E·A·S·E East-Asian Association for Science Education

The Newsletter of
The East-Asian Association for Science Education
東亞科學教育學會通訊

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Dear Friends,

The most wonderful season of a year, autumn, is just around the corner in Korea. I hope my dear friends of EASE are also enjoying the coming autumn. I do prefer the expressions of 'friends' to that of 'members' of EASE, because to me EASE has been always occasions of reunion with old friends, not like meeting for business.

Our next conference of EASE is coming very soon. Thanks to the great efforts of Organizing Committee in Korea and of colleagues at Chosun University, everything is now ready for the participants and guests of 2011 EASE Conference. The venue of the conference, a brand new building called Sun-Rising Theater, would greet us as the first users of the building. The university would welcome us with a great support as one of its biggest international guests.

EASE 2011 Conference at Gwangju has around 300 presentations of lectures, oral and poster presentations, workshops and demonstrations. There would be well over 500 participants to the Conference. Following the great success of the first conference at Taipei in 2009, this year's conference is expected to continue its previous success, not only in terms of its size but also of its quality.

We look forward to meeting you in the 'City of Light', Gwangju (光州) in October 2011.

- EASE president, Jinwoong Song, Seoul National University, Korea.

Last Announcement: EASE 2011 International Conference

Venue: Sun-Rising Building, Chosun University, Gwangju, Korea (http://eng.chosun.ac.kr/)

Date: Oct 25th-Oct 29th, 2011

Theme: Lighting the World with Science

Registration rate

Registration	US$ 200
Registration for students/teachers	US$ 90
On-site registration	US$ 220
On-site registration for students/teachers	US$ 110

Guideline for Poster and Oral presentation of EASE 2011

Poster Presentation

- **A0 paper size (841mm X 1189 mm)** poster is recommended.
- The place you can post your poster will be assigned on site. The posters will be grouped by theme.
- The authors should post their papers 10 minutes before the session.
- Poster presentations in each session are scheduled for 60 minutes or 80 minutes.
- At least one author is required to stay during the assigned session to interact with the audience.
- Authors are preferred to preparing for the hard copies of presentation available for dissemination.

Oral Presentation

- 20 minutes including 5 minutes for Q & A will be provided for each oral presentation.
- Three up to five presentations are assigned into each session of total 60 minutes or 100 minutes.
- LCD projector and computer will be provided. (If you use Mac, you need to make your own arrangement)
- Authors are preferred to preparing for the hard copies of presentation available for dissemination.

General Information

-If you need **limousine service** from INCHEON international airport to Gwangju city, contact me: ease2011bus@gmail.com. You can use other transportations and get the information from the website.

-If you have not reserved the **hotel** yet, visit the website to fill out the form to be sent to me: ease2011accommodation@gmail.com

-About **the weather** of OCT in Korea? You can find information from the website.

- Visit Korea and enjoy EASE 2011!!

Please visit EASE 2011 website. http://new.theease.org/conference.php

If you have any other question, contact EASE headquarter (easeheadquarter@gmail.com)

China Mainland News Express

1. The 7th *China Mainland National Annual Conference on Biology Education* will be held on October 29-31, 2011 at Nanjing Normal University, China Mainland, which will be mainly focused on reforming per-service biology teacher training courses at normal universities in China Mainland.
2. The 1st *"Huawen Cup" China Mainland National Competition of Pre-service Science Teachers' Teaching Sills*, hosted by Micro-Teaching Professional Commission of China Education Technology Association, will be held on November 25-27, 2011 at Central China Normal University. The contestants should performance 10-minute-classroom teaching to show their basic teaching skills.

Mission of EASE

- Fostering networks among researchers
- Being a platform for collaboration and cooperation
- Contributing to policies and practices through research
- Enhancing research relevant to our culture and heritage

The 1st Tuition-free Pre-service Science Teachers are Teaching in Mid-western Rural Schools of China Mainland

Jian WANG, Enshan LIU (Beijing Normal University, Beijing, China Mainland)

In order to attract outstanding students to normal universities, to encourage more outstanding young people to be teachers, and to promote education development and equity, the State initiated the project of training per-service science teachers in the normal universities of China Mainland totally with the government's sponsor and established the corresponding system in 2007. In these four years, a total of 46,000 students were enrolled as tuition-free normal students in six normal universities directly under the Ministry of Education. All the first tuition-free normal graduates have been approved to teach in the primary and middle schools, and over 90 percent of them are going to teach in Midwest part of China Mainland.

After 4 years training, most of them were qualified to be science teachers. On the morning of June 17, 2011, the graduation ceremony for these per-service science teachers was held in Beijing Normal University, Beijing, China Mainland. Premier Jiabao WEN attended the commencement ceremony.

Premier WEN delivered an important speech. He said that teachers are entrusted with the sacred mission of enlightening people's intelligence and inheriting civilization, and are carrying the dreams and hopes of thousands of families. The implementation of free education for the normal students is a strong signal for the whole society to pay great attention to normal education, to attract the best and most talented students to be teachers, and to encourage more outstanding people to be life-long educators. This policy is meant to establish the atmosphere of respecting teachers in the society, and make teaching to be the most respected and enviable career.

All the pre-service science teachers was encouraged to actively participate in the innovative practice of education reform, to attach great importance to the development of students' abilities in imagination, innovation and practice, and to stimulate student's interest and create an atmosphere conducive to personal development, so as to bring this beautiful educational ideal to reality.

Now, all of them have gone to the western rural schools of China Mainland and now are working as in-service science teachers. Their efforts will contribute to the improvement of science education in China Mainland.

Graduation ceremony for per-service science teacher

Premier WEN is shaking hands with graduates.

A science teacher is having her first class.

Discussion with students

Revision of Biology Curriculum Standard for Middle School in China Mainland

Jian WANG (Beijing Normal University, Beijing, China Mainland)

China Mainland started the 8th biology education reform since 1999. The main beliefs of biology curriculum standard are science for all, advocating inquiry-based learning, and enhancing students' scientific literacy. All biology teachers, curriculum designers and educational researchers jointed together to implement new science curriculum. Biology education has made astonishing progress in the past 10 years. However, we are facing many new challenges yet, such as how to improve teaching effectiveness in science classroom.

Taking the difficulties and challenges considered, Ministry of Education (MOE) China Mainland conducted nation-wide educational investigations in 2007 and 2009, which served as symbol of biology curriculum standards revision movement. As a result, a large numbers of solutions and constructive advice were collected. At the same time, experts and researchers have carried out varieties of research in many strands from theoretical research to classroom practice, from teachers teaching strategies to student learning styles, which resulted in enormous improvement of teaching and student learning.

Based on these investigations and research results, MOE China Mainland begins to revise Biology Curriculum Standard, including the subject of biology, chemistry, physics, and geography. Standard revising committee is composed of science education experts, excellent science teachers, scientists, and professionals from other social institutions. The criteria for revising are: (a) information, research and evidence based, (b) international benchmarked, (c) realistic for effective use in the classroom, and (d) build upon strengths and lessons of current standards.

So far, the revision has just been finished, and the final standard will be soon published. For the next step, teacher training will be on the schedule as one of the critical part of education reform, which will greatly facilitate biology teachers' deep understanding, implementing of the revised Biology Curriculum Standards as well.

Preparing per-service chemistry teachers with experimental skills

Rui WEI (Beijing Normal University)

The 2nd *Chinese National Chemistry Experiment Design Competition of Per-service Chemistry Teachers* was held on July 15-19, 2011 by the Commission of Chemistry Instruction and Beijing Normal University. 96 per-service chemistry teachers from 32 normal universities around the whole nation attended the competition. All contestants should take 2 exams: (a) paper-pencil exam on the chemistry theoretical knowledge, which shares 30% of the final score, and (b) experiment design test which focuses practical skills and contributes 70% to the final score.

This competition leads to emphasizing on the experimental skills of per-service chemistry teachers during teacher training, which will benefit the chemistry education in middle and high schools in China Mainland.

NBO empowers science education in middle school in China Mainland

Jian WANG (Beijing Normal University)

The 20th Chinese National Biology Olympiad with 124 middle school students from the whole nation was held on August 19-21, 2011 by China Zoological Society and Sichuan Mianyang middle school.

NBO, in accordance with national science curriculum standard, includes paper exam and four practical tests (zoology, botany, biochemistry and molecular biology, and ecology). The practical tests are designed systemically as entirety, in which practical operating with instruments and apparatus and minds-on activities are needed. Students can show their theoretical knowledge and ability to organize knowledge to analyze and solve practical problems.

NBO has been keeping empower science education in middle school with its ability orientation.

Improving science & technology education in elementary and middle schools via grading program

Jian WANG, Wei WANG (Beijing Normal University, Beijing, China mainland)

Science and technology education is one of the essential missions of middle school. In order to improve education quality, China Association for Science and Technology initiated an educational program of grading middle schools with sci-technology education approach from April 1 to August 8, 2011, which was sponsored by Intel China mainland.

The program expert team developed criteria used to making the first grading of 119 schools from the whole nation (China Mainland, Hong Kong, Macau, and Tai Wan). All these schools should submit paper and electronic materials to the organizing committee, which provided evidence for school quality in the field of science and technology education. As a result, the top six middle schools and four elementary schools were selected to be interviewed and checked by expert team through field work in every school.

In later days, those 10 schools will introduce their ample experience of school managing, organizing, students cultivation, educational believes and teaching strategies to peer schools around the whole country, which will contribute to the improvement of science and technology education in China mainland.

Field visiting | Examing materials | Interview by experts | Discussion | Award ceremony

"There is no royal road to science, and only those who do not dread the fatiguing climb of its steep paths have a chance of gaining its luminous summits." 在科学上没有平坦大道，只有不畏劳苦沿着陡峭山路攀登的人，才有希望达到光辉的顶点。(by Carl Marx)

Physics Curriculum Reform in Elementary Education in China Mainland

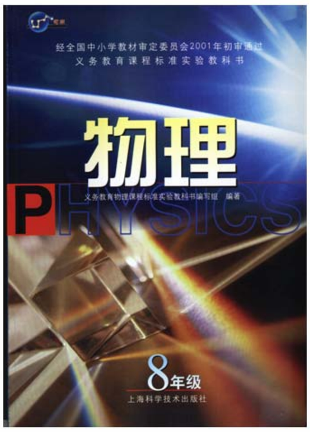
Boqin LIAO, Fuqiang LI (Research Center of Science Education, Southwest University, Chongqing, China mainland)

China mainland elementary education curriculum reform started in 1999. In July 2001, the MOE of China mainland issued *The Compulsory Education Physics Curriculum Standard (experimental)*, and in September of the same year, new teaching materials were published and used in experimental areas. In April 2003, *The Senior High School Physics Curriculum Standard (experimental)* was issued 3 years later, followed which, teacher training was carried out in forms of reports, discussions by face to face, and long distance training through network.

National Physics Curriculum Standards

The curriculum beliefs are: (a) physics for all students and improving students' scientific literacy, (b) physics, real life and society interact each other (c) paying attention to the penetration of disciplines, the development in the area of science and technology, (d) promoting the diversification of learning mode, pay attention to science inquiry, and (e) paying attention to the guidance of evaluation reform, promote students' development.

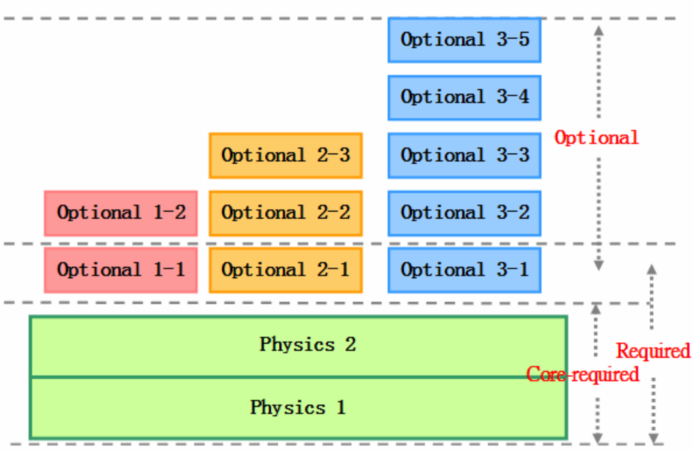
The new curriculum applied in middle schools put forward its objective from three aspects: (a) knowledge and skills, (b) process and method, and (c) attitudes and values, aiming at comprehensively cultivating students' scientific literacy. In respect of curriculum content, "material", "movement and the interaction" and "energy" are basic parts in junior middle schools; meanwhile, there are 12 modules for senior high schools. Physics course 1 and course 2 are for all high school students, optional 1-1 and 1-2 mainly focus on the relationship and interaction between physics and society, which reflect the humanity characteristics of physics. Optional 2-1, 2-2 and 2-3 focus on the application of technology. Emphasizing the integration of physics and technology, optional 3-1, 3-2, 3-3, 3-4, and 3-5 focus on providing students with a relatively comprehensive and basic content of physics, and enabling them understand the thoughts and research methods of physics, etc.



Physics textbooks for grade 8

Physics curriculum for junior middle school focuses on providing all students equal opportunities for development; and curriculum for high school focuses on the diversity and selectivity, emphasizing students' personality development.

With time goes, curriculum reform in China Mainland is on-going, and physics curriculum in middle schools will be perfected in the future for students' all-round development, so as to produce more citizens with scientific literacy.



Structure of physics curriculum in senior high schools

① Teacher training by lectures (in Gansu)
② Teacher training by discussion (in Fujian)
③ Teacher training by internet (in Chongqing)

For the Improvement of Nation's Science Literacy

In February 2006, Chinese State Council issued *the Outline of the Action Plan for the Nation's Science Literacy*, in a move to raise the nation's scientific literacy in a phased manner from 2006 to 2010, and further to 2020. The Outline is made up of six major parts, including foreword, policies and objectives, major actions, infrastructure projects, supporting conditions, and implementation. For more information, please visit the website: http://english.cast.org.cn/.

From traditional lecturing to interactive approach: pre-service science teacher education in China Mainland

Yingzhi ZHANG (Capital Normal University, Beijing, China mainland)

From international perspective, pre-service teacher education is organized according to two basic models: consecutive model and concurrent model. In China Mainland, the latter one is more popular. That is to say, per-service teachers studies both academic subjects and pedagogical subjects simultaneously.

Pre-service science teacher education provides the first step in the process of science teacher professional development. It prepares students in both disciplinary content and pedagogical knowledge. During the pedagogical subjects, students will develop their teaching skills and learn the principles of instructional design.

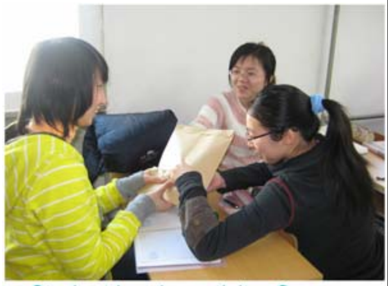
Teaching skills are trained mainly through micro-teaching. At first, educator lectures the key ideas of particular skill, such as the skills of board writing and drawing, questioning and so on. Then, students are divided into groups of 5-10 and take turns to teach a 5-10 minutes lesson to their peers, focusing on that certain skill.

Per-service science teacher is taking a teaching trial

Right after the 'trail teach', the student is asked to self-evaluate their own performance, and each peer will be asked to give comments and suggestions for improvement. The educator and teaching assistants will add the comments and conclude the discussion. Benefiting from the feedback from educators and peers, students can make self-reflection of their teaching practice and revise the original detailed lesson plan, which should be submitted. Actually, student may like to think about these comments and suggestions and then have the second teaching trial together with other students. They may form self-help groups for micro-teaching in order that particular skills could be well trained and practiced.

Teacher and peers are giving comments

The principles of instructional design will be learnt through meaningful lecturing, coupled with peer collaborative activities and deep discussion, around some important topics, such as teaching beliefs of science curriculum, the nature of science, the educational and psychological theories, teaching objective design, teaching strategies, classroom assessment, and so on. Students will be required to select the appropriate teaching strategies and instructional media according to specific teaching content and students' characteristics. Instead of traditional lecturing approach, this course emphasizes more on interactive way and active learning. Here is a case in point.



Student inquiry activity: Can you guess what's inside the paper bag

The Nature of Scientific Inquiry is a very important and popular topic in science education. However, it is relatively abstract and students usually feel difficult to understand. In order to help students deeply understand the nature of scientific inquiry, we use three progressive activities. The first activity 'Can you guess what is inside the bag' can stimulate students' curiosity and engage students to observe through all kinds of senses. This activity introduces the start point of the science, that is, curiosity leads to careful observation and deep exploration. The second activity 'Mysterious Black Box' aims to present an interesting analogy to the paradigm of scientific discovery. Actually, scientists have been trying their best to reveal the secrets of natural 'black box' over the years, and scientific process generally follows the paradigm: make observation, raise question, make hypothesis, and verify the explanation and prediction. In the third activity, students are asked to make up a story according to incomplete pictures. This activity will elicit students' thinking about the dynamic process of science. With the new pictures (evidence) appear, the story (explanation or theory in science) will be revised and move close to the truth. At last, the educator and students discuss together the key ideas of the nature of scientific inquiry.

Group discussion

This kind of activities are supported and favored by students and gain very exciting teaching effect. Many students left comments on the website of academic affairs office of our university that the teaching features of this course were interesting and novel, and being able to inspire their deep understanding thinking.

We are pleased with these feedbacks, and we also realize that improvement should be keeping on so as for preparing more qualified science teachers.

Yingzhi ZHANG received a PhD in Curriculum and Instruction from Beijing Normal University. Her research interests include science teacher education, the Nature of Science, meaningful learning and learning progressions.
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"Education is not preparation for life; education is life itself." 教育不是对人生的准备，教育就是人生。(by John Dewey)

Study on the Development Model of Senior High School Biology Teachers' PCK

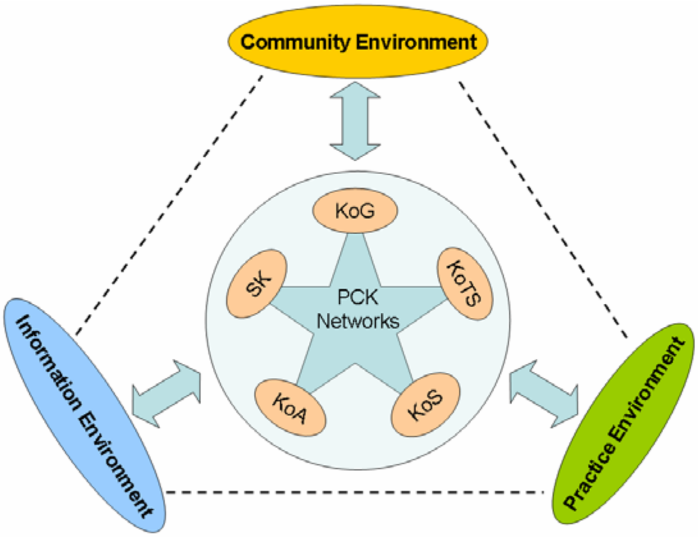
Chunlei ZHANG (East China Normal University, Shanghai, China mainland)
Enshan LIU (Beijing Normal University, Beijing China mainland)

Since Shulman first proposed Pedagogical Content Knowledge (PCK) in 1986, the studies of PCK have being lasted for more than twenty years. Researchers took many points of view to define PCK and various methods to study its content, structure, sources, development and assessment. In this study, a mixed method was used to explore the PCK development of senior high school biology teachers. PCK is defined as a particular professional knowledge network used in teachers' instruction of specific topic. It includes many sub knowledge domains and each domain plays a role in the knowledge network. PCK is used and reflected at teachers' daily work such as instructional design, implement, reflection and so on. Its function is to solve practical problems that teachers face with in teaching specific topic.

This study is composed of three separate studies including study A, B and C. They are addressing the following research questions: (a) What is the structure of teachers' learning environment? (b) What knowledge domains and domain relationships do teachers' PCK networks include? and (c) How does expert teachers' PCK develop in their learning environment? Firstly, a measurement scale was developed and used to study the structure of teachers' learning environment. 176 records were received with 169 valid. Factor analysis was used to find the main factors that affect teacher's PCK development. And then, a questionnaire was used to capture teachers' decision making process when teaching specific topic. With this study, altogether 213 records were received with 208 valid. The data was structured into concept maps, with which one-way analysis of variance was performed to find out the significant difference in the nodes and links of the map between different teacher groups. In order to find out how expert teachers' PCK network was developed in their personal learning environment, case study method was used. Five expert teachers were interviewed. As far as research methods were concerned, concept map was used both as an interview guideline and an analyzing tool. The interviews mainly focused on teachers' PCK domains content, knowledge sources and its developing process. In this way, the development of sub domains of PCK was linked with teachers' sub learning environment. Thick descriptions were used to capture the particularity and complexity of teachers' PCK development.

Study A shows that teachers' learning environment can be divided into three sub environments: practice environment, community environment, and information environment. Study B indicates that PCK networks are developed by adding new knowledge domain and domain links, from separated to an intergraded network which can be interfered from the sum number of nodes and links in teachers' instructional decision making map. There are significant differences in using frequency of some nodes and links between different teacher groups and teaching topics, which implies that teachers' instructional decision making map is sensitive to teachers' characteristics and subject topics. The last study shows that expert biology teachers' PCK networks are composed of mainly five knowledge domains: knowledge subject, knowledge of students, knowledge of goals, knowledge of teaching strategy, and knowledge of assessment. Knowledge of instructional resources, curriculum and ICT are less mentioned or categorized into formal five domains by expert teachers. Knowledge of students mainly comes from teaching experiences. Subject knowledge is continually developing and gets linked with more representations. PCK development affecting factors also include teachers' leaning motive, teaching beliefs, personal interests and external learning environment.

Based on both quantitative and qualitative study results, a development model of PCK was built. The model includes the external environment for the development of PCK and the internal interactions between PCK sub knowledge domains. The external environment includes practice environment, community environment and information environment. PCK domains include: subject knowledge, knowledge of students, knowledge of goals, knowledge of teaching strategy, and knowledge of assessment. Teachers develop their PCK networks and specific PCK domains by interacting with specific sub environment. Teachers' reflection and reflection-based instructional designing process would lead to the interactions of the sub PCK domains. PCK is recorded and reused in the from of design products such as lesson plans or courseware.



The Interaction model of PCK networks with Practice, Information and Community Environments (PCK-PICE)

Note: Subject Knowledge (SK)
Knowledge of Students (KoS)
Knowledge of Goals (KoG)
Knowledge of Teaching Strategy (KoTS)
Knowledge of Assessment (KoA).

Chunlei ZHANG is a lecturer in School of Life Science of East China Normal University. He received a PhD in Curriculum and Instruction from Beijing Normal University. His research interests include teacher knowledge and beliefs, Model-based Inquiry, Personal Learning Environment (PLE) and Virtual Learning Community (VLC).
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Capitalising on the participation of Hong Kong in TIMSS: promoting teachers' assessment skills

Siu Ling WONG (the University of Hong Kong)

TIMSS was a large-scale international study participated by over sixty countries in their last round of study in 2007. Hong Kong has been participating in TIMSS since the mid-1990s. It compares the performance of students in Mathematics and Science at Primary Four and Secondary Two levels among the participating countries every four years.

The team of science teacher educators at The University of Hong Kong, has been working on another related on-going project entitled *Promoting Assessment for Learning in Junior Secondary Science through Secondary Analysis of the Hong Kong Data of the "Trends in International Mathematics and Science Study (TIMSS) 2007" on Science Component"* since Nov 2010. The project consists of both teacher development and research elements. It aims to capitalize on the very rich data set of Hong Kong and some selected countries. Selected questions in which Hong Kong students perform less than expected (only among those released questions in the TIMSS homepage) with item statistics were provided to teachers. Items statistics including detailed breakdown of Hong Kong students' responses of each multiple-choice and each short response question, difficulty and discrimination indices of an assessment items were provided to teachers. Such kinds of data with appropriate training and learning activities can serve very meaningful learning of assessment of/for learning.

There are three key activities in this project:

(1) Enhancing teachers' skills of using assessment strategies to identify students' weaknesses

During this key activity, teachers were given a summary of item statistics of each selected question from the 2007 TIMSS released items. To enable more quality use of the data to make sense of student performance and likely misconceptions, each statistical term together with its qualitative meaning were explained. They then worked in group of 4 to 8. Understanding of some students'' common misconceptions from the TIMSS 2007 and invited them to come up with possible reasons behind these misconceptions and ways to tackle these misconceptions.

(2) Learning through doing: hands-on experience in designing and improving assessment items

As TIMSS questions do not necessarily cover the topics of the local Junior Science Curriculum and teachers may find it more, relevant, beneficial and interested in improving or designing those relevant assessment items. Thus we have been fairly ambitious in repeating a similar procedures in the 'real TIMSS': (i) Design a question including marking scheme, (2) discuss among the National Research Coordinators about possible improvement of the question, (3) piloting the question, and (4) further improvement). On top of these procedures, we also provide detailed item statistics from the pre-workshop test. With the goal of development of good skills of assessment through hands-on training, some general principles (e.g. clarity, precise terminologies) and item statistics of the pre-workshop assessment (which consists of questions designed by some participating teachers before the exposure to our training workshop). Corresponding post-workshop assessment will soon be conducted. We are keen to share with you how the post-workshop test is compared with post-workshop test to see if our training does have an influence in improving teachers' assessment skills as reflected in the setting of questions.

(3) Teachers sharing of formative assessment for promoting quality of teaching and learning

We have been extremely grateful to a few teachers sharing their authentic classroom practice of the formative assessment in improving teaching and learning. (a) Progressive improvement in addressing each identified issue at a time in the teaching of reflection of mirrors (by Mr. Lie Ho Yin) (b) Uncovering students' thoughts through interviews (Miss Idy Chan) (c) Expanding beyond written responses: Diagram drawing as an effective way of revealing of misconceptions (by Ploe Lo) (d) Am I giving out too much hints – improving the design of an assessment item (by Lee Wing Shing, Ray)

The personal sharing of the above teachers provided a diverse means of probing students' thoughts.

Teach Photosynthesis with Concept Chains

Cheng LIU (Beijing Normal University, Beijing, China mainland)

At present, the overwhelming majority of learning theories imply that students should start to learn from what they have already known, follow the proper pathway to construct the relationship among conceptions and get deep understanding of certain conceptions consistent with their cognitive level. So it is important for teachers to make teaching plans with proper learning start point and increasingly complex and inclusive conceptual learning pathway when they teach certain concept for students in given grade. But the question is how do teachers design such teaching plans?

To answer this question, a research focusing on using concept chains to make teaching plan about the conceptions of photosynthesis was implemented in Beijing, based on a Ph.D. program.

Before designing of concept chains, curriculum documents study and students' recognition investigation were conducted firstly. Based on the analysis of 30 curriculum documents from different countries or districts, a list of declarative statements about the meaning of "photosynthesis" from K-12 was elaborated, which indicates that the distribution of these 13 declarative statements from K-12 follow two patterns (see Fig.1 and Fig.2).

Then, a two-tier diagnose test fitting for Rasch model was developed to investigate and measure students' understanding of photosynthesis. Based on investigation data from 179 students with 156 valid records, the pattern of cognitive difficulty sequence among different components of the conception "photosynthesis" was found.

Following the pattern in curriculum documents study and students' recognition investigation, 4 principles about designing photosynthesis concept chain were set, including the start and final points, the main idea, the development path, and declarative statements in the concept chain. Based on these principles, photosynthesis concept chain and corresponding teaching plan for students in senior high school were developed.

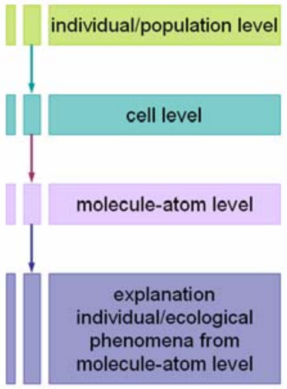

Fig.1 Pattern 1 of the distribution of declarative statements of photosynthesis

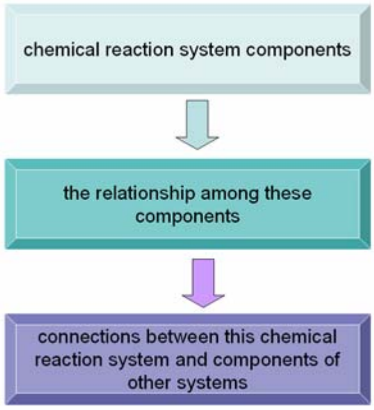

Fig.2 Pattern 2 of the distribution of declarative statements of photosynthesis.

Finally, the experimental study was carried out with 124 student participants of grades 10 and 11, who were divided into two groups. All variables were controlled as much as possible, except for teaching plan. In the experimental group of 76 students (67 valid records), the teaching plan consistent with concept chain was implemented. On the contrary, the control group composed of 48 students with 41 valid records only received traditional teaching plan. Data was collected by two-tier diagnose test and semi-structured interviews before and after experimental study.

Questionnaire data showed students' understanding about photosynthesis in both groups was improved and there was no statistically significant difference between the improvements of these two groups. However, interview showed that students in experimental group could transform their understanding of photosynthesis from "phenomenal model" to "assimilatory model", but not "scientific model", whereas students' understanding were still at the "phenomenal model" in the control group. It was maybe one of the reasons why questionnaire data didn't show statistically significant difference between the two groups. Besides aforementioned reason, several variables could mediate and constrain students' conceptual change to "scientific model", including learning time, teachers' understanding and textbook, and so on. It still needs further studies. But the result of study implies that teaching plan based on concept chain could help students develop their understandings about photosynthesis and could also initiate conceptual change from "phenomenal model" to "assimilatory model".

This study also indicates that designing process of concept chains developed in this study is feasible and valid. So do the 4 design principle and the photosynthesis concept chain for students in senior high school. Concept chain has the potential to be an effective tool and strategy to teach certain concept in a given grade with the consideration of whole coherent curriculum from kindergarten to grade 12.

Cheng LIU received his doctor degree in Curriculum and Pedagogy from Beijing Normal University. Now he is a visiting scholar in the College of Science and Letters of Illinois Institute of Technology, focusing on nature of science (NOS) and inquiry. His research interests include conceptual teaching and learning, concept map and atlas, NOS, and scientific inquiry.
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Books on Science Education

Bridging Cultures: Indigenous and Scientific Ways of Knowing Nature

Glen Aikenhead & Herman Michell (2011) ISBN13: 9780132105576
Pearson Education, Don Mills, Ontario, Canada

Book Summary

This book supports science teachers, teacher candidates, and science educators preparing to implement science curricula that recognize Indigenous knowledge as a foundational way to understand the physical world. Indigenous and scientific ways of knowing nature have similarities and differences, as well as strengths and limitations. By exploring these in detail based on academic scholarship, the book guides the reader in building their own cultural bridges between their scientific world and the world of an Indigenous community; bridges that lead to a culturally responsive science classroom. These cross-cultural capabilities can be applied to multicultural classrooms in urban settings.

Based on the experiences of cross-cultural science teachers and researchers worldwide, including the authors' experiences, the book concludes with practical general advice that helps prepare teachers for developing science lessons and units that combine the two knowledge systems according to a ministry or department of education's expectations.

The book demonstrates how the intellectual tradition of the scientific community coexists with the wisdom traditions of Indigenous communities. This benefits the scientific literacy and insights into nature of both Indigenous and non-Indigenous students. The goal of a cross-cultural school science is for all students to learn the best from Indigenous and scientific ways of understanding nature.

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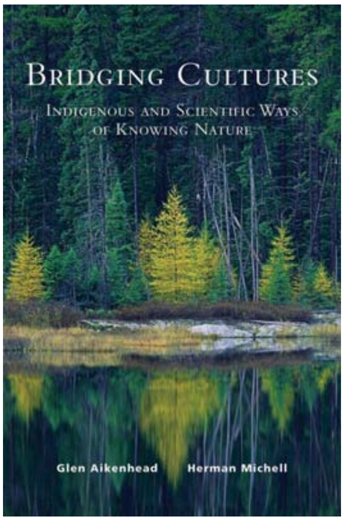

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http://www.ssma.org/

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http://www.ase.org.uk/conferences/annual-conference/

42nd Annual ASERA Conference
June 28th - 30th, 2012 @ University of the Sunshine Coast, Sippy Downs, Queensland
http://www.asera.org.au/index.php/annualconf/2012annual-conference

2011 Area Conference in Hartford
October 27 –29, 2011 @
http://www.nsta.org/conferences/2011har/?lid=tnavhp

"Education is what remains after one has forgotten everything he learned in school"
教育就是当一个人把在学校所学全部忘光之后剩下的东西。(by Albert Einstein)

A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas

Committee on Conceptual Framework for the New K-12 Science Education Standards; National Research Council (2011)
ISBN-10: 0-309-21739-3
The National Academies Press, Washington, DC, USA

Book Summary

Science, engineering, and technology permeate nearly every facet of modern life and hold the key to meeting many of humanity's most pressing challenges, both present and future. To address the critical issues of U.S. competitiveness and to better prepare the workforce, *Framework for K-12 Science Education* proposes a new approach to K-12 science education that will capture students' interest and provide them with the necessary foundational knowledge in the field.

Framework for K-12 Science Education outlines a broad set of expectations for students in science and engineering in grades K-12. These expectations will inform the development of new standards for K-12 science education and, subsequently, revisions to curriculum, instruction, assessment, and professional development for educators. This book identifies three dimensions that convey the disciplinary core ideas and practices around which science and engineering education in these grades should be built. These three dimensions are: cross-cutting concepts that unify the study of science and engineering through their common application across these fields; scientific and engineering practices; and core ideas in four disciplinary areas: physical sciences, life sciences, earth and space sciences, and engineering, technology, and the applications of science. The overarching goal is for all high school graduates to have sufficient knowledge of science and engineering to engage in public discussions on science-related issues; be careful consumers of scientific and technological information; and have the skills to enter the careers of their choice.

Framework for K-12 Science Education is the first step in a process that will inform state-level decisions and provide a research-grounded basis for improving science teaching and learning across the country. The book will guide standards developers, curriculum designers, assessment developers, teacher educators, state and district science administrators, teachers, and educators who work in informal science environments.

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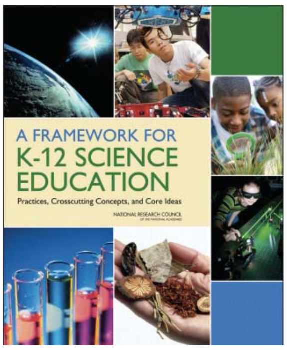

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