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ICPE Chair's Corner

The International Conference on Physics Education 2006 held at the historic National Olympics Village in Tokyo in August gave the commission members yet another opportunity to meet and deliberate on how best we can proactively work towards the fulfillment of our mandate.

The recent efforts by ICPE, ASPEN and UNESCO to organize train-the-trainer Active Learning Workshops in developing countries are providing a forum for exchange of ideas about educational praxis. They are leading to the establishment of networks of physics teachers who can proactively undertake new programs and implement pedagogic innovations in their own countries.

One of our collective concerns is how educators and students in all countries can have access to high quality education resources. There is felt to be a need to establish an international program for development and dissemination of low-cost equipment for basic "hands-on" physics education on one hand and appropriate use of ubiquitous low-cost technologies for advanced laboratory use on the other. Prototype examples and case studies of how resource materials and activities developed in one place have been effectively adopted or adapted elsewhere would be of interest to many communities.

We invite reports for electronic collation at our website and for publication in this newsletter. These would provide valuable inputs to the community of physics educators at large, particularly those in developing countries. It would be our endeavor to create a database of innovators and bring them together for a "Hands-on" Developers Workshop sometime soon.

Pratibha Jolly

Pratibha Jolly, ICPE Chair, Delhi

In this issue

The Physics Force: Wild and crazy physicists blend facts and fun

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Talking to Dan Dahlberg, you'd never think the likable, Texas-twanged physicist would go after a colleague with a sledgehammer. But there he stands, wielding the heavy implement with relish over Hank Ryan, a high school physics teacher, who lies supine on a bed of nails with a concrete block on his chest. A moment's aim, a mighty backswing, and Dahlberg slams the sledgehammer down, smashing the block to smithereens.

"Good one," says Ryan.

Figure 1. *Hank Ryan, a member of the original Physics Force, makes a point about air pressure during a performance for school children*

So ends another demonstration by the Physics Force, a two-pronged group of wild and crazy physicists who use highly visual and entertaining stunts to teach the elements of their science. Based in the U.S. "Twin Cities" of Minneapolis and St. Paul in the northern state of Minnesota, the troupes perform for more than 30,000 students, teachers and members of the general public every year. Their trademark mix of science and shenanigans has a way of bringing out the wonder in audiences of all ages.

"We want to show that physics is fun and interesting, and that it's something people can understand," says University of Minnesota Physics Professor Dahlberg, an expert on magnetics who has been on the Force almost since its inception. "People will come and be entertained, but they'll be surprised at how much they learn."

Begun in 1984, the original Physics Force now comprises Dahlberg, and five high school physics teachers from the Twin Cities area, including Ryan. In 1999, in order to ensure that the work would continue, a second troupe formed, calling itself Physics Force: The Next Generation. Its members are University of Minnesota Physics Professor Cynthia Cattell, a space physicist, and four other high school physics teachers.

The original Force stages five morning shows for elementary schools and a big public show, the Physics Circus, at the University of Minnesota every January, and both troupes target kindergarten through sixth grade audiences. The Next Generation concentrates on performances for children from inner-city schools in the Twin Cities. The kids' appreciation runs surprisingly deep, as evidenced by Dahlberg's tale of one show at an elementary school in the Twin Cities.

"It was the last thing in the school day on a Friday about two weeks before Christmas," he says. "The show lasted an hour and 10 minutes, but even the kindergartners stayed engrossed. We also were doing another show at the school that evening, so we told the kids to come back and bring their parents. And they did. That night, the auditorium was packed with families, and kids were explaining to their parents what was happening.
"That was really special. I had always argued that if we waited till kids are in high school to show them that science and math are fun, interesting and exciting, we've already lost the battle. I'd like everyone to realize that it is as much fun to exercise your mind as it is to exercise your body."

For grade-school children, part of the draw has to be the sight of grown physicists shooting a roll of toilet paper 30 feet into the air (a lesson on the Bernouilli effect) or propelling themselves on a cart by emptying a fire extinguisher (for every action an equal and opposite reaction).

Figure 2. *'Rocket Man' Dan Dahlberg, a member of the original Physics Force, propels himself across a stage with a fire extinguisher during a performance for school children.*

Of course, the destruction angle helps. Besides destroying barrels and blocks, the performers throw eggs at both a hard surface and a soft bed sheet to show that it matters how a given force is applied.

And then there's the element of danger. In a variation on the "dumb monkey, dumb hunter" fable, the original Force dangles a teammate 20 feet above the stage and drops him just as Dahlberg shoots a billiard ball at him from a cannon. Sure enough, both ball and physicist fall at the same rate, and the ball is caught in a baseball mitt a split second before said physicist makes impact—in a pile of cushions, of course. In the "hit the nail on the head" demo, a physicist puts a block of wood on his head and sits quietly as a teammate pounds a nail in the block. And then there's the ever-popular bed of nails, with or without the concrete block smashup.

"After a show, a lot of people come up and want to try some of the demos, especially the bed of nails," says Jay Dornfeld, a high school teacher in the original squad. "It's been especially high school students who do this [at the University of Minnesota]. They say, 'It's easier than I thought'."

Although the two Forces perform different combinations of stunts in their "Physics Circus" shows, but both love to stage the collapsing barrel demonstration. "It's my favorite," says Next Generation member Jon Anderson, a young high school teacher who's fond of making his entrance to a show on a unicycle.

In the barrel demo, the team partially fills a 55-gallon (208 liter) steel drum with water and heats it to boiling. They then seal the container and hose it down with cool water. Inside, the hot water vapor condenses and the pressure plummets. Suddenly, the barrel implodes with a loud WHUMP!, the victim of relentless air pressure from outside. The audience squeals its approval. Sometimes it even gets into the act.

Figure 3. *Fred Orsted, a member of the original Physics Force, isn't just blowing smoke—he's demonstrating some facts about air pressure to a young audience*

The Force was launched through the efforts of the late Philip Johnson, who designed and constructed science demonstrations for classes at the University of Minnesota. A specialist in large-scale physics demonstrations, he produced a physics "Road Show" that was used in high schools, elementary schools and colleges. The Force picked up momentum in 1990, when the American Association of Physics Teachers met in Minneapolis and Johnson arranged a performance at the University of Minnesota.

"After a show at one high school, a music teacher asked to keep the imploded barrel, Cattell recalls. "He used it as a drum and performed with his jug band at the school."
"The response is gratifying," says Fred Orsted, another young high school teacher in the original Force. "Say, when someone comes up and says they thought it would be boring but they had a fun time. That goes with our mission to show kids that science can be fun, even if it is difficult."

"The crowd went wild," says Dahlberg. "We got a standing ovation."

Even better, the American Public Broadcasting System (PBS) show Newton's Apple filmed the performance and sold the video to physics teachers. Next thing they knew, the Physics Force was being booked everywhere. The Twin Cities-based 3M Corporation asked them to entertain participants in its Wizard Program, which sends employees into schools to interest young people in science, and the American Institute of Physics booked them for a show in northern Minnesota. They also have been featured three times on German TV's Know-How show (which comes out "Knoff-Hoff" in German), and they have twice wowed crowds at Disney's Epcot Center in Florida.

In spite of such exposure, however, the Force doesn't take its show on the road—that is, outside the Twin Cities area—as often as it would like. Funded by the University of Minnesota, the performers want to spread the gospel of fun and physics throughout the state. But cost per attendee is a factor in their funding, and Minnesota is huge, area-wise. Getting all their equipment out to the far corners of the state doesn't come cheap. Luckily, however, the Force garnered one of ten $10,000 grants the American Physical Society conferred for 2005 to celebrate the World Year of Physics. The money has enabled them to perform in cities like Duluth, a port on Lake Superior; and Bemidji, a city in the heart of Minnesota's northern iron-mining region. This fall they'll also perform in the neighboring state of Wisconsin.

Back in the Twin Cities, the Next Generation is busy enthralling an elementary school crowd in a big physics lecture hall on the University of Minnesota campus. Claire Hypolite, a high school physics teacher who holds a Ph.D. in chemical engineering from the university, is carefully piling three china plates and a vase of flowers on a tablecloth.
"Do you believe in physics?" she yells.
"Yes!" the crowd yells back.
"Do you really?
"YES!"

Grasping the tablecloth with both hands, Hypolite counts to three and jerks the cloth free without disturbing the fragile objects on top of it. The audience erupts in applause; no doubt the "physicist as magician" has made her point about "no force, no change."

Later, Cattell takes a young volunteer from the crowd and hands her one of two bathroom scales. As Cattell and the girl hold their scales bottom-to-bottom, Cattell directs the girl to push her scale against Cattell's and watch the needle. But as the girl pushes with her scale, Cattell pulls hers back, like a fighter rolling with a punch.

"What does your scale say?" Cattell asks.
"Zero."
They hold their scales against each other again, and this time when the girl pushes, Cattell pushes back. The scales are now locked against each other, caught between two contestants who both refuse to give ground.
"What does it say now?"
"Forty pounds."
"Mine says forty, too. Let's try for sixty," says Cattell. More pushing, and both scales register 60 pounds.
"Your scale only registers a force when mine does," Cattell points out. "That's because forces come in pairs."

Another young volunteer, coached by Anderson, stands on a chair and holds a bowling ball in front of her face. The ball hangs by a taut rope and is, in effect, a pendulum. Anderson tells the girl to let go of the ball without giving it any push and to stand absolutely still. She releases the ball. It swings away to the other side of the room and then heads back to her, stopping and reversing direction about an inch from her face. Anderson thanks her and takes her place. He holds the ball next to his face and gives it a good push, then makes a hasty exit from the chair. Sure enough, the bowling ball swings right through the space where he had stood. Once again the laws of motion not only reign supreme, they make great theater.

Audience participation also plays a big role in shows by the original Force. In some demos they use one or two children, but the biggest role for "extras" is when the team brings kids on stage for a tug of war in which the two sides try to pull apart a pair of plates held together by a vacuum seal. In another demonstration, the "poop organ," the physicists roll out several lengths of sewer pipe and play "Twinkle, Twinkle, Little Star." Fortunately, it's the kids and not the physicists who supply the vocal accompaniment to this one.

Figure 4. *Children trying to pull apart a pair of plates held together by a vacuum seal*

The Physics Force isn't really out to make physicists of their audiences, just to show them that their subject—and, by extension, all of science—need not be intimidating and can lead to all sorts of fun. Even if most don't go on to careers in science, kids who watch either troupe get that message and a clear picture of how knowledge of physics can make the world around them more understandable and predictable.

Or, in the words of founder Phil Johnson:
"One does not have to be a concert pianist to enjoy classical music, nor a physicist to appreciate the beauty of the natural physical laws that are a part of everyday life."

The Force has prepared pre- and post-show handouts for schools at which they perform, as well as videos of most of their demonstrations in the Physics Circus. All are available on the Web at:

http://www.physics.umn.edu/outreach/pforce
(Click on: Physics Circus*)*

Application of modern teaching strategies in physics teaching

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This article is abridged from an article which appeared in "The China Papers" published by UniServe Science, in July 2005. The complete article may be viewed at: http://science.uniserve.edu.au/pubs/china/vol5/CP5_phys_03.pdf.

Introduction

In today's world, because knowledge and technology becomes outdated rapidly and is updated constantly, much of what students will need to know in their future career after graduation has not yet been generated! This knowledge explosion cannot be solved by adding more courses to the curriculum. Therefore, the responsibility of teachers in university or college is not only to teach the students the particular or professional knowledge of their discipline but also to help them develop successful lifelong learning skills.

In order to improve university teaching methods, research into science teaching and learning has been done in western universities for over twenty years. As a visiting scholar at The University of Sydney, I have learnt a great deal about modern teaching theories in western universities. In this paper, I will briefly introduce a number of contemporary teaching approaches; discuss the teaching approach used at Tsinghua University; and, based on what I have learnt at The University of Sydney, make some suggestions for the modifications to my teaching approach.

Contemporary teaching approaches

Modern teaching research in university education is focused on changing from a teacher-centred approach to a student-centred approach, which encourages students to take more interest in learning the discipline. Eventually, new teaching approaches will encourage active learning, will help students to develop a deep level of understanding of the content, and will help them possess some key learning skills for their future work, e.g. self directed learning, problem solving, communication, team work, etc. Problem based learning (PBL) and concept mapping are excellent modern teaching approaches that help develop these skills and are widely used in western universities

Problem based learning

What is problem based learning? PBL is a curriculum design and a teaching/learning strategy which simultaneously develops higher order thinking, disciplinary knowledge bases and practical skills by placing the learner in the active role of practitioners (or problem solvers) confronted with a situation (ill-structured problem) which reflects the real world (King, 2005). PBL is also a style of learning in which the problems act as the context and driving force for the learning. In a PBL environment, the learner is encouraged to solve the problem, which is set in a real world framework and is interesting, challenging and complex for the learner. In order to solve the problem, the learners have to discover or learn new knowledge either individually or together in groups, analyse relevant information obtained from different sources, think critically, and discuss the solution with others. Generally the problems used in PBL are open-ended, they do not have only one correct solution, so that the learner tends to focus on the learning process as well as obtaining a correct answer.

What are the outcomes of PBL? The outcomes of PBL are: to encourage the learner to be more active and motivated; to encourage the learner become an independent learner; to help the learner to achieve a deep level of understanding of the relevant knowledge; and to encourage the learner to develop some key skills including problem solving, team work, lifelong learning, critical thinking and communication.

What are the advantages of PBL? PBL encourages deep learning and understanding. Students should be able to make sense of the material by integrating new knowledge with prior knowledge through the experience of solving problems, using a range of critical, cognitive and transferable skills.

What are the disadvantages? The time and resources needed for PBL should not be underestimated. The amount of content taught in this way is reduced compared to the amount that is taught in lecture-based teaching. PBL may be a new experience for teachers and learners, therefore both may require more support at the beginning. In addition, the problems must be selected carefully and professionally, so that they are at the right level for the students. The problems should be interesting and challenging for the learners.

Concept mapping

Concept mapping is a technique used for representing knowledge graphically. Knowledge graphs are networks of related concepts that are interconnected, and consist of *nodes* representing related concepts within a topic and *links* representing the relationship between concepts (King, 2005).

Concept maps can help teachers to explain complex structures and relationships of concepts, and to integrate graphically new knowledge with existing knowledge. Comparing his/her own concept map with a learner's concept map, a teacher can diagnose misunderstandings and misconceptions for the concept, and evaluate the learning results at the end of the topic. Concept maps also help learners to retain a mind map of the information they are studying, i.e. why are we learning this? Constructing one concept map before a topic and one after the topic can be used to help learners know what it is they have learned and what it is they still do not understand. By matching correctly new knowledge to their own schema, eventually learners will achieve a deep understanding of the knowledge.

Current courses and teaching strategies

As a teacher working in the Physics Department of Tsinghua University, I teach two courses (*Modern Physics* and *General Experimental Physics* (GEP)) for under-graduate students. There are about 150 students in the course of *Modern Physics* and 24 students in the *GEP*, respectively. The contents and teaching strategies of the two courses are briefly described in the following paragraphs.

The content of *Modern Physics* includes some essential concepts, principles and applications of Quantum Mechanics, Condensed Matter Physics, Modern Optics and Nanotechnology. The teaching process is currently teacher-centred, in line with a behaviourist view of learning which is used widely in most Chinese universities. A student's score in the final examination is used as the assessment result. In order to increase student interest, I currently ask the students to take up a challenge: that they should submit a feasible research proposal for any topic which is related to the content of the course, and assume that they have enough financial and technological support. They must work in groups of eight. Surprisingly, most students are very active and interested in this task. The final reports submitted by each group are impressive, creative and academic. Unfortunately, at the time I was only able to discuss with each group the feasibility of their scheme, the rationale of the knowledge applied and suggest some modifications to overcome any deficiencies, because, I was unaware of how I could do more for the students.

The content of GEP includes some general physical experiments, such as Ohm's law, measurement of the speed of sound, string vibration, thermal sensors, spectrum measurement, etc. Before doing the experiments, students are asked to read the manual that describes the principle, schematic diagrams, operating procedures and data processing required. Then the students learn how to do the experiments in practice, how to use or operate some special instruments and how to perform some data processing. We have improved this over a period of time by making modifications. As a result of the modifications, a few selected experiments are now suggested for students. Students are required to do the experiments individually, taking care when operating the equipment and repeating the experiment more than twice. Meanwhile, the data processing is more complicated, so students have to process the data using a computer. Finally, students need to submit a research report that is over thirty pages.

Modification of teaching approach

Teaching of *Modern Physics*

Most undergraduate students in Tsinghua University are excellent, intelligent and active. They all have a strong background in classical physics, but they have only a little understanding for the content of *Modern Physics*. Because the content and concepts in *Modern Physics* are very abstract, boring and hard for students to learn by themselves, they might lose interest if they spend too much time learning on their own. In my opinion, the application of modern teaching strategies, such as PBL, case study and concept mapping, must be based on a basic understanding of *Modern Physics* otherwise the students will not be able to learn anything. Therefore, it is important and efficient to keep some of the good traditional teaching approaches but combine them with new modern teaching approaches.

As the students have only limited understanding of the essential concepts and content at the beginning, the teacher must organise the lecture carefully by breaking down each topic into small packages which are logically ordered and sequenced. The knowledge packages should be taught by using the traditional teaching approach in the classroom, with the students mastering each individual knowledge package before they go on to next one. As mentioned above this is the traditional teaching strategy that is currently used in my teaching. After students understand the essential concepts and content in *Modern Physics*, the modern teaching strategy of concept mapping will be introduced. Figure 1 is an example of a concept map for the topic of *Condensed Matter Physics* (CMP) in *Modern Physics* teaching.

Firstly, students will be asked to draw a concept map of the topic that has just been taught, consisting of concepts and links between the content of CMP, based on what students have learnt in the course. This concept map reflects student's mastery of the knowledge of CMP. Generally, there will be some misconceptions and deficiencies in the knowledge. The teacher will also draw a concept map of CMP. Then, a series of seminars and tutorials will be held to discuss and modify the concept map made by the student. By understanding the student's concept map, by providing new information, by explaining the relevance of certain things, by modifying the misunderstanding of concepts and by comparison with the teacher's concept map (shown in Figure 1), the teacher will encourage a deep level processing of knowledge. Students will be able to assimilate new information or knowledge, and modify or rebuild their concept map to fit in the new knowledge. Eventually, a correct and integrated understanding of *CMP* knowledge will be achieved at a deep level, and the student's lifelong learning skills will be promoted during the process.

The topics which students find challenging should be kept and developed, but some modification must be made in using the PBL approach. The range of topics should be limited to the content of *Modern Physics*, i.e. the essential concepts and techniques used in the scheme should come from the content taught. Before the teacher discusses these with the students, they will discuss them within their groups with all students being encouraged to participate. As a result of the challenging topics, the discussion process will help students develop problem solving skills as well as teamwork skills. The final assessment for this course will consist of the final examination (60%), the challenging topic (30%) and homework (10%).

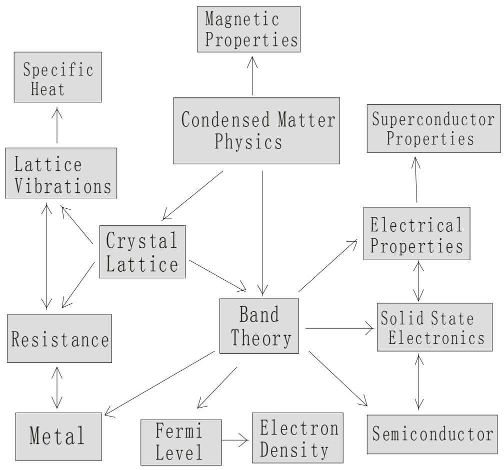

Figure 1. *Concept map of Condensed Matter Physics*

Teaching of *General Experimental Physics*

General Experimental Physics (GEP) is an essential physical course, which aims at developing the student's ability to apply knowledge learnt in practice. Today's graduates are required to possess many specific skills as well as knowledge of their discipline, therefore it is also necessary to modify the teaching strategy in the GEP course. The content of the GEP course should consist of two kinds of experiments, basic experiments and advanced experiments. The purpose of basic experiments is to train students' ability to apply their physical knowledge in practice and to cultivate good operating habits in the laboratory. The advanced experiment is similar to the selected experiment mentioned above, but the teaching approach must be modified. Firstly, students select one experiment that they are interested in, but there is no experimental manual for this course. Students working in a group will be expected to: find out what are the main concepts and principles used in the topic; design the experimental schematic diagram and operating procedure; choose which instruments are to be used; correctly connect or build the instruments required; and predict the experimental results or data. Finally, students will do the experiment based on their schematic diagram, and the feasibility of the scheme will be assessed based on the final experimental result and report. The final assessment will consist of the basic experiment of 60% and advanced experiment of 40%.

Actually, the whole process of the advanced experiment based on PBL simulates a practice topic or project that students will meet in their future work after graduation. This process is able to train and promote some key abilities and skills, such as intellectual and imaginative powers, self-learning, problem solving, teamwork, lifelong learning and self-assessment etc. The teacher's job in this teaching strategy is to select the experiment carefully, to provide direction when students have difficulties, and to assess and discuss the final result or data with each group.

Conclusion

The teaching strategy of PBL and concept mapping are strong motivators for students' interest and activity and in developing their learning ability and relevant skills. However, we cannot adopt these strategies without first considering the difference in the teaching environment, background of students' knowledge and the discipline in which we teach. We must analyse the content of the course very carefully, and find optimal teaching approaches for each course. When considering the courses, *Modern Physics* and *General Experimental Physics*, I believe the optimal teaching strategy is a combination of the traditional teaching approach with PBL and concept mapping.

Acknowledgements

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References

Boud, D. and Feletti, G. (1998) *The Challenge of Problem-Based Learning*. Routledge Falmer.

King, M. (2004) Lecture Notes: *Teaching Science in English*, The University of Sydney.

Raine, D. and Symons, S. (2005) *Problem-based Learning in Physics and Astronomy*. The Higher Education Academy Physical Sciences Centre.

Savin-Baden, M. (2000) *Problem-Based Learning in Higher Education: Untold Stories*. Open University Press.

Stäuble, B. (2005) *Using concept maps to develop lifelong learning skills: A case study*. Teaching and Learning Forum. [Online] Available: http://lsn.curtin.edu.au/tlf/tlf2005/refereed/stauble.html.

Wingspread Conference (1994) *Quality Assurance in Undergraduate Education: What the Public Expects*.

Citation for the Presentation of the ICPE Medal to Professor Jon Michael Ogborn of the Institute of Education, University of London

Tokyo – 2006

The Medal of the International Commission on Physics Education of the International Union of Pure and Applied Physics was established in 1979 for the purpose of recognizing contributions to international physics education which are "major in scope and impact and which have extended over a considerable period of time".

At the ICPE2006 conference in Tokyo, this year's medal was awarded to Professor Jon Ogborn for "long and distinguished service to physics education". It was presented by the chair of ICPE, Professor Pratibha Jolly, who delivered the following citation.

Jon Michael Ogborn, Professor Emeritus of the Institute of Education, University of London, is awarded the ICPE Medal in recognition of his many contributions to physics education, which have been outstanding in their nature and international in their scope and influence.

After studying Natural Sciences at the University of Cambridge, Jon Ogborn obtained a Post Graduate Certificate of Education from the Institute of Education in the University of London, and became a physics teacher at the William Ellis School. Within a few years he was Head of Science at the Roan School, and a few years after that he joined the academic staff of the Worcester College of Education. While there, he was appointed, along with Paul Black, to lead the Nuffield Advanced Physics Project, which produced a radically new physics course for 16 to 18 year-old students.

In 1971 Jon moved to Chelsea College in the University of London, initially as a Senior Research Fellow, then as Reader in Physics Education. He was appointed Professor of Science Education at the Institute for Education in 1984; a position he held until 1997. From 1997 to 2001 he was Professor of Science Education at the University of Sussex, and since 2001 he has been Emeritus Professor of Science Education at the University of London Institute of Education.

In a long and distinguished career, Jon Ogborn has been a participant, often a leader, in many educational research projects, and has guided many students to the successful completion of their doctoral studies. He has worked on students' conceptions, computer modelling, data analysis and images in science education. The teaching of energy and thermo-dynamics have been particular interests of his. Such is the extent to which he has gained the respect and trust of those who have worked with him, that he was the natural choice to lead the *Advancing Physics* project funded by the UK Institute of Physics in 1997. This very large and complex project involved another radically new approach to the teaching of Advanced Level Physics, and resulted in a course that is now followed by about 25% of all the students who progress to that level. Jon's ability to inspire confidence and generate enthusiasm amongst classroom teachers was vital to the success of that project.

At the international level, Jon Ogborn is well known for his involvement with GIREP and ESERA, and for his work with George Marx on the Danube Seminars on Physics Education. He has lectured in more than 25 countries, encouraging the educators of many nations with his helpful and supportive attitude and broad cultural view. He has been involved in EU research projects, and has advised the EU on research grants. He also spent six years as a member of ICPE, during which time his many activities included editing the second edition of their publication *Physics Now*.

Professor Jolly presents the medal to Professor Ogborn

ICPE2007 (Marrakech)

International Conference on Physics Education 2007
Building Careers with Physics
November 11–16, 2007
Marrakech, Morocco

This conference will be hosted by the Cadi Ayyad University of Marrakech (UCAM) and the Tunisian Society of Optics (STO), in collaboration with the International Commission on Physics Education within the International Union of Pure and Applied Physics (IUPAP/ICPE).

ICPE2007 is the first IUPAP-supported international conference on physics education in North Africa. Its main objective is to provide an opportunity to exchange ideas and experiences about Building Careers with Physics, and to discuss findings and experiences in the teaching-learning process in Physics in general, and in career-oriented curricula and Educational Reforms in particular.

ICPE2007 aims to present issues and examples of practice that highlight the following main themes:

- New Job Opportunities
- Effective Teaching Strategies
- Learning with Technology
- Physics for Sustainable Development
- Bridging the Gaps
- Women and Girls in Physics

In as much as teaching physics is of concern to the entire community of physicists, there is an urgent need to communicate and effectively use the new techniques and strategies developed by physics education research (Hands-on Labs, Learning studios, ILDs, Active Learning, etc). Furthermore, the full potential of the internet in physics education still remains largely unexploited. It is imperative that major efforts be devoted to bridge the gap between the domain experts, teachers, education researchers and policy makers, particularly in developing countries.

Given the significant success that the previous conferences (Delhi, Tokyo) of the ICPE have enjoyed, we strongly feel that this event will be a strong impetus to introduce new curricula and teaching methods in Morocco as well as in other countries where educational reforms have been (or will be) undertaken.

Lastly, the Moroccan Society of Applied Physics is in the process of being created. ICPE2007 will be an opportunity to introduce it in order to form networks with other physics societies.

Marrakech, the conference venue, is located in the south-central part of the country, 40 km way from the majestic and picturesque high Atlas Mountains. Marrakech offers a rich historical and cultural heritage. The Jamaa El Fna Place is unique in its charm and is a melting pot of centuries-old cultural heritage and open-air gastronomy. In the amazing Souks (ancient markets), the artistically and skilfully made handcrafts will definitely stimulate those shopping instincts in the most conservative shoppers. The old-city ramparts, the Koutoubia Minaret majestically standing in the heart of the city, the widespread wonderful historical monuments, gardens and basins will definitely leap you back in the greatest times that this city has enjoyed. In addition, the city offers quality hotels and is one of the most attractive, convenient and unforgettable conference venues.

The **deadline** for submitting papers is **April 30, 2007**.

For any questions regarding papers, posters, and symposia, please contact the organizing secretary:

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For registration, call for papers, accommodation and other details please visit the Website of the conference

http://www.ucam.ac.ma/icpe2007/

IX Inter-American Conference on Physics Education San José, Costa Rica, July 2006

The Inter-American Conference on Physics Education (IACPE) is a traditional meeting, promoted each 3 years, by the Inter-American Council of Physics Education. This year, the 9th meeting was held at San José, Costa Rica, July 3–7, 2006. The Costa-Rican committee was composed by members of the Physics Department and the School of Teacher Education of the Universidad de Costa Rica, the Physic Department of the Universidad Nacional, the Science Department of the Universidad Estatal a Distancia (University for Distance Learning) and the Ministries of Science and Technology, and of Education. About 100 delegates (mainly physics educators) from 14 countries attended the IX IACPE, with 22 of these delegates coming from Costa Rica.

The theme of the Conference was "*Teaching Physics in the New Millennium*" and its goal was "new ideas for the teaching of physics with virtual and electronic instrumentation equipped laboratories for the education and development of physics teachers". The number of paper proposed to the conference was more the one hundred, organized in six themes:

- The preparation of physics teachers;
- Teaching Physics to professionals in related fields;
- Relation between physics, other sciences, technology and society in the teaching of physics;
- Informal learning of physics and the use of appropriate techniques and technologies;
- Teaching of physics in non university levels; and
- Research in the teaching of physics and other sciences in the classroom".

The Latin-American Center of Physics (CLAF), the International Commission of Physics Education of the International Union of Pure and Applied Physics (ICPE/IUPAP) and the Ministry Science and Technology of Costa Rica, endorsed the IX IACPE.

More details can be found at the website:

www.efis.ucr.ac.cr/varios/ixconfenfisica.htm

Background: Latin-American Physics Education Network (LAPEN)

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The creation of the Latin-American Physics Education Network was inspired by the existence of other similar networks throughout the world. Its main purpose was to coordinate projects and to establish links between existing groups working on Physics Education in different countries of the region. The Brazilian delegate explained the necessity of a Latin-American network during the meeting of the International Commission of Physics Education (ICPE) in Durban in 2004. The first step towards funding LAPEN was taken during the International Meeting on Teaching Physics and Professor Training (RIEFP 2005), which was held in Matanzas, Cuba in November 2005. Delegates from Mexico, Brazil, Uruguay, Colombia, Peru, Spain, Argentine and Cuba participated in drawing up the constitution.

LAPEN was also sponsored by the general assembly of the IX Inter-American Conference, held at San José, Costa Rica in July of this year, and linked with the meeting of the International Commission on Physics Education in Tokyo in August 2006, when its statements was presented.

The first coordination team of LAPEN was constituted by:

President:	Dr. Mauricio Pietrocola, pietro@usp.br
Vice-president:	Dr. Eduardo Moltó Gil: Iacpe@fisica.uh.cu
Executive Secretary:	Dr. César Eduardo Mora Ley: cmoral@ipn.mx.

The website of LAPEN is:

www.cicata.ipn.mx/lapen/lapen.htm

AsPEN Active Learning Workshop in Japan, August 2006

Lakshman Dissanayake
AsPEN Chair; and Professor of Physics
University of Peradeniya
Sri Lanka

The Asian Physics Education Network (AsPEN) was established in 1981, under the auspices of UNESCO in order to set up a program of cooperation in the field of university physics teaching, which is an urgent priority for the Asian region. It has four primary objectives: to contribute towards promoting the overall development of university physics education in the Asian region; to establish a programme of cooperation amongst members in physics education and related areas; to establish effective channels of communication; and to disseminate information on physics education and related ideas.

In August 2006, AsPEN organized an Active Learning Workshop on Physics Education, at Kagawa University, Takematsu, Japan from 9th to 12th August. The workshop was held in order to promote active learning methods in Physics Education to Japanese Physics teachers. About 50 teachers, mostly from Kagawa district participated in this workshop.

Invited presentations were given by: Professor Lakshman Dissanayake (AsPEN Chair, Professor of Physics, University of Peradeniya and NPC Sri Lanka) on "The Role of AsPEN in Promoting Active Learning Methods in Asia" and "Teaching Heat and Phase Changes using Interactive Lecture Demonstrations (ILD)"; Professor David Sokoloff (University of Oregon, USA) on " Promoting Active Learning Methods Based on IT"; Dr Pratibha Jolly (Chair, ICPE) on "New Directions of Physics Education for the 21st Century"; Dr Linda Santiago Posadas (UNESCO, Jakarta) on "Scientific Literacy for Sustainable Development"; Dr Ivan Culaba and Mr. Joel Maquilling (AsPEN Resource Persons, Ateneo de Manila University, The Philippines) on "Active Learning in Optic and Photonics"; Professor Akizou Kobayashi (Niigata University, Japan) on "Analysis of Various Motions Using Digital Movies"; and Professor Naoshi Takahashi (Kagawa University, Japan) on "Teaching Demonstrations on Centre of Gravity".

On the last day, a fascinating hands-on workshop using a syringe type vacuum pump, open air GM counters and new materials for electricity demonstrations, was conducted by a group of Kagawa High School Physics Teachers lead by Lady CATS (Creators of Active Teaching Materials for Science). This hands-on session generated lot of interest and enthusiasm among participants. Foreign resource persons also learnt many new ideas from their Japanese colleagues.

About fifty high school teachers, mostly from Kagawa district, actively participated in this workshop. The Organizing Committee consisted of Prof. Hiroshi Kawakatsu, Professor of Science Education at Kagawa University and AsPEN NPC, Japan (Chairman), and Professors Syunsuke Nakanishi and Akizou Kobayashi (Vice Chairmen). This was one of the very successful and interesting workshops organized by AsPEN in recent years.

The workshop was supported by UNESCO, Jakarta Office, The Board of Education of Kagawa Prefecture and The Board of Education of Takamatsu City. Interested readers can get more information from the coordinator of the workshop:

Prof. Hiroshi Kawakatsu,
Faculty of Education,
Kagawa University, 1-1 Saiwai-cho,
Takamatsu City, Kagawa, 760-8522 Japan.

Figure 1. *Participants during an active learning sessions using hands on apparatus at the AsPEN worksop at Takematsu, Japan*

Phys Wiki

A Physics Wiki for Development of Instructional Materials

Wiki is a term applied to a web site in which users can contribute information and modify information that has been posted by others. Because many people contribute small parts to a large effort, a Wiki can grow to become a major contribution of collection knowledge and experience, maybe even wisdom. The most well know Wiki is *Wikipedia* (http://wikipedia.org/) which now has over a million entries in English and hundreds of thousands of entries in many other languages. In fact one of the best descriptions in English of the concept of a Wiki is in the *Wikipedia* at http://en.wikipedia.org/wiki/Wiki. By changing the "en" in this address to an abbreviation for your favorite language (fr for French, af for Afrikaans, ja for Japanese, etc.), you can probably find a similar description of the concept of a Wiki.

The idea of *Phys Wiki* began as part of the World Conference on Physics and Sustainable Development which occurred in October 2005 and was described in the previous ICPE Newsletter http://web.phys.ksu.edu/icpe/Newsletters/n51.pdf page 3. One of the breakout groups for Physics Education began to develop a series of lessons for teaching physics as it is applied to some important practical topics. The lessons focus on the topics of:

- Solar Thermal Energy,
- Water Physics,
- Improving Human Limitations,
- Photovoltaic Cells, and
- Low Impact Lighting.

Of course, at a short conference a group can only make a start on the development of new instructional materials. To continue the development beyond the conference we decided to adopt the Wiki idea. One group of conference participants created the first outline for each of the topics listed above. That outline is now posted at http://web.phys.ksu.edu/physiki/. Everyone is invited to make additions or changes to these outlines. By having a large number of physics teachers from throughout the world contribute, we hope to create lessons that will be useful in a variety of different cultures. Because all changes are saved we can even have different versions of lessons on the same topic for different situations.

If none of the topics listed above interest you, you may add the beginnings (or more) of lessons on your favorite topic by clicking New Lesson and following the instructions. We ask that you do not post any materials which have been copyrighted unless you are able to send us permission from the copyright holder.

All questions about *Phys Wiki* should be sent to Dean Zollman at

dzollman@phys.ksu.edu.

IUPAP – ICPE

International Commission on Physics Education
International Union of Pure & Applied Physics

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