taught a Physical Science I survey course through the virtual community college. This summer, I'll be cooperating with another instructor to develop Physical Science II, and maybe (if things work out right) I will be working on developing the online class for trig-based physics in the fall.

In my on-campus classes, I am using Blackboard quite extensively to supplement the inclass activities. I'm using the free version of CourseInfo at Blackboard.com to implement Just-In-Time-Teaching for my classes.

Elements of an Interactive Synchronous Internet Course

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Contrary to what some might think, internet courses are not a panacea. Don't expect to see huge enrollments, at least not using my approach. The technique of a synchronous (real-time interactive mode) keeps the course delivery under control. It allows the student to interact with the professor more along the lines of a small seminar course. While the course also allows the student to work at their own pace, the weekly meeting helps focus the student and keeps them on track. By its very nature this way of "teaching" an internet course does not lend itself to huge mass produced sections of students. I believe it is the most effective way for a student to have a positive experience with an introductory science course.

This approach is not a cure-all either. It requires more work for the professor than a traditional course. The professor can become a private tutor if not careful. This method does allow the maximum interaction with a student without physically being in the same space as the student. In cyberspace, the computer with various programs can link you via real-time chat, audio or video. This method also allows for more flexibility. The flexibility can also turn out to be a negative aspect for the student if they tend to procrastinate.

The synchronous model was used to design this course because during the past 30 years of teaching I have found that students learn better when there is interaction. Just because your student is in the same room or thousands of miles away should not change this fact. However, this type of learning is not for all students. The successful student in an internet course must be intelligent, self-directed, orderly and goal oriented.

The astronomy course I have designed and taught in this mode for the past two years contains three distinct components: a CD-ROM, course Website and the Online observatory.

The CD-ROM is an electronic text book which I wrote and edited. It contains the basic information for the curriculum. The materials contained in this CD-ROM are the bones the student fleshes out using the internet resources. It also contains the various communications programs the student will be using during the semester. This CD-ROM also gives the student a sense of who I am and what I look like and sound like. I am no longer an abstraction but a real person.

The course Web site is the place where the course information is found as well as the jump point for the student to research the internet. Information about the online observatory is also found here. The URL for the website is http://www.api-az.com.

The Online observatory is used to send real-time astronomical images to the students. They can receive the images simply by using their web browsers. They do not need any special software. While there are several online observatories which students can select images from, my online observatory is used in real time and with me working the telescope. I have found it to be important for the professor to help guide the student while making observations. This allows questions to be answered that the students have about what they are observing. This happens whether the student is physically at a telescope or connected online.

I have compared the outcomes of my internet classes to my traditional classes. The internet students complain more about the work they have to do. Most students felt since it was an internet course it would be easy. The internet students tend to do slightly better than the traditional students. The drop out rate seems to be higher with the internet students. Chatting with some of the drop outs I found that they expected an easy way out of taking an introductory science course and the internet course was "too hard."

I have also designed an online course for professors who would like to learn how to teach using this method. It is a hands on course done online just as a student would experience. Contact me for more information at astro@api-az.com.

This technique can be used for any laboratory science. Instead of the online observatory, one could design an online physics laboratory. A blend of the internet with a traditional class is also possible. That is my next challenge.

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Some Design Ideas and Suggestions for Web Based Courses

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Neat internet links:

The World Lecture Hall:
http://www.utexas.edu/world/lecture/
Journal of Asynchronous Learning (JALN):
http://www.aln.org/
Teaching and Learning on the WWW:
http://www.mcli.dist.maricopa.edu/tl/
Builder.com-Web Graphics and Design - Building a better interface:
http://www.builder.com/Graphics/UserInterface/?St.tv.cn (This site is the basis for much of this paper.)

Web Site Tips

TEST IT !!!! Test it on different platforms, as many as possible.
Maximize your web page at about 50 K. It takes a 28.8 modem too much time to download more than that.

Images:

Images should be interlaced. This allows the image to be slowly built. This may be called Progressive Encoding for jpeg files.
Check compression levels if possible.
Never use a graphic where text will do.
Establish information architecture.
Structure the site. Starting the design on note cards is helpful.
Move from general to specific.

Navigation:

Avoid orphaned pages, pages with nowhere to go.
Always include a link to a parent or home.
Avoid pages with no way to go Back.
Load Navigation bars first.
Arrange buttons in a single direction, top to bottom, or left to right.
Identify the site on every page. Use the upper left corner or design.
Keep your design consistent, buttons, navigation, etc.
Keep vital elements in the top half.
Differentiate visited links from unvisited links.
Build deep sites with short pages. Keep the pages focused. Long pages with large amounts of information will not be read.
Don't overlook the status bar. Send a message instead of just the URL of the link.
Emphasize readability.

Page Development

Process the material. Using a word processor is ok, but notepad works better. Its more consistent in the transfer of text.
Beware of using html editors. A year ago I would swear by FrontPage, now I use Dreamweaver and I am reserving judgment on it. FrontPage is easier to use, but its not always WYSIWYG. See http://wind.cc.whecn.edu/~marquard/astronomy/labs/pulsar_sm2.htm or http://wind.cc.whecn.edu/~marquard/astronomy/labs/pulsar_sm3.htm, the sporadic font changes and the repetition of equations were not my idea, and not what I saw under the editing process.
Break down or categorize the page at this point making the pages small.
Import images.
Establish links from within your own website.
Research links from outside your web site and establish those links. Test these links on various platforms to establish usability. If usability is in question, warn students of the possible problems.
Insert exercises and work within the site. Always do your exercises yourself before assigning them to students. This is even more critical when you may not have complete control of the situation.

Overview continued from page 1

Scott Wennerdahl started the conference with a working session on instructional design for online courses. He then continued into using Blackboard's CourseInfo online course management system. This was done both from a student view for learning and instructor view for instruction. He dealt with various materials that could be used with the system and the assessment tools that are available. Blackboard provided a *Resource Guide* for each participant containing details on using the various features of CourseInfo software. Participants also used the discussion board of this system as a pre-conference activity dealing with issues and problems in online courses.

John Griffith from Linn-Benton Community College (OR) shared with the participants how he has approached teaching an online Web-based calculus level physics course. For the labs, students receive a kit of physics equipment that they use during the semester to conduct experiments. At the end of the semester, they return the kits and receive a deposit back. He led the participants in a working session on building basic Web pages using commonly available tools. Participants received a CD from him and the project provided the book *HTML: The Definitive Guide* (3rd Edition) by Chuck Musciano & Bill Kennedy from O'Reilly & Associates.

On Thursday, this conference featured the work of Evelyn Patterson of the United States Air Force Academy (USAFA) and Gregor Novak from Indiana University-Purdue University-Indianapolis (IUPUI) on Just-in-Time Teaching (JiTT). Just-in-Time Teaching is a web-based pedagogy pioneered as a collaborative effort of physics faculty at USAFA and IUPUI. JiTT pedagogy exploits an interaction between Web-based study and an active learner classroom. Essentially, students respond electronically to carefully constructed Web-based assignments, and the instructor reads the student submissions "just-in-time" to adjust the lesson content and activities to suit the students' needs in the next class meeting. Workshop participants explored JiTT materials developed for introductory physics classes, learned how to apply JiTT templates, had a chance to see how to include physlets in Web pages, discussed JiTT pedagogy and implementation issues, and then worked on projects using this technique. Another pre-conference task for the participants was a WarmUp or "preflight" activity that was used to start the sessions and to illustrate the power of this teaching strategy. Participants received *Just-in-Time Teaching: Blending Active Learning with Web Technology* by G. Novak, E. Patterson, A. Gavrin, and W. Christian from Prentice Hall.

Barry Berman, a former physics teacher at Logal (which is now Riverdeep.net), led a working session on how to use and how to customize Web-based simulations. Logal gave the participants a free one-year subscription to the simulations on the Logal.net web site. Also on Friday, Dave Maloney from Indiana University-Purdue University at Fort Wayne looked at the difficulty of connecting the results of Physics Education Research with activities for Web-connected physics courses. He reviewed the strategies of developing and employing TIPERs (Tasks Inspired by Physics Education Research) and connecting them with Web activities.

During this conference there was time for both formal and informal sharing. For example, Martin Mason (College of the Desert, Palm Desert, CA) presented his experiences with teaching a conceptual physics course online. He had the students come into the college to do the labs each week. Paul Marquard (Casper College, Casper, WY) gave the participants a presentation on tips and tools for developing online Web pages from his experience in teaching an astronomy class online. A summary of these can be found elsewhere in this newsletter. Mark Winslow (Independence Community College, Independence, KS) showed the group a software tool (Lotus Screen Cam which is included in Lotus Smart Suite) for capturing screen display actions with voice recordings to make lectures available on a CD for distance-learning students. Finally, Todd Lieff (Cloud County Community College, Concordia, KS) discussed some preliminary results in his research in student learning. He had looked at the impact of VMBL (video or virtual MBL) versus conventional MBL for 12 labs in a first semester algebra-trig physics. He studied gains in conceptual understanding and changes in their attitudes connected with these different strategies. He also reported on the results of the test on functional understanding (Tufts Univ.) and compared them with the results of individual student interviews.

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with Technology" grant with the Kansas State University teacher education department has given me development time and money for this new project. Even though the IPC4 conference showed us an alternative system (Blackboard.com) to self-coding web pages, I have elected to just create my own system. A method that will be more time consuming but one that will be tailored for my personal needs and the needs of my students. Hopefully it will be up and running by the fall 2000 semester.

CaFD

***C**urriculum **a**nd **F**aculty **D**evelopment Newsletter For Two-Year College Physics Educators*

Summer 00

National Science Foundation,

Joliet Junior College (IL),

and

Lee College (TX)

http://tycphysics.org

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Upcoming TYC Physics Workshops

Sept. 28-30, 2000 **Microcomputer-Based Laboratories (MBL) Workshop** at Joliet Junior College in Joliet, Illinois (near Chicago) with Ron Thornton (Tufts University), Tom O'Kuma (Lee College), Curtis Hieggelke (Joliet Junior College), and William Hogan (Joliet Junior College).

Nov. 2-4, 2000 **Physics in Context (PIC) Workshop** at Sinclair Community College in Dayton, Ohio with Fred Thomas (Sinclair Community College), Robert Chaney (Sinclair Community College), Curtis Hieggelke (Joliet Junior College), and Tom O'Kuma (Lee College).

Feb. 15-17, 2001 **Physics Simulations and Physics Education Research Workshop** at Lee College in Baytown, Texas (near Houston) with David P. Maloney (Indiana University-Purdue University at Fort Wayne), Alan Van Heuvelen (Ohio State University), Cindy Schwarz (Vassar College), Curtis Hieggelke (Joliet Junior College), and Tom O'Kuma (Lee College).

These workshops are part of a pilot project that has a goal of helping two-year college (TYC) students develop a stronger understanding of science with an emphasis on physics and its applications in industry. It provides a series of professional development workshops for TYC teachers who teach the core physics courses for technology and other programs. This set of workshops will cover the major developments in teaching and learning strategies that have emerged in the last few years. They are funded by the Advanced Technological Education (ATE) Program of the National Science Foundation. For applications and more information, contact the the TYC Physics Workshop office at Joliet Junior College or visit the web site http://tycphysics.org

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