Supporting and promoting science education internationally

The ICASE Newsletter November 2009

Newsletter of the International Council of Associations for Science Education.

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1. ICASE News

ICASE is a Non-Governmental Organisation, set up by its member National STAs, Science Societies, Science Centres, etc to form an International Science Education Communication Network. Are you a member of a national/regional organisation which is a current member of ICASE ? It is possible for all organisations interested in international science and technology education to belong to the ICASE network. Contact Miia Rannikmae, ICASE Secretary, for more information (miia@ut.ee).

ICASE World Conference 2010 June 28-July 2, 2010

Submissions are welcome from science educators and especially from teachers of science subjects.The deadline for abstract of papers and a 3 page synopsis is now approaching (see www.worldSTE2010.ut.ee or www.icaseonline.net). There is no need for the full paper.
The synopsis is intended to help the reviewer to provide feedback to the presenters (if appropriate) and to help to group presentations into meaningful sessions within the conference. This is also of particular help for workshops requiring specific facilities. PLEASE NOTE – the deadline for submissions is the 15th NOVEMBER, 2009.

SHOULD THIS DEADLINE PROVE TO BE DIFFICULT, PLEASE CONTACT THE CONFERENCE ORGANISER (miia@ut.ee) so that guidelines can be given on how best to proceed.

ICASE World Conference 2013

Call for Expressions of Interest to be a partner with ICASE as host organisation for ICASE2013 - World Conference on Science and Technology Education.

ICASE intends to hold another World Conference on Science and Technology Education during 2013. In order to achieve this, ICASE will form a partnership with a 'host association/organisation' located in the country where the conference will be staged. ICASE and the host association/organisation will assume shared responsibility for the conference and each will nominate a co-convenor and will contribute people to the necessary conference committees. This is a call for expressions of interest from associations/organisations interested in becoming a partner with ICASE as host association/organisation for ICASE2010. Proposals should be submitted by January 15th 2010 to: Dr Robin Groves. Chair, ICASE World Conference Standing Committee: Email: grovesr@ozemail.com.au or Mailing address: PO Box 244, Mount Hawthorn. WA 6016, Australia. Enquiries may be directed to the email above. A decision will be made by ICASE by March 15th 2010 and the successful proposer and all other bidders will be notified. It is anticipated that the planning for ICASE2013 will commence immediately, and that advance information about it will be made available at the ICASE 2010 World Conference in July 2010.

Global Conversations in Science Education Conference, convened by NSTA
Philadelphia, Pennsylvania, 18th March 2010
THEME: "Assessing Student Understanding of Science: Perspectives and Solutions"
This will be a special day by the National Science Teachers Association dedicated to science education from an international perspective. This is a ticketed event (M-2), open to all registered attendees of the NSTA National Conference on Science Education (at no additional costs). Tickets will be available in November. You may register for the conference now and add tickets to your registration later. Conference registration and hotel information is now available on the NSTA website at http://www.nsta.org/conferences/2010phi/
Activities begin on Wednesday, March 17, with a President's International Reception for all international visitors and invited guests. On Thursday, the day commences with a welcome ceremony, including a NSTA conference orientation, followed by a plenary talk by Dr. Rodger W. Bybee, Chair of the PISA 2006 Science Expert Group. Dr. Bybee will speak about global assessments and comparisons. There will also be concurrent sessions related to the theme focusing on formative, summative, and global assessments. A full complement of papers will also be presented in a poster session, along with a luncheon plenary speaker, Dr. Robin Millar, Chair of the Departmental Research Committee at the University of York, UK. Dr. Millar will speak about problems related to assessing what students really know. The day will conclude with a panel discussion with Dr. Bybee and Dr. Millar. For more information, please visit the website at http://www.nsta.org/portals/international/intlsciedday.aspx.

ICASE Treasurer
ICASE is pleased too announce that the new treasurer is Peter Russo, the CEO of ASTA. He will be taking over from Adrian Fenton who decided that with a change of job he preferred to resign. His position was complicated by the ASE decision to withdraw form ICASE.

2. Science Activities

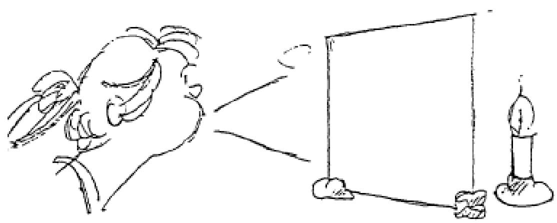
These following activities are from a collection built up by ICASE through its former primary science newsletter (STEP) and other sources. They are put forward to bring attention to small activities which can be carried out in the science classroom with minimal equipment.

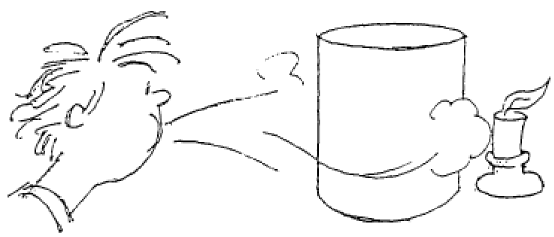
A) STEP ACTIVITY

Blowing out candles

Challenge: How can you blow out a candle when it is behind something?

You need safe surface to work on
Candle
Matches
Cardboard
Plasticine
Large tin can
Jar lid or saucer





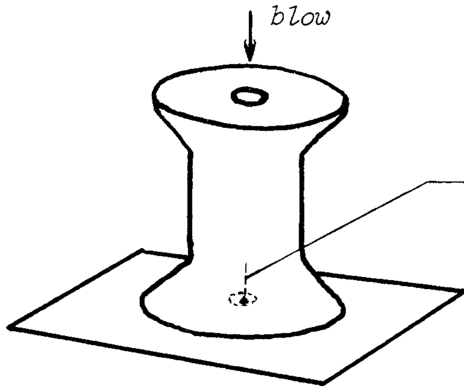
What to do
Prepare a safe surface to work on. Aluminium foil or a large cooking tray will help to keep the activity safe. Use plasticine to hold the cardboard sheet upright. Use a little plasticine to hold the candle upright in the jar lid or saucer. Place the candle behind the cardboard. Light the candle. Try to blow out the candle by blowing towards the cardboard. What happens to the candle flame? After extinguishing the candle, place the candle behind the large tin. Light the candle. Try to blow out the candle by blowing towards the tin. What happens to the flame? Can you blow it out ?

More to do
1. How can you shape the cardboard so that now you can blow the candle out?
2. Are there shapes other than a cylinder which enable you to blow out the candle?
3. Blow the candle out so that a trial of smoke remains. Place the candle in front of the tin can. Are you able to see a smoke trail around the can as you gently blow to wards the extinguished candle?

B) ADDITIONAL SCIENCE ACTIVITY

FLOWING AIR - THE FLOATING CARD

Materials: 1. A paper card (3 x 5").
2. A thread spool and a pin.



Procedure:

1. Hold the card up close to the mouth and blow against it. What do you observe? What did the card do?
2. Now push the pin through the center of the card
3. Hold the card against the spool with the pin sticking in the hole of the spool. Ask: "What would you expect the card to do when I blow through the hole of the spool?" (Anticipated answer: 'blow away').
4. Now blow through the hole of the spool and let go of the card (card should stick against the spool).

Questions:

1. What did you observe when blowing against the card without the spool?
2. What did you observe when blowing through the hole of the spool against the card?
3. Where was the faster flow of air created?
4. What is different about the air above the card as compared to the air under the card (while blowing through the spool hole)?
5. What is keeping the card against the spool?

Explanation:

By blowing in the hole of the spool, we are creating a faster flow of air above the card, thus creating a partial vacuum at this spot: between the card and the spool. The relatively slower moving air, which is surrounding the card, exerts a higher pressure compared to the air between the card and the spool. This makes the card stay close to the spool. As soon as we stop blowing through the spool, the card drops, because the pressure above and below the card is equalized.

C) USING EXPERIMENTAL IDEAS IN SCIENCE TEACHING

This newsletter contains two experimental ideas. It is hoped that these are of interest. But how to use these experiments in teaching ? Teachers need to be free to include experimentation as they feel best, but given below is ICASE thinking in putting forward the experiments in this newsletter. Teachers and science educators are welcome to comment.

1. Who does the experiment ?

Clearly these experiments can be undertaken as a teacher demonstration. However, the intention is that the students are involved, either working individually, or more likely, in small groups. The apparatus is kept as simple as possible and can often be brought from home, or made by the students themselves.

Why is student involvement preferred ? We note the old Confucius saying – I hear and I forget; I see and I remember; I do and I understand. The belief is that the more students are engaged, the more they learn. Teacher demonstrations, or large group experiments, limit student involvement and are thus not preferred.

2. Should instructions be given to students ?

The sections *'What to do'* and/or *'Procedure'* clearly spell out how to undertake the experiment. But it is not intended that the experiment must be used in this way. By following instructions, a *'cookbook,'* or *'follow a recipe'* situation is created. This highlights the **doing,** but **probably not** the understanding. Where instructions are provided, the student learning can be expected to be the explanation that follows. And the teacher is then focusing on students' explanatory skills. The questions have been added to the first experiment to encourage moves away from a 'cookbook' or 'do-and-forget' approach and towards a more exploratory approach. In the second experiment the questions seek understanding which can lead to modifications of the experiments for more novel effects. It will a pity if the teacher is the person who answers these questions. In fact it would be interesting to learn of situations where the students, themselves, are both asking and then answering the questions.

3. Inquiry learning

Can the experiments be used in an inquiry approach, whereby the students ***raise questions*** and **suggest the *purpose* and *procedure themselves* ?** This is very much an ICASE recommended approach. It means students put forward the investigatory question, plus the procedure to follow. It promotes science as the seeking of explanations to questions put forward rather than to a 'wondering why' approach, although perhaps this is appropriate for the younger students.

So what would be the investigatory questions for these experiments ?

This is a challenge left for you to consider.

3. An Introduction to Ideas for Greater Relevance of Science Teaching for the Enhancement of Scientific Literacy

Jack Holbrook, ICASE President

In the last newsletter, this column considered:

- *What is an example of a socio-scientific scenario ?*

The example given was a consideration of the issue of cleaner fuels, possibly biodiesel, but recognising that this was not actually looking towards a solution (scientific problem solving leads to a solution), but was in fact setting the scene for making a decision, a decision which recognises that while the science learning is an important part for examining the scenario, it was not enough. Science education needs to go further and for example consider other socially related factors, such as the raw materials are also foodstuffs and hence if used a fuel limit that to be used as food. 'The recent episode of big increases in the cost of corn, because much was being used to create fuel, reinforces this point]. The scenario thus illustrates an issue that can be considered socio-scientific and where the science conceptual learning is important, but insufficient.

- What is stage 3?

The last newsletter suggested that stage 3 had two important consideration – consolidation and decision making. Consolidation is an important part of science learning and in stage 3 the consolidation is undertaken in the ***transferenc****e of the decontextualised science learning from stage 2, back to the issue at hand as introduced in the scenario in stage 1. In this way the idea is that the decisions taken reflect on the scientific aspects as well as on other social dimensions (economic, environmental, ethical, political, etc). Stage 3 thus relates to argumentation skills and concensus making leading to making decisions. Stage 3 recognises that science and science education (science teaching in school) are* ***not of the same nature*** *and it is necessary to be clear that these are two separate (but interrelated) disciplines.*

This leads to a consideration of why relevance is considered so important in science teaching? And in striving for relevance, it leads to a consideration of what is science education ?

Motivation theory suggests that while extrinsic motivation (the motivation in school which is largely supplied by the teacher) is important, it is intrinsic motivation (motivation coming from the individual) that needs to be present for positive learning to be enhanced. Intrinsic motivation is thus suggested as being extremely important for meaningful learning. This intrinsic motivation can come about from the extrinsically driven situation in the classroom whereby the teacher interests the students in the learning and the students themselves recognise that this is something that they wish to learn more about and hence it has relevance for the students. However, this is a big challenge for the teacher, especially as the students are in fact a group of individuals and motivational efforts by the teacher in one direction may not motivate all students. In fact, there is evidence to suggest that external motivation without intrinsic motivation being present as well could have a negative effect for students.

Intrinsic motivation does not have to come from the extrinsic motivation supplied by the teacher. The extrinsic to intrinsic approach is probably very strong at the primary school level (grades 1-6), but at the onset of adolescences, factors outside school tend to play an increasingly important role If it is possible that the student environment and engagement outside the school can provide a stimulus for igniting intrinsic motivation, this, it is contended, can be a powerful learning frame from which the learning within the school can build.

Intrinsic motivation is unlikely to result from school learning which is isolated from the society in which the student lives. It is also unlikely if the science in school is conceptualised without reference to the manner in which science impinges on the lives of students. Thus, undertaking the learning of science which is followed by applications of that science in the society is not seen as an approach leading to initial intrinsic motivation (the applicational aspect is actually driven by extrinsic motivation which may or may not lead to intrinsic motivation and only then at the end of the topic). What is needed is for the science teaching to stem from the society, from the world of the students where student concerns have already been aroused.

Developing science teaching from student concerns is seen as no easy task. It suggests moving away from the textbook approach and seeing the textbook as a reinforcing document to be used as and when the students see the need. But one approach being developed is to identify concerns or issues facing the students (unfortunately any concern or issue cannot be guaranteed to be appropriate for all students). The issue or concern is thus considered from a relevance perspective and can be, and for the most part probably is, local rather than regional, or regional rather than global. The stage 1 scenario is thus a key element in striving towards relevance of the teaching that is to take place in science lessons. The target is this that this learning is intrinsically motivated, but of course supported and enhanced by teacher driven, extrinsically motivational actions.

The picture intended is thus that relevance in science education, enabling science teaching to be intrinsically motivational, is the way forward for the teaching of science subjects in schools. And from this it needs to be clearly recognised that relevance is NOT the same as interest. Whereas interest might be seen as enjoyment and probably temporary, relevance is seen as meaningful for the student, useful as perceived by the student both for the present and in the future, or important in that it helps the student to make more sense of their world, their development or their future within society or a career.

This approach to stimulating intrinsic motivation in school science, via relevance, is very different from considerations of ‘relevance’ to the curriculum, ‘relevance’ to the examination or ‘relevance’ to the needs of the school. Expressions put forward by the teacher, such as ‘this learning is important because it is in the curriculum’, or ‘it is essential for the examination’, or ‘for learning in higher education institutions’ are simply part of a teacher’s extrinsic motivation ploy and without intrinsic motivation are likely to do more harm than good. The meaning of relevance in science education is seen as external to the school and can only be meaningfully employed to the curriculum, examinations etc if these are coming from society, changing as society changes and in tune with the experiences impinging on the learners (the students). In this sense the textbook is always out-of-date, the curriculum too inflexible and the examination too limited in being able to address the relevance factor enabling intrinsic motivation to play a major role in science learning .

It is thus suggested we are beginning to develop a different philosophy for science education, one which is driven by student needs stemming from society and much less for the needs of scientists or perceived as needs by scientists. The approach advocated is thus context-based with the context having sufficient relevance for the students to stimulate intrinsic motivation.

This raises the questions (to be considered in a subsequent newsletter) -

What is the shift in philosophy for science education ?
How can this be effected ?

4. SAFE SCI Be Protected

Article provided by Dr. Ken Roy – Chairman of the ICASE Standing Committee on Safety in Science Education. He is also Director of Environmental Health & Safety, Glastonbury (CT), an authorized OSHA instructor and science safety consultant. Email: Royk@glastonburyus.org

GETTING A GRIP SAFETY-WISE!

I. Safety Quiz!

Laboratory accidents involving hands can usually be classified under four main hazard types: abrasions, chemicals, cutting and heat. One glove does not fit all however!

Hand protection can be as critical in the laboratory or the field when it comes to personal protective equipment (PPE) use. OK – Let's see what the reader knows about PPE hand protection!

1. Do regulatory standards and/or best practices address hand protection? T or F?
2. Rubber gloves protect lab workers from all chemicals? T or F?
3. MSDS's address the type of glove needed for a specific chemical? T or F?
4. No other glove type should be used unless allergic to rubber or latex? T or F?
5. A small tear in the cuff of a glove will not compromise its use? T or F?

Answers are given in this article on hand protection in the laboratory. Let's see how well you did.

II. Safety Says!

Most regulatory agencies and best/professional practices directly address personal protective equipment (PPE) for hands. Employers should select and require employees to use appropriate hand protection when employees' hands are exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; chemical burns; thermal burns; and harmful temperature extremes. Employers should base the selection of the appropriate hand protection on an evaluation of the performance characteristics of the hand protection relative to the task(s) to be performed, conditions present, duration of use, and the hazards and potential hazards identified. Basically, the employer must do a safety assessment to determine what issues must be addressed and how they are to be rectified relative to hand protection.

III. What Are The Important Hand PPE Questions?

The general requirements for PPE should include the performance of a written hazard assessment, selection of the appropriate PPE to protect the employee and proper training and records noting appropriate employees have been trained. Five important questions science teachers should be asking are as follows, relative to hand protection:

1. When is it necessary to use hand PPE?
2. What type of hand PPE is necessary?
3. How is hand PPE properly put on, worn, adjusted and removed?
4. What are the limitations of the hand PPE?
5. What is the appropriate care, life span, maintenance and disposal of hand PPE?

IV. What Kinds of Exposure Warrant Hand PPE?

Hand PPE using gloves are to be used if there is the potential for the following exposure

1. Abrasions – Appropriate leather or heavy cotton knit gloves are required in cases where abrasive materials or abrasive producing tools/equipment are used.

2. Cuts & Lacerations – Appropriate cut resistant gloves are required in cases where sharp objects are being used.
3. Electrical Shock – Appropriate rubber insulated gloves and leather glove protectors are required to protect employees from prescribed voltages.
4. Hazardous substances – Appropriate chemical resistant gloves are required to prevent chemical contact and skin absorption.
5. Temperature Extremes – Appropriate thermal protection via insulated gloves are required.

General types of hand protection include the following:

1. **Metal mesh gloves** - resist sharp edges and prevent cuts
2. **Leather gloves** - shield your hands from rough surfaces
3. **Vinyl and neoprene gloves** - protect your hands against toxic chemicals
4. **Rubber gloves** - protect you when working around electricity
5. **Padded cloth gloves** - protect your hands from sharp edges, slivers, dirt, and vibration
6. **Heat resistant gloves** - protect your hands from heat and flames
7. **Latex disposable gloves** - used to protect your hands from germs and bacteria
8. **Lead-lined gloves** - used to protect your hands from radiation sources .

V. Safety Data Sheet Information Critical!

SDS information should include appropriate PPE for each hazardous chemical. The SDS section on PPE addresses not only hand protection but also may address other forms of PPE such as eye, face, body, respiratory, etc. An example is the SDS for Hydrochloric Acid. It reads as follows:

Personal Protection for HCl:
Personal Respirators:
If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.
Eye Protection:
Use chemical safety splash goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

In the case of HCl, skin protection includes rubber or neoprene gloves, plus other equipment to protect the body relative to skin contact.

VI. Chemical Hazards: Special Attention for Hand Protection!

The type of glove protection used in the laboratory is first determined by the nature of the substances involved. Commercial labeling on the container and SDSs should be viewed prior to working with any hazardous chemical. Most often, glove type is provided for that specific hazardous chemical, as well as additional PPE.
Over time, all gloves will be permeated by the chemical. Try to determine the gloves characteristics relative to life span such as thickness and permeation rate. Gloves should have a scheduled replacement date which depends on how often they are used and the permeability to the

substance(s) handled. Gloves being taken out of service should be cleaned of the contaminate material and then appropriately discarded.

VII. Getting The Gloves Off!

Best practice suggests the following guidance in removing gloves:
To take off your gloves when you have finished, peel one glove off by holding the cuff. Then, with your ungloved hand, hold it wrong-side out as you peel off the other glove by the cuff.

When you're finished, both gloves will be wrong-side out and the contaminated surface will be on the inside.

VIII. FINAL THOUGHTS!

In summary – consider the following items when the need for hand PPE is there:

1. Make sure the glove size fits and is comfortable.
2. Remove jewelry such as watches, rings that can puncture gloves.
3. Always inspect gloves before putting them on and when using them for signs of deterioration, holes, cuts, tears, etc.
4. Always replace worn or damaged gloves.
5. When the work is completed, make sure the gloves are disposed of in the correct waste container.
6. Always wash hands with soap and water before and after glove use.

PS: Answers in case any were missed!

1. Do regulatory standards and/or best practices address hand protection? T!!
2. Rubber gloves protect lab workers from all chemicals? F!!
3. MSDS's address the type of glove needed for a specific chemical? T!!
4. No other glove type should be used unless someone is allergic to rubber or latex? F!!
5. A small tear in the cuff of a glove will not compromise its use? F!!

Live Long & Prosper Safely!

Resources:
International Labor Organization (GHS Draft):
http://www.ilo.org/public/english/protection/safework/ghs/ghsfinal/index.htm

Occupation Safety & Health Administration: http://www.osha.gov/dsg/hazcom/ghs.html

Australian Guidance Procedures for the Use of Personal Protective Equipment (PPE) in the Workplace.
http://www.dse.murdoch.edu.au/admin/safety/docs/PersProtectEqpProc.doc

5. NSTA Testimony on Science Education for the USA

Testimony to the President's Council of Advisors on Science and Technology (PCAST) in the US by Francis Eberle, Executive Director, National Science Teachers Association

On behalf of the National Science Teachers Association, the largest organization in the world promoting excellence and innovation in science teaching and learning for all, thank you for your commitment to STEM education. As the leader in science education, NSTA reaches over 300,000 teachers every week, and we work to engage teachers of science nationwide and improve student learning by providing a vast array of products, services, and programs.

NSTA enthusiastically embraces the concept of STEM education, and we value the importance of engineering and technology in the K-12 curriculum. We welcome this opportunity to provide input to PCAST. We will be limiting our recommendations primarily to science education. As you know, there have been some promising indicators for science and math education in the United States recently:

- In 2006, slightly more than half the states required 3 or more years of both mathematics and science courses for high school graduation. (*Science and Engineering Indicators 2008*)
- More students are taking advanced science classes; student course completion rates have increased since 1990 in advanced biology, chemistry, and physics, although they leveled off between 2000 and 2005. (*Science and Engineering Indicators 2008*)
  Growth was especially strong in mathematics. The Class of 2005 graduates completed mathematics courses at far higher rates than their 1990 counterparts in all categories except trigonometry/algebra III. The proportion of students completing courses in precalculus/analysis, calculus, and Advanced Placement/International Baccalaureate (AP/IB) calculus at least doubled since 1990. (*Science and Engineering Indicators 2008*)
- The National Math and Science Initiative posted a 71.5 percent increase in AP exams passed in math and science by African American students as compared to 13 percent nationally.
- More teachers are teaching "in-field." Nationally, 61 percent of secondary mathematics teachers in U.S. public schools majored in their field, and 77 percent of science teachers majored in their field (CCSSO *State Science and Mathematics Education Indicators 2007*)

Unfortunately while many of these indicators are encouraging signs, we still have a long way to go. It is our belief that building the human capacity to educate students to be internationally competitive will require the nation to first address four major challenges to improve science education.

Challenge Number One: Lack of Coordination between K-12, Higher Education (Including Community Colleges) and Career and Technical Education (CTE)

Currently students do know what is expected of them as they move from middle school to high school, and then from high school on to post secondary education. There are internal barriers at these major transition points for students, such as weak career counseling and job awareness connected to course and performance expectations, low course expectations for students, poor articulation across grade transition points (e.g. grade 8 to 9, grade 12 to 13) and institutional barriers such as courses for some students and not others, preventing those students from advancing to the courses they need.

In the October 30 2007 *National Action Plan for Addressing the Critical Needs of the U.S. Science, Technology, Engineering and Mathematics Education System*, the National Science

Board (NSB) points out: "*The nation faces two central challenges to constructing a strong coordinated STEM education system: Ensuring coherence in STEM learning and ensuring an adequate supply of well prepared and highly effective STEM teachers.*"

The National Science Teachers Association agrees with the NSB recommendation that we must promote vertical alignment of STEM education across the grade levels from PreK through the first years of higher education by:
• Improving the linkages between high school and higher education and the workforce
• Creating or strengthening STEM education focused P-16 or P-20 councils in each state
• Encouraging alignment of STEM content throughout the P-12 education system

Recommendation: PCAST should support the development and implementation of policies that will encourage a vertical alignment of STEM education.

Challenge Number Two: Disconnected Infrastructure in Science Education (Standards and Assessments and Professional Development) Resulting in Uneven Delivery of Science
Standards and Assessments: The policies and instruments that are used for determining students' performance and success in science are irregular and uneven within states and across this country. A coherent science education system can provide all students with the knowledge and skills necessary for life in the 21st century.

Common national K–12 science education standards should be drawn from current national standards documents, and be more streamlined and focused, and organized around a small number of big ideas rooted in the major fields of science that develop over the K–12 span and include crosscutting concepts and skills that would unite the disciplines in a deep, meaningful way. National assessments and accountability mechanisms should be developed aligned to common science standards. This will enable schools to better guide instructional improvement and innovation in science. Students can move from school to school, and state to state and find similar expectations and accountability measures.

Teacher Professional Development: Long term, coherent, reform-based professional development is essential for all teachers of science. Research shows after 80 to 100 hours of professional development, teachers reported more inquiry based practices. Professional development should focus on content knowledge, active learning, and be coherent with other activities. Significant in improving these are collaborative learning opportunities, groups of teachers from the same school, and the duration of the professional development program.

Recommendation: PCAST can assist the science and education communities efforts to develop common standards that are more focused, aligned, and coordinated with assessments and advocate for quality, evidence based teacher professional development experiences.

Challenge Number Three: Lack of Funding For Equipment and Supplies
It is unfair to have high expectations for students if teachers and schools do not have the requisite materials and equipment to properly teach science. A 1995 U.S General Accounting Office (GAO) report found that 42 percent of schools surveyed reported they were not well equipped in the area of laboratory science. A second 2000 GAO report found that approximately 40 percent of college students who left the sciences reported problems related to high school science preparation. This under preparation was linked to problems such as a poor preparation in math and lack of laboratory experiences or exposure to computers.

Abstract learning does not provide students with the understanding of science needed for problem solving and innovative thinking, but rather memorization of information. Developmentally appropriate laboratory experiences are essential for both middle level and high school aged students, yet these experiences for a large number of students are abysmal. Far too many schools have undertrained or inadequately supported teachers, outdated lab equipment and insufficient materials-or in many cases no labs at all.

Although no specific research is available on science educators specifically, according to the QED *2006-2007 Teacher Buying Behavior Report*, on average teachers report spending a total of $475 of their own money on classroom materials and supplies. 44% of respondents spend over $500 on their classrooms, with 20% spending over $1,000, and 38% of teachers report needing materials that support differentiated instruction.

Recommendation: PCAST can encourage comprehensive federal policy that will ensure that STEM classrooms are adequately supported.

Challenge Number Four: Equity Issues in Science Education

Underrepresented minorities represent 34% of those aged 18-24 in the United States. We will need to find effective ways to reach these young people if we want a high quality STEM workforce in future years. While we all recognize this issue and it has been widely documented, only a few targeted yet disconnected programs are having success.

In 2000–01, only about 13 percent of bachelor degrees awarded to African Americans and Hispanics were in the STEM fields, compared with 31 percent for Asian Americans and 16 percent for whites. These figures have changed little over the past decade. (American Council on Education *Increasing the Success of Minority Students in Science and Technology)* A closer look at the data reveals that African Americans and Hispanics enter higher education with the same level of interest in the STEM fields as their peers, but that they fail to persist in these majors at the same rate as their white and Asian-American classmates. (American Council on Education *Increasing the Success of Minority Students in Science and Technology)*

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The NAEP Science 2005 Trial Urban District Assessment (TUDA) tells us that many of these challenges begin at the K-12 level:

- The 4th Grade Average NAEP Science Scores for the nation are 149. In the NAEP TUDA study of ten urban areas (Austin, Charlotte, Houston, San Diego, New York City, Atlanta, Boston, Cleveland, Chicago and Los Angeles), only one city (Austin) scored 147; the other nine urban city scores are significantly below the national average
- There is a wide disparity between the national percentile ranking of white students and black and Hispanic students in the same urban area. For example, Atlanta white students ranked at the 86th percentile, while Atlanta black students ranked at the 22 percentile.
- The 8th Grade average NAEP science score for the nation is 147. The 8th graders scores in each urban area assessed were significantly below the national average.
- In nine out of ten urban areas, more than half of the students scored at the below basic level in science.

Recommendation: PCAST should recommend the development of policies that would focus on underserved populations and ensure resources are targeted as needed.

6. Calendar of Events

The Association for Science Education, UK will hold its annual conference at the University of Nottingham from Thursday the 7th January to Saturday, 9th January, 2010. This year's conference theme is 'Inspirational Science: the Best in Science Teaching and Leanirng.' Please consult the website www.ase.org.uk for further details.

National Science Teachers Association (NSTA), Philadelphia, USA

The next NSTA **National Conference will be held in** Philadelphia, PA from March 19-21, 2010. Please consult the NSTA website for more details. An international day will be held on the 18th March on

Global Conversations in Science Education Conference
Philadelphia, Pennsylvania

THEME: "Assessing Student Understanding of Science: Perspectives and Solutions"

On Thursday, March 18, 2010, the National Science Teachers Association will have a special day dedicated to science education from an international perspective. **This is a ticketed event (M-2), open to all registered attendees of the NSTA National Conference on Science Education (at no additional costs).** Tickets will be available in November. You may register for the conference now and add tickets to your registration later. Conference registration and hotel information is now available on the NSTA website at http://www.nsta.org/conferences/2010phi/

Activities begin on Wednesday, March 17, with a President's International Reception for all international visitors and invited guests. On Thursday, the day commences with a welcome ceremony, including a NSTA conference orientation, followed by a plenary talk by Dr. Rodger W. Bybee, Chair of the PISA 2006 Science Expert Group. Dr. Bybee will speak about global assessments and comparisons. There will also be concurrent sessions related to the theme focusing on formative, summative, and global assessments. A full complement of papers will also be presented in a poster session, along with a luncheon plenary speaker, Dr. Robin Millar, Chair of the Departmental Research Committee at the University of York, UK. Dr. Millar will speak about problems related to assessing what students really know. The day will conclude with a panel discussion with Dr. Bybee and Dr. Millar. For more information, please visit the website at http://www.nsta.org/portals/international/intlsciedday.aspx.

ICASE World Conference, 28th June – 2nd July, 2010, Tartu, Estonia

The 3rd ICASE World Science and Technology Education Conference will be held at the University of Tartu.

Conference theme - **Innovation in science and technology education: research, policy, practice.** The Call for Papers is now announced for each of the sub-themes – *research; policy and practice.*

[See website for more details about the call for papers - www.WorldSTE2010.ut.ee]

10th ECRISE and 4th DidSci conference, Krakow, Poland July 4 – 9, 2010

The organizing committee cordially invites you to attend and participate in the 10th European Conference on Research In Chemistry Education (ECRICE) and 4th International Conference Research in Didactics of the Sciences (DidSci). We kindly invite all academicians, doctoral students, science teachers, and researchers to take part in these events.

Based on a long tradition, ECRICE is organized under the auspices of EuCheMS (formerly FECS), in relation to the activity of the Division of Chemical Education. This meeting follows successful conferences held in Istanbul (2008), Budapest (2006), Ljubljana (2004), Aveiro (2001) etc. This Conference is an opportunity to exchange experiences on research in chemical education (ECRICE) and research & practice in natural science education (DisSci) carried out at every education level from primary school to graduate studies. The aim of the conference is to familiarize participants with the most recent achievements in the various scientific centres.
The programme will feature a wide variety of plenary, invited and contributed lectures, as well as poster sessions. Topics include:

- Results of science/chemical education research and reports on evidence-based and/or research informed practice at all levels in the fields.
- Teaching and learning chemistry/science at all level of education (from elementary schools to universities, general and vocational schools).
- Life long learning in chemistry/science.
- New technologies in chemical/science education.
- Laboratory work (Micro Scale Chemistry, safety issues etc.).
- Chemistry/science teachers' education (pre- and in-service training).
- Teaching chemistry/science to students with diverse abilities (teaching gifted student, teaching students with learning difficulties).
- Critical analysis of chemistry/science textbooks and curricula.
- Green chemistry and environmental chemistry education.
- Ethical issues in chemistry/science education and research
- Chemistry and Society, public understanding of chemistry.
- History and philosophy of chemistry/science.
- Chemistry/science and industry.
- International programmes and projects in chemistry/science education.

Abstracts of oral contributions and posters will be peer reviewed. The language of ECRICE will be English, whereas the language of the DidSci component of the conference will be English, Polish, Czech, and Slovak. For more information contact: Iwona Maciejowska ECRICE 2010 secretary at e-mail address: ecrice2010@ap.krakow.pl or Małgorzata Nodzynska DIDSCI 2010 secretary at e-mail address: didsci2010@ap.krakow.pl

7. ICASE Executive Committee 2008-2011

Based on the ICASE constitution, the ICASE Management committee as well as Regional Representatives are elected by member organisations. These elected members, in turn, nominate chairs of relevant standing committees. Together these persons form the ICASE Executive Committee and are the persons who make decisions on behalf of the ICASE Governing Body. The ICASE Governing Body is the **ICASE member organisations**.

The Executive Committee **(the decision making body working for the Governing Body)**

President
Prof Jack Holbrook
E-mail jack@ut.ee

Past President
Dr Janchai Yingprayoon
E-mail janchai@loxinfor.co.th

Secretary
Prof Miia Rannikmae
E-mail miia@ut.ee

Treasurer
Peter Russo
E-mail ceo@asta.edu.au

Regional Representative for Africa
Dr Ben Akpan
Executive Director of STAN, Nigeria
E-mail: ben.akpan@stanonline.ng
(Member Organisation – Science Teachers Association of Nigeria)

Regional Representative for Asia
Dr Azian Abdullah
Director, RECSAM, Malaysia
E-mail: azian@recsam.edu.my
(Member Organisation – RECSAM)

Regional Representative for Australia/Pacific
Dr Beverley Cooper
E-mail: bcooper@waikato.ac.nz
(Member Organisation – NZASE, New Zealand)

Regional Representative for Europe
Dr Declan Kennedy
E-mail: d.kennedy@ucc.ie
(Member Organisation – Irish Science Teachers Association (ISTA)

Regional Representative for Latin America
Gabriela Inigo
E-mail: gabrela_inigo@hotmail.com
(Member Organisation – Albert Einstein Club, Mar del Plata, Argentina)

Regional Representative for North America
Prof Norman Lederman
E-mail: ledermann@iit.edu
(Member Organisation - Council of Elementary Science International - CESI)

Chairs of Standing Committees
Safety in Science Education
Dr Ken Roy
E-mail: Royk@glastonburyus.org

World Conferences
Dr Robin Groves
E-mail grovesr@ozemail.com.au

Pre-secondary and Informal Science Education
Ian Milne
E-mail I.Milne@auckland.ac.nz