International Council of Associations for Science Education

Supporting and promoting science education internationally
The ICASE Newsletter

DECEMBER 2011

Welcome to the ICASE December 2011 Newsletter !

The ICASE Newsletter is a regularly distributed publication containing current information about topics of interest in the field of science education. The table of contents for this issue is located in the right hand column.

The International Council of Associations for Science Education (ICASE) was established in 1973 to extend and improve science education for chldren and young people throughout the world. Today, ICASE is a huge network of science education associations, institutions, foundations and companies, facilitating communication and cooperation at the regional and international level.

International Council of Associations for Science Education

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ICASE News

Jack Holbrook, ICASE Past President

ICASE News

The December issue of Science Education International (SEI) is now on the ICASE website www.icaseonline/seiweb

This is a special issue with a Guest Editor, Prof Susan Rodrigues, Nothumbria University , UK. on the theme the impact of social capital (social factors involving family, friends, other students, the community, society as a whole) on student career aspirations, with particular regard to science careers.

This special edition of Science Education International reports on the problems/issues/factors that exist given the large number of initiatives, policy changes and activities that have been introduced over the last decade.

Leaks in the Science, Technology, Engineering and Maths (STEM) pipeline have for many decades been a cause for concern: Reports have documented a decline in students opting to pursue science post-secondary education; a decline in numbers of science graduates pursuing science careers and a drop off between undergraduate and postgraduate endeavour. Other inequities within the STEM pipeline have also caused concern, as policy makers have noted the absence or dwindling numbers of particular societal groups from within the STEM pipeline. To a certain extent, much of the focus in addressing these concerns has dwelt on making changes to formal education. Curriculum reviews, teacher professional development, policy change, have all been advocated in order to address the issue of a leaking STEM pipeline. However, the pipe continues to discharge, which would suggest that simply addressing formal education factors will not determine whether students opt in or out of STEM study and careers. In this special edition of SEI, we present articles documenting the influence of various social capital factors on student choice with regard to STEM careers.

Content of the December Issue

For more, visit the ICASE website. All past issues of SEI are also on the website.

Promoting Intrinsic Motivation

Jack Holbrook, ICASE immediate past president

Motivation of students is obviously very important. But how important is the motivation coming from the students themselves?

Consider an initial scenario presented to students (maybe anywhere between grade 8 and grade 11 students), related to home-made soap:

There are many brands of soap on the supermarket shelves. Yet there is a growing interest in making home-made soap, especially for festive occasions when many people are looking for suitable gifts for relative and friends.

But how to make home-made soap and how do you decide whether buying home-made soap is safe, suitable for use and is a viable proposition? And is it important that such soap should also be able to clean well? Should such soaps have a pleasant smell, look good and have a good feel on the hands? Is price a factor in determining what might be the most appropriate commercial soap? And does this mean home-made soaps are only viable to sell on festive occasions?

Question

Is the above scenario motivational for students?

Here I don't mean can it be made motivation for students by any act, or form of words by the teacher, or any outside influence. I mean quite simply, is it motivational to students by itself?

If, in your opinion it is, then this is an example of an approach to intrinsically motivate students. It is motivating the students without input for other external sources e.g. the teacher, or an assignment requirement.

If, on the other hand, it is not seen as motivational for students (and especially if shown not to be by presenting to students) then this example cannot be considered intrinsically motivating. If it is considered important for students to undertake activities related to this, then extrinsic motivation by the teacher will be necessary.

So what is intrinsic motivation?

At a simple level we can say it is the motivation that drives persons to do something because they themselves so wish. And they wish to do this something without any external influences (from the teacher, by parents or by the threats of examination pressure, etc).

Reiss suggested 16 motives or basic desires that are seen to drive intrinsic motivation. It is suggested not all have applicability to science teaching and hence these 16 are divided below into 2 sections – with the top section considered potentially further related to science learning,

Reiss's 16 Motives

Motive name	Motive	Animal Behaviour	Intrinsic feeling
Power	Desire to influence (including Leadership related to mastery)	Dominant animal eats more food	Efficacy
Curiosity	Desire for knowledge	Animal learns to find food more efficiently and learns to avoid prey	Wonder
Independence	Desire to be autonomous	Motivates animal to leave nest, searching for food over larger area	Freedom
Status	Desire for social standing (including desire for attention)	Attention in nest - better feeling	Self-importance
Social contact	Desire for peer companionship (desire to play)	Safety in numbers for animals in wild	Fun
Acceptance	Desire for approval	Unclear: animal self-concept?	Self-confidence
Vengeance	Desire to get even (including desire to compete, to win)	Animal fights when threatened	Vindication
Honor	Desire to obey a traditional moral code	Animal runs back to herd when stared at by prey	Loyalty
Idealism	Desire to improve society (including altruism, justice)	Unclear: Do animals show true altruism?	Compassion
Physical exercise	Desire to exercise muscles	Strong animals eat more and are less vulnerable to prey	Vitality
Romance	Desire for sex (including courting)	Reproduction essential for species survival	Lust
Family	Desire to raise own children	Protection of young facilitates survival	Love
Order	Desire to organize (including desire for ritual)	Cleanliness rituals promote health	Stability
Eating	Desire to eat	Nutrition essential for survival	Satiation (avoidance of hunger)
Tranquility	Desire to avoid anxiety, fear	Animal runs away from danger	Safe, relaxed
Saving	Desire to collect, value of frugality	Animal hoards food and other materials	Ownership

S. Reiss (2004). Multifaceted Nature of Intrinsic Motivation: The Theory of 16 Basic Desires. Review of General Psychology, Vol. 8, No. 3, 179–193.

Assuming the soap scenario provokes intrinsic motivation, which of the 16 motives is most likely to relate?

Possibly curiosity.

Possibly status.

Possibly acceptance.

For too long science teachers have relied on the teachers themsleves being the sole motivator of students. The consequence of this is that where this does not work, the students quickly become disinterested in science lessons and fail to meet their learning potential in this area. If science education is expected to play an important role in the education of students in their future lives, whether this is a social context of the home, or in citizenship, or within the world of work, then motivation of students is important to promote 'education for all.'

The search is thus on for ways to go beyond the motivation by the teacher and also find ways to motivate the students through their own need for involvement. This intrinsic motivation is thus important for science teaching and, related to this, approaches to teaching in science lessons must be an important consideration.

With an approach to promote intrinsic motivation by using a lesson initiator (or an initiator for a series of lessons), we have a way of involving self motivation. But how? What will self motivate sufficient students in the class to make this a powerful approach? One suggested approach is the initial scenario. Clearly this is not going to be motivational simply because it is a scenario. We need to find scenarios that appeal to student's curiosity, status, or maybe acceptance.

The soap scenario is one attempt at this. It relates to something familiar to students. It relates to their personal lives. It also introduces an issue which is intended to be of sufficient importance to students to evoke motives for wanting to learn more. That learning more, of course, is the scientific ideas to which the curriculum relates.
So we return to the question - is this scenario intrinsically motivational to students ?

To determine that it is necessary to try it out in the classroom. If the outcome is positive, this approach must surely be considered very powerful, as can now play a major role through self learning, driven by motivation. If it is not suitable, then we should not give up, but search for alternatives. After all, a scenario appropriate for one group of students may be strongly motivational, but this might not be the case for another. Research has shown that for primary (grade 4-6 or so), scientific phenomena can be powerful motivators for students. But at the higher grades, 7 or 8 and often especially grade 9, more socio-scientific issues are appropriate. The soap scenario is intended to be socio-scientific. It relates to a society concern and also invites students to learning more about the scientific substance – soap.

SAFE SCI: Be Protected!

By Dr. Ken Roy Director of Environmental Health & Safety Glastonbury Public Schools
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WORKING SAFER WITH LIVE BACTERIA – OR NOT!

A science activity book author recently had a chapter dedicated to learning about the ever present flora in schools. One of the activities was designed so upper elementary and middle school students could gain experience in seeking out environmental flora in school building areas such as lavatories, cafeterias, gym lockers, corridors, water fountains and classrooms. It was suggested that students take agar lined petri plates and secure samples from these areas in the school. Students would then culture the plates and take colony samples to make stained slides for microscopic viewing. Decades ago, that might have been a viable activity with proper safety precautions but today, the world has changed. With the advent and/or presence of harmful bacteria such as methicillin-resistant Staphylococcus aureus (MRSA), Streptococcus bacteria, coliform, E. coli and other potentially harmful bacteria, coupled with students having weak or compromised immune systems, this type of activity is a recipe for a potential health disaster!

MRSA can be especially dangerous and it results can be fatal, given many strains are resistant to antibiotics. Coliform and E.coli make themselves available when students are delinquent in using appropriate hygiene practices like washing their hands after bathroom use. Some strains can cause gastrointestinal issues like vomiting or severe attacks of diarrhea. They also can cause serious kidney function problems. Coliform and E. coli also have been found on school water fountains which could be a credible indication of recent sewage or waste entering the water system. In gym lockers, the most common types of bacteria found include E. coli and Staphylococcus.

There are several safety issues which arise when students work with live bacterial cultures. First of all – what are they culturing? It is a virtual unknown when students do general survey gathering and inoculation of environmental flora in agar petri plates. Secondly, during the process of fixing and staining bacteria for slides, there is the real risk of direct physical exposure for students and the teacher to the culture. No matter how much safety training is given, students at these ages just do not have the skills, experience and knowledge to safely deal with live cultures. Remember that professional adults have accidents in laboratories in working with bacteria after many years of experience! Also the suppressed immune system issue is real and out there. An exposure of these individuals can be fatal. The problem is, given privacy laws, the teacher probably does not know who is immune suppressed.

What Can Be Done In A Safer Way?

In 2007, the NSTA Reports printed an article titled A common classroom science activity may be dangerous and potentially fatal. Is your biology up-to-date? How about your Curriculum? In that article, the authors recommend the following best professional practices relative to bacteriological work in schools:

- Eliminate all science activities that might encourage the growth of environmental bacteria in schools. (Also avoid mold cultures.)
- To teach bacteriology, substitute activities that demonstrate the growth of positive bacteria, such as milk souring, compost degeneration, yogurt culture, and sugar fermentation.

- Make sure that every classroom has access to hand-washing facilities that include warm water and soap or alcohol-based cleansers. (Remember, these are flammable.)
- Teach hand washing as an important survival skill. Because the duration and the rubbing are what prevent the infection, encourage students to extend the time and increase the vigor they use during hand washing. The time it takes to sing "Happy Birthday" or the school fight song is a good measure of how long hand washing should take.
- Involve students in communication campaigns to emphasize cleanliness and the importance of good hygiene.
- Add special lessons in hygiene for students who share locker rooms, showers, or other personal facilities.
- Communicate with parents, and share the lessons you are teaching. Encourage parents to consult their physicians at the first sign of skin infection and to keep children home until such infections disappear.

At the high school level (grades 9-12), special care needs to be taken to train students in the professional best practices in proper BSL-1 lab safety techniques. Included should be proper handling of biological and chemical agents, use of required personal protective equipment (e.g. nitrile gloves, etc.) appropriate disposal of lab equipment which came in contact with petri plates, autoclaving, proper handling/washing techniques with soap and water, etc. Students should never use environmental bacteria in petri plate systems! Only use commercial cultures of nonpathogenic bacteria. A laboratory safety acknowledgement form also needs to be sent out to students and their parents/guardians for review and signatures noting both the benefits and potential dangers of working with bacteria, along with safety protocols.

BOTTOM-LINE!

The bottom-line is that at the elementary/middle school grade levels (K-8) there should be no live culturing of environmental bacteria by students! There are alternatives available which illustrate process without the danger of exposure to harmful bacteria, including the teacher demos involving yogurt or kefir culturing and others. Also there are a variety of commercially available fixed and stained bacteria slides available for use. At the high school level, only commercial cultures of nonpathogenic bacteria should be considered along with strict safety training. Practice safer science by being aware of safety issues, accessing the situation and taking the best professional action and/or following legal standards.

Reference:

Texley, Juliana, and Kwan, Terry (2007). *A common classroom science activity may be dangerous and potentially fatal. Is your biology up-to-date? How about your Curriculum? NSTA Reports, NSTA Press, Arlington, VA, USA. http://www.nsta.org/publications/news/story.aspx?id=54441*

The Association for Science Education
Promoting Excellence in Science Teaching and Learning

Science Education Research

ASE Annual Conference 2012 @ University of Liverpool

Wednesday 4th - Saturday 7th January 2012

Research Seminar Series Promoted by the ASE Research Committee

Papers or poster presentations will cover science education research topics.

The contributions can include:

- teacher education
- early years education,
- primary education
- secondary education
- curriculum development and evaluation
- pedagogy
- learning and assessment in science

Contributions come from teacher educators, teachers, higher education degree students and from colleagues involved with curriculum development and evaluation.

Contact the ASE website for more details

NSTA 2012

Please mark your calendar for some special international activities planned during the NSTA National Conference on Science Education in Indianapolis, Indiana, March 29-April 1, 2012.

Activities begin on Wednesday, March 28, with science classroom visits (tentative) in the Indianapolis area—this will be a ticketed event with a minimal cost to cover transportation. That evening, please join us at the President's International Reception for all international visitors and invited guests.

On Thursday, March 29, and Friday, March 30, there will be a conference dedicated to science education from an international perspective. The focus will be on Global Conversations in Science Education with the theme of "STEMing Across Borders: An International Perspective on Science, Technology, Engineering and Mathematics." There will be numerous opportunities for international visitors to network together and to interact with science educators from various cultures, including those from North America. This is a ticketed event (M-2), open to all registered attendees of the NSTA National Conference on Science Education (at no additional costs). Online registration is now open.
For more information, visit the NSTA website at
http://www.nsta.org/conferences/2012ind/registration.aspx

The conference commences with a plenary talk by Dr. Julio E. Lopez-Ferrao, Program Director, Division of Research on Learning in Formal and Informal Settings at the National Science Foundation in Washington, D.C. Dr. Lopez-Ferrao will speak about Conceptualization of STEM as a construct, directions in STEM fields, and future implications for STEM teaching and learning.

This plenary session will be followed by concurrent sessions related to the conference theme, and a full complement of papers will be presented in a poster session, followed by a luncheon plenary speaker, Dr. Marissa Rollnick, Chair of Science Education, Marang Centre for Mathematics and Science Education, Wits School of Education, Wits University, South Africa. Her talk is titled "Towards STEM improvement in South Africa- Breaking the Vicious Cycle".

There will also be a panel discussion. The day will conclude with short presentations from participants on current trends, issues, and best practices from around the world. On Friday, March 30, there will be a "Welcome to My Classroom" showcase, highlighting classroom settings from around the world.

For more information, please visit the website at http://www.nsta.org/portals/international.aspx.

21st Symposium on Chemistry and Science Education to be held at the TU Dortmund University, 17-19 May 2012

Issues of Heterogeneity and Cultural Diversity in Science Education and Science Education Research

The 21st Symposium on Chemistry and Science Education will continue the long tradition begun in 1981 with the first symposium on chemical education organized by Hans-Jürgen Schmidt. The 2012 symposium is titled **"Issues of Heterogeneity and Cultural Diversity in Science Education and Science Education Research"**. Heterogeneity and cultural diversity are becoming increasingly important challenges for educational systems worldwide. Growing rates of migration and higher numbers of multi-cultural societies mean that educators must achieve a broader spectrum of competencies among their young people. Science and chemistry teaching are not untouched by these developments, challenging the practices and methodologies in these areas. Answers are demanded from science education research in the areas of understanding potential problems and providing impulses towards more effective practices.

The symposium's main questions will address:

- Which science teaching problems are connected to different areas of heterogeneity in science classrooms? How can they be overcome?
- Which influences do learners' multi-cultural backgrounds have concerning the learning of science?
- What types of problems arise due to different linguistic abilities or a background including a different native language? How can we best deal with linguistic heterogeneity in science classrooms?
- How can we teach the domain-specific language of science in classes containing students with different native languages?
- How do we cope with students with special needs in science, e.g. in lab environments?
- What are the challenges in and potential innovations involved with teaching gifted children in science classes?

Which changes can examples of good teaching practices in different countries suggest for bettering science teaching with respect to issues of heterogeneity and cultural diversity?

All contributions will be presented by invited lecturers. There will be key-note lectures and short presentations. Suggestions for appropriate lectures are welcome by May 2, 2011. Please contact Dr. Silvija Markic, University of Bremen: *smarkic@uni-bremen.de*.

Conference chairs: Prof. Dr. Bernd Ralle, TU Dortmund University, *bernd.ralle@tu-dortmund.de;* Prof. Dr. Ingo Eilks, University of Bremen, *ingo.eilks@uni-bremen.de;* Dr. Silvija Markic, University of Bremen, *smarkic@uni-bremen.de;* Prof. Dr. David Di Fuccia, University of Kassel, *difuccia@uni-kassel.de*

Further information: *http://www.chemiedidaktik.uni-bremen.de/symp2012/index.html*.
A second announcement will follow in Autumn 2011.
Conference fees: None. Travel costs, accommodation and social events are the responsibility of the participants.

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The ICASE Executive Committee is persons who make decisions on behalf of the ICASE Governing Body. The ICASE Governing Body is the **ICASE member organisations**.

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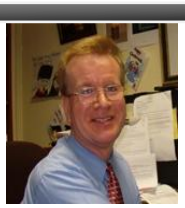

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