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## ISSUE 18 MAY/JUN 2009

### ARE YOU A KNOWLEDGE MAKER?

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In the literal sense, a knowledge maker is one who makes or creates knowledge and a knowledge user is one who does not question but simply employs or puts the knowledge into practice. As a teacher, which would you rather be? Read on to find out how you can become a knowledge maker through action research.

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### STOP DRAWING MODELS IN SECONDARY MATH?

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"Why can't I use the model method to solve this problem? I can still get the answer!" The above is a common complaint received by secondary school mathematics teachers. Some have even resorted to banning the use of the model method in class because they believe it prevents students from learning to use letter-symbolic algebra. But is this belief valid?

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### DON'T JUST TEST COMPREHENSION, TEACH IT!

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All teachers hope to have students who are proficient and independent readers, and who will become lifelong learners. How do we ensure that students really understand what they're reading? Researchers are helping teachers understand just what they can do about it and why it's so important.

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### CARTOONS IN THE CLASSROOM

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Capturing the attention of and engaging pupils during lessons is at times challenging and frustrating. Yet this is important if pupils are to benefit from the lessons taught. One teacher used cartoons during a Science lesson and found that her pupils not only enjoyed themselves but also gained a better understanding of the concepts. So what is the appeal of cartoons?

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### WHO IS DRIVING THE FUTURE OF EDUCATION?

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We live in an increasingly technology-enhanced learning environment where the drivers of the future are the youth of today, noted Professor Roy Pea in his keynote address at the 2009 Redesigning Pedagogy International Conference. But are our schools equipped to deal with this reality? Dr Vicente Reyes grapples with this issue as he reflects on the future of education reforms.

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## ARE YOU A KNOWLEDGE MAKER?

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### Article highlights

How action research benefits teachers

How to start an action research

How to deal with problems that arise

Tan Wah Kiat is a knowledge maker. A former teacher now pursuing his doctoral degree in Queensland, he is a firm believer of teachers doing research. Wah Kiat has had his fair share of ups and downs with action research projects during his years as a teacher.

Based on his experience, Wah Kiat shares with us his motivation for conducting action research and his advice for teachers who are considering embarking on such research.

#### Q: What is educational action research?

**A:** Educational action research is a form of self-reflective inquiry undertaken by teachers and/or students within social situations.

#### Q: What is the purpose of action research?

**A:** There are three main purposes:

1. To improve the rationality and justice of the teacher's own practices
2. To improve the teacher's understanding of these practices
3. To improve the situations in which the practices are carried out

Educational research is *not* merely a tool to prove the efficiency or effectiveness of particular pedagogy or intervention. It is not about being "right".

It is essentially a framework to think about learning that embodies all the elements of competent practice (Cochran-Smith & Lytle, 1999). These elements include subject matter knowledge, knowledge about the disciplinary foundations of education, human development, classroom organization, pedagogy, assessment, the social and cultural contexts of teaching and learning, and knowledge of teaching as a profession.

#### Q: Why should teachers embark on such research? What are the benefits both professionally and personally?

**A:** If we hold fast to the stated objectives above, action research allows the teacher-researchers to explore and question their own and others' interpretations, practice, and ideologies.

This is advantageous to teachers who want to develop their practice by analyzing existing contexts and identifying elements for change. The rigorous process enhances teachers' professional development through the fostering of their capability as professional knowledge makers, rather than simply as professional knowledge users.

All participants involved in the research could also benefit on a personal level because the emancipatory process gives the opportunity for individuals to make genuine change and improvements.

#### Q: What issues should they consider researching?

**A:** Presently, the majority of action research projects conducted by teachers in Singapore are focused on improving academic outcomes (Tan et al., in press). I propose a broader understanding of action research with greater focus on issues of equity and social justice.

For example, teachers may consider researching on how they use gendered language in their classrooms. For the triangulation of data, they may audiotape and analyze their own lessons, coupled with personal journal entries of their reflections on the lessons and interviews with the students in the class.

**Q: How should teachers initiate or design a quality action research?**

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**A:** Identify a problem or issue that is close to the heart. Never create a problem to solve or work backwards with a solution in mind.

Read relevant literature. It is always good to start with some background knowledge of existing research done in the field.

Start small by designing a pilot study and take it as the first cycle of action research. The pilot study may help decide the feasibility of data collection methods and refine the research questions.

It is also important to have a critical friend to always question without offering too much advice. The rationale is really for the teacher-researcher to reflexively verbalize and organize the design of their action research.

**Q: What are some potential problems teachers might encounter? What can they do in such situations?**

**A:** Time management is often a major problem for teachers with ever-increasing workloads. It is typical of teachers to complete action research projects with minimum fuss and attention when they view it as an additional burden. Schools should recognize teachers who are engaging in action research and their workload should be negotiated.

Perhaps one of the biggest problems that teachers may face is the fear of telling "unwelcome truths" (Kemmis, 2006). The Ministry and school leaders can help alleviate that fear and allow, or even encourage, and support teacher-researchers to critically examine and question policies and strategies that may seem oppressive.

**Q: Tell us about one of your action research projects.**

**A:** I conducted an action research on the gendered practices of PE teachers in my school.

I created a "book of moments" for the PE teachers to record incidents where they felt represented either positive or negative experiences. This was followed by interviews and lesson observations with them.

I embarked on this project because I realized through the literature and reflexivity that my personal practices are gendered, even though I always thought that I was impartial.

**Q: What advice do you have for teachers embarking on action research?**

**A:** From my personal experience, don't be upset by failures or lack of cooperation from participants. These are usually wonderful data that helps shape your next cycle of action research.

Also, we have to start believing that "to find bad news is good news" for action research!

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## STOP DRAWING MODELS IN SECONDARY MATH?

"Why can't I use the model method to solve this problem? I can still get the answer!" This is a common complaint received by secondary school Math teachers. Some have even resorted to banning the use of the model method in class because they believe it prevents students from learning to use letter-symbolic algebra. But is this belief valid?

### Article highlights

Should we discourage students from using the model method in secondary school?

How can teachers use the model method to teach letter-symbolic algebra?

To solve word problems, it is important for students to represent the information presented in the word problems. Students as young as Primary 2 are taught to construct model drawings to help them visualize the word problems.

Because of the familiarity with the model method, many students continue to use it even at the secondary school level, where they are taught to use the more abstract letter-symbolic algebra.<sup>1</sup> (Ng, 2003)

However, many secondary school teachers are concerned that continued use of the model method may prevent students from learning letter-symbolic algebra, which is the preferred tool.

Letter-symbolic algebra is also the language of higher mathematics, making it the gateway for students who want to further their mathematical study. Letter-symbolic algebra can be used to solve all types of algebra word problems, while the model method is limited in its applications.

When efforts to discourage the use of the model method fail, some teachers resort to desperate measures such as banning the use of the model method in their classrooms.

But does the model method really hinder students from learning symbolic algebra?

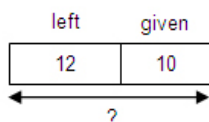
### Model method versus letter-symbolic algebra

The model method and letter-symbolic algebra are methods that can be used to solve algebraic word problems. The main differences are in the manner in which the unknowns are represented and how the value of the unknown is evaluated.<sup>2</sup>

The following, taken from a Secondary 1 Math textbook, is an example of a question that can be solved using both the model method and symbolic algebra.

### From model to algebra

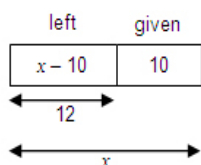
Suppose Peter has some marbles. He gave 10 to Jane and he had 12 marbles left. How many marbles did he have at first?



Using models, we find out that Peter had 22 marbles at first.

Now let us use algebra to solve the problem.

Let the number of marbles Peter had at first be  $x$ .



He gave 10 marbles to Jane. Thus, he had  $(x - 10)$  marbles left. This is given as 12 marbles.

$$x - 10 = 12$$

Can you guess the value of  $x$ ?<sup>3</sup>

(Source: Sin, Chip, & Ng, 2006, p. 111)

### Using the model method as a bridge

When the model method was introduced to the curriculum, it was not intended as a tool to help students learn symbolic algebra. However, continuous use of the model method by lower secondary school students demands that teachers take another look at how students' knowledge of the model method can be used to help students learn letter- symbolic algebra.

In a study by Associate Professor Ng Swee Fong, teachers found that the model method and letter-symbolic algebra are related (Ng, 2003). A word problem captured in a model diagram may be converted to algebraic equations and vice versa.

For students to make the transition to letter-symbolic algebra, teachers can help them by asking a series of appropriately targeted questions such as:

In the model method what do rectangles represent?

Instead of rectangles, can other objects be used to take over the role of the rectangles?

Can letters of the alphabet be used instead?

So, instead of banning the use of the model method, secondary school teachers can activate students' prior knowledge of the model method and use it as a bridge to teach letter-symbolic algebra.

### What can be done?

Although the connection between the two models was taught to all pre-service teachers, the significance of this knowledge may not be appreciated at that point as pre-service teachers lack actual classroom experience.

Dr Ng and her colleagues (2006) suggest that it may be more useful to target this knowledge at lower secondary school math teachers, who are currently facing the model method-symbolic algebra dilemma.

The important thing is not to stop students from using any method to solve a problem. With understanding comes appreciation. Once students understand what they are learning, they can better appreciate the usefulness and importance of letter-symbolic algebra. Then, they can choose the most effective method to solve problems.

### Notes

1. In the current curriculum, students learn the model method first in primary school, before being introduced to abstract letter-symbolic algebra in secondary school.
2. In the model method, rectangles are used to represent unknowns and the arithmetic method is used to evaluate the unknown. In letter-symbolic algebra, letters represent unknowns and the value of the unknown is evaluated using transformational procedures, which maintain the equivalence of an equation.
3. Using letter-symbolic algebra, the answer to this question, expressed as an algebraic equation, looks like this:  $x - 10 + 10 = 12 + 10 = 22$

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### Further reading

Ng, S. F. (2009, June). *What is algebraic about the model method?* Paper presented at the international conference on Redesigning Pedagogy: Designing New Learning Contexts for a Globalising World, National Institute of Education, Nanyang Technological University, Singapore.

Read more about the *Teaching and Learning Mathematical Word Problems: A Comparison of the Model and Symbolic Method project* by the Centre for Research in Pedagogy and Practice (CRPP). The project is led by Associate Professors Kerry Lee and Ng Swee Fong, from CRPP and the *Mathematics and Mathematics Education Academic Group*, respectively.



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## Teaching and Learning Mathematical Word Problems

### A comparison of the model and symbolic methods

In Singapore, children are introduced to algebraic word problems from Primary 4 onwards. To help children access such problems, they are taught a variety of problem solving heuristics. One of the most popular is the model method.

Although anecdotal evidence points to the method's success, there is little research on how students understand and construct models. Furthermore, little information is available on the extent to which early introduction of word problems aids in the learning of symbolic algebra in the secondary school years.

In this project, we address several issues regarding the utility and efficacy of the model method. Using a multidisciplinary approach, four series of studies will be conducted, each containing a number of qualitative studies or quantitative experiments. The objectives of this study are:

1. To examine differences between the model and symbolic methods from a cognitive processing perspective.
2. To examine the connections novice and expert problem solvers make regarding the model and symbolic methods.
3. To examine the parameters of processes that subserve the model method.

### Project Brief

**Project Number:**

CRP 22/03 KL & 9/05 KL

**Research Focus:**

Mathematics

**Keywords:**

Teaching strategies;  
mathematical literacy

**Start Date:** Dec 2003

**Status:** Completed Mar  
2009

### Project Team

**Principal Investigator  
(s):**

- **Kerry Lee**
- Ng Swee Fong

**Collaborator(s):**

- SGH Cognitive  
Neuroscience  
Laboratory

**Contact Person:**

**Kerry Lee**

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## DON'T JUST TEST COMPREHENSION, TEACH IT!

All teachers hope to have students who are proficient and independent readers, and who will become lifelong learners. How do we ensure that students really understand what they're reading? Researchers are helping teachers understand just what they can do about it and why it's so important.

### Article highlights

- Why are reading and comprehension so important?
- How can teachers help students read better?
- What does research tell us about reading intervention?

Many parents seem to think that when it comes to reading, it is the quantity of books read that matters. This emphasis is seen in schools as well. Our children thus try to read as many books as possible.

But more important than the number of books read is how much of the text has been understood. Children may be able to decode words and pick out their meanings but they may not have comprehended the text in its entirety.

In fact, data gathered from the School-based Reading Innovation Project shows that it is not uncommon to see students attaining high scores for decoding in reading assessments, but score poorly for comprehension.

There is also the tendency for schools to *test* rather than to *teach* comprehension.

Testing comprehension involves asking a series of questions in order to ascertain students' understanding of the text. On the other hand, teaching comprehension focuses on equipping students with a set of comprehension skills to assist them in understanding texts thoroughly.

### The importance of comprehension

Research has shown that reading and comprehension correlate with academic achievement in the long run. Students who truly comprehend texts gain an in-depth understanding of the text. This enables them to relate the knowledge to what they have previously learned as well as to what they may learn in the future.

A good reader, one who is able to comprehend what is read, should be able to do the following:

1. **respond** creatively and critically to the text;
2. have a "global" **understanding** of text, that is, be able to comprehend texts as a whole, and not just individual sentences and paragraphs; and
3. **connect** the text with oneself (the reader), with other texts, with the world and life in general.

### Facilitating students' comprehension

Comprehension is a complicated process that involves the interaction of two factors - the text and the reader.

Text factors have to do with how a text is put together. It includes aspects such as text structure (the way a text is organized), paragraph structure, different strategies that writers use in constructing the text. These are things that teachers can examine together with their student.

Reader factors refer to a set of behaviour that a good reader brings to undertake the comprehension task. Teachers can help students to develop some of these behaviours:

1. Activating prior knowledge while reading
2. Making predictions
3. Previewing text features such as book blurb and title
4. Using organizational strategies in organizing knowledge
5. Using metacognitive strategies such as inferring and summarizing
6. Connecting text to personal experience

Teachers can systematically and explicitly instruct students on these strategies during reading comprehension lessons. They can demonstrate and model the use of the strategies to help students translate them into practice.

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### Teaching the teachers

In Singapore, reading instruction at schools may be further enhanced to develop students into proficient and critical readers - readers who can not only decode the meaning of individual words but also be able to comprehend the meaning of whole text at different levels.

A study undertaken by the Centre for Research in Pedagogy and Practice at NIE investigated the reading instruction in a primary school. Several areas of the programme were chosen for enhancement, one of which was in the teaching of comprehension. Teachers attempted to modify their reading instruction to include the instruction of comprehension strategies.

Reading with comprehension is one of the components essential for developing proficient and independent readers. To facilitate text comprehension, students should be equipped with comprehension strategies first. This will give them an advantage in text comprehension and in turn enable them to perform better in their comprehension task.

### Investigating literacy instruction

*SingTeach* speaks to Assistant Professor Chitra Shegar, who tells us more about the School-based Reading Innovation Project.

#### Q: How did this project investigate the nature of literacy instruction?

**A:** This project was carried out with teachers in Primary 1 and 2 of a neighbourhood school, with the aim of enhancing reading instruction in the school. To get an overview of the nature of reading instruction in the school, I observed the teachers over an entire unit of lessons.

Following that, I mapped out the school's reading instruction programme and asked the teachers if it was a true representation of the school's programme. They then compared their programme with internationally recognized, comprehensive reading programmes. This helped them identify gaps in their school's reading instruction programme and revealed areas that need improvement.

#### Q: What is a comprehensive reading programme?

**A:** A comprehensive reading programme develops readers into proficient critical readers. In such a programme, children will be systematically instructed on phonics and comprehension strategies. They will also be shown the connection between reading and writing. In addition, it should also include a programme to foster the love of reading in children.

#### Q: How were these components incorporated into the project school's curriculum?

**A:** Those areas identified for enhancement were addressed through professional development workshop. Through these the teachers were provided with specific knowledge and techniques for use during their reading instruction. Following the workshops teachers designed new lessons plans to institute changes. Feedback was given on the lesson plans as well actual conduct of lessons.

Visit the [project's webpage](#) or contact the project's principal investigator, *Assistant Professor Chitra Shegar*, to learn more about this project.

### Resources

Look out for the book *Techniques for Developing Readers and Writers* (edited by Dr Chitra Shegar and published by Cengage Asia), due out in early 2010, which will showcase a variety of techniques used by the teachers to develop students as readers and writers.

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## Reading Intervention Model

### A reading intervention model to improve reading instruction in primary schools

In Singapore, the Ministry of Education accords considerable importance to reading instruction in schools. The Ministry's main aim of reading instruction is to prime students to become readers who can make sense of print and construct the meaning of texts. Additionally, they should be able to respond creatively and critically to literary texts.

However, a series of projects conducted by CRPP to gain an insight into the nature of reading instruction programmes in Singapore schools has indicated that there is a gap between the goals envisaged by the Ministry and how reading instruction has transpired in schools. There appear to be two important reasons for this. Firstly, reading instruction programmes in schools do not inherently comprise the essential components of successful reading instruction programmes as internationally recognised. Secondly, it appears that schools and teachers lack the procedural knowledge that is required to translate the corpus of research in reading into effective classroom practice.

In view of this, this project proposes a school-based Reading Intervention Model to improve reading instruction in Singapore primary schools. This model has been formulated on the basis of current research on reading instruction and comprises features that are considered to be essential components of successful reading instruction programmes. It is envisaged that the implementation of this model in two low-achieving primary schools will serve as a prototype for adjustments to be made to existing reading instruction in Singapore. Such a prototype will provide directions that will facilitate the development of competent, efficient and independent readers who become lifelong learners.

The data from this project will provide a detailed coding instrument that will allow assessment of reading instruction in Singapore schools based on the criteria of internationally recognised effective reading instruction programmes.

#### Project Brief

**Project Number:**

CRP 18/05 CS

**Research Focus:**

Language & Literacy

**Keywords:**

English language;  
reading; primary school

**Start Date:** Jan 2006

**Status:** Completed Mar  
2009

#### Project Team



**Principal Investigator  
(s):**

- Chitra Shegar

**Contact Person:**

**Chitra Shegar**

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### Article highlights

What are concept cartoons?

What are the benefits of using concept cartoons?

How can cartoons be used to clear misconceptions in Science?

### Concept cartoons as a teaching strategy

Science concepts are often abstract and difficult to grasp, especially for children. And when teachers try to explain them in as simple a manner as possible, they run the danger of oversimplifying these concepts.

It is also common for pupils to develop misconceptions about these concepts. How then can we help our pupils to fully comprehend complex science topics?

One teacher decided to use cartoons to help her Primary 4 class learn about Matter. Ms Farah Aida Rahmat, who was then teaching at Pasir Ris Primary School, also tried to observe and document its effectiveness through action research.

### What are concept cartoons?

Ms Farah made use of "concept cartoons" in her lesson. Concept cartoons are "cartoon-style drawings presenting characters with different viewpoints around a particular situation" (Roesky & Kennepohl, 2008, p. 1355).

According to researchers Brenda Keogh and Stuart Naylor (1999), concept cartoons are extremely versatile as a teaching strategy. They may be employed across subjects, such as in the development of reading skills in English, or the teaching of problem solving in Math.

Concept cartoons may be also used at different stages of a lesson - as a trigger to get students to tune in, as an activity to elicit pupils' responses and generate discussion, or as a means of summarizing the topic at the end.

Ms Farah found such cartoons particularly useful for clearing up her pupils' misconceptions about the Science topic, Matter.

### A teacher's reflections

"[This action research] made me think critically about how my pupils make connections between what they know and what is being taught to them."

This was what Ms Farah noted as she reflected on her action research. She carried out her research at Pasir Ris Primary with the support of the Science and Health Education Department.

The purpose of this action research project was to observe the impact of concept cartoons as a teaching strategy. In particular, she was interested in its effectiveness in addressing misconceptions that would arise in the learning of a new topic.

Ms Farah worked with a Primary 4 class of 40 high-ability pupils. She taught two lessons on the topic of Matter and the pupils made a presentation during the third lesson. The lessons were modelled on the 5E-inquiry model of teaching and learning. Concept cartoons were used at different stages of the learning - the *Engagement*, *Exploration*, *Explanation*, *Elaboration* and *Evaluation* stages.

At the end of the study, she observed that her pupils benefitted from the use of concept cartoons in her teaching. The pupils managed to clear up misunderstandings about the topic. And, most importantly, they thoroughly enjoyed themselves!

"When my pupils enjoy themselves while learning, they seem to learn more," noted Ms Farah. "Their engagement throughout the learning journey is essential to the success of their own learning."

### Why use concept cartoons?

Clearly, there are many benefits of using concept cartoons.

#### 1. Grabs attention

Kids and adults alike like cartoons. They usually associate cartoons with fun and humour. Concept cartoons thus provide an appealing and non-threatening way to represent ideas. Pupils are more likely to be enthusiastic towards the activity to come and will then be more focused and receptive to learning.

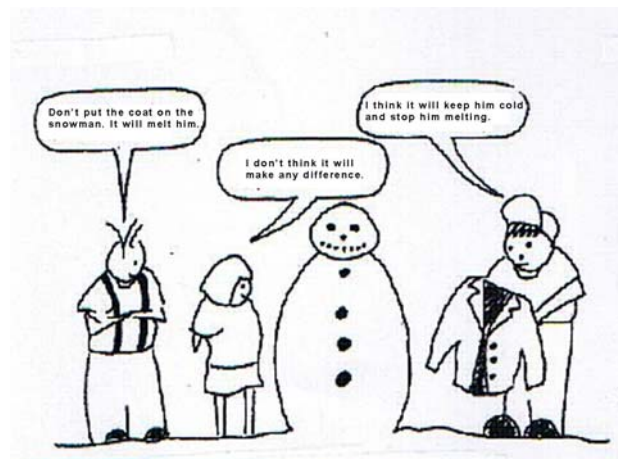
#### 2. Generates participation

In cartoons, the ideas have to be presented succinctly. These ideas can be so thought-provoking that pupils are drawn into "participating" in the dialogue by "becoming" one of the characters, giving rise to vibrant class discussions. The lesson thus becomes more interactive and student-centred as pupils are actively involved in their learning.

#### 3. Develops skills

During discussion of the concept cartoons, pupils have to verbalize their ideas and thoughts. They are motivated to take a stand on the different ideas presented. If they disagree, they may present and defend their points of view. This process allows teachers to gain important insights into their pupils' understanding. Participating in such discussion also lets pupils hone their communication skills.

### Using concept cartoons



(Source: Keogh & Naylor, 1999, p. 433)

The concept cartoon above was developed to address the misconception that "some materials have the property of making things warm" (from <http://www.conceptcartoons.com/>). Each character in the cartoon conveys a particular idea "spoken" in the speech bubble.

The cartoon is useful as a teaching tool to invite pupils to voice out their opinions and provide reasons for their ideas. The informal nature of concept cartoons encourages pupils to present their views without fear of being judged. This opens up an opportunity for teachers to probe and clarify their pupils' thoughts on the topic.

Here are some tips for developing your own concept cartoons:

- Base cartoon characters on people or icons that pupils are familiar with
- Choose a context for the cartoons that is familiar to the pupils
- Minimize text used to present the concept
- Concepts or ideas should relate to one central idea or word (Keogh & Naylor, 1999)

Visit the [Concept Cartoons website](#) to learn more about concept cartoons and how you can use them in your classroom.

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## WHO IS DRIVING THE FUTURE OF EDUCATION?

We live in an increasingly technology-enhanced learning environment where the drivers of the future are the youth of today, noted Professor Roy Pea in his keynote address at the 2009 Redesigning Pedagogy International Conference. But are our schools equipped to deal with this reality? Dr Vicente Reyes grapples with this issue as he reflects on the future of education reforms.



Prof. Roy Pea's central keynote message was about "the value of re-conceptualizing the nature of learning". His speech highlighted how advances in information technology have dramatically reshaped schooling and education, thus the need to re-conceptualize the nature of learning.

It must be noted that discussion about reform in education is not entirely new.

Frustration about the seemingly endless iteration of apparently hollow education reforms have been raised by prominent scholars (Cuban, 1990; Tyack & Cuban, 1997). Reform driven by networks of schools (Lieberman & Grolnick, 1996) and by the irrepressible waves of globalization have similarly been identified (Gopinathan, 1999; Reyes & Gopinathan, 2008).

In most of the literature on school reform, the drivers have undoubtedly been policy makers, researchers and school practitioners (Luke, Freebody, Lau, & Gopinathan, 2005; Mintrom & Vergari, 1998; Yip, Eng, & Chin, 1990). But an insightful point raised by Prof. Pea about the nature of schools deserves reflection:

*Digital natives are consumers and producers; schools are unchanged from their parents' generation and schools are not the best sources of information.*

From this assertion, he moved on to declare a truly refreshing and captivating message in relation to the lingering questions of school reform and who drives these. Prof. Pea accurately described that this time around, it is the youth who are driving the future, not educators or researchers.

The very current and relevant examples provided by Prof. Pea of how the youth have taken the initiative and have seized learning and have transformed these into an "expansion of imagined fields of action" are certainly convincing anecdotes of a new wave of "technologically-enhanced learning" that are imminent.

As the 21st century leaps forward, we realize that today's generation of digital natives may not necessarily fit the mould of our conventional schools. (One can argue that our current conventional schools are patterned after the 19th century "assembly-line" factories, where our kids go through a metaphorical conveyor belt and are provided with knowledge and skills as they move along one grade level to another.)

Prof. Pea has argued quite compellingly that the drivers of the future are the youth. A pivotal question related to this would be: What then should the roles of researchers, policy makers and school practitioners be in an increasingly technology-enhanced learning environment?

Prof. Pea's keynote has been a powerful platform to jumpstart a conversation towards resolving this question.

Let the conversations continue.



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Roy Pea is Stanford University Professor of the Learning Sciences and Co-Director of the Human Sciences and Technologies Advanced Research Center. More

information about his keynote address on "Fostering Learning in the Networked World: Trends, Opportunities and Challenges for Learning Environments and Education" may be found online at: <http://conference.nie.edu.sg/2009/info/keynote-speaker.php>

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*Vicente Reyes is an Assistant Professor with the Policy and Leadership Studies Academic Group at the National Institute of Singapore. He has a keen interest in the politics of schooling and governance, policy implementation, school reform and transformation.*

*If you have a view on a current issue in education, we'd love to hear from you. Write to us at [sgteach@nie.edu.sg](mailto:sgteach@nie.edu.sg)*

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## Keynote Speakers

Deborah Loewenberg Ball, [University of Michigan](#), USA

### Making Mathematics Learnable in School: What is the Work of Teaching Mathematics?

With an ever-increasing demand for mathematical literacy around the globe, the need for skilful teachers of mathematics has never been greater. An effective system of professional preparation rests on a coherent and detailed understanding of the work that teachers are expected to do. This matters because teaching is paradoxically both an utterly commonplace and fundamentally unnatural practice. Teaching centres on knowledge, but it is about helping others learn to know and do. It requires ways of working with groups of learners while being responsible for individuals' progress. This presentation will probe fundamental aspects of the teaching of mathematics that must be at the core of teachers' professional training in order to supply the number of skilled teachers needed to reach broader and higher levels of mathematical literacy.



Deborah Loewenberg Ball is Dean of the School of Education and William H. Payne Collegiate Professor at the University of Michigan. Her research focuses on mathematics instruction, and on interventions designed to improve its quality and effectiveness. Her research groups study the nature of the mathematical knowledge needed for teaching and develop survey measures that make possible analyses of the relations among teachers' mathematical knowledge, the quality of their teaching, and their students' performance. Her research has been recognised with several awards and honours, and she has served on several national and international commissions and panels focused on policy initiatives and the improvement of education, including, most recently, the

National Mathematics Advisory Panel.

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David C. Berliner, [Arizona State University](#), USA

### Rational Responses to High-stakes Testing and the Special Case of Narrowing the Curriculum

The criteria by which one's activities are judged are always kept in mind and influence the behaviour of the person being evaluated, whether that person is an Olympic diver, a stock broker, or a teacher. The diver may concentrate on her entry into the water, the broker may be concerned with profits rather than morality, and the teacher will be concerned with student test performance. These are rational responses to evaluation. But the preoccupation with the use of test scores to judge teachers and schools in the US and elsewhere has resulted in many well-documented unfortunate occurrences: gaming the system; cheating; treating students inappropriately; and the one that may ultimately have the most economic impact, narrowing the curriculum. Evidence exists that the number of hours in the school week is greatly higher in reading and language arts, and mathematics, the tested subjects. While the hours per week are down dramatically in subjects such as social studies, history, art, music, physical education, and even science, the subjects not tested in the U.S. accountability scheme called *No Child Left Behind* (NLCB). What turns out to be rational responses to high-stakes testing may be hurting students, teachers, and the economic future of the USA.

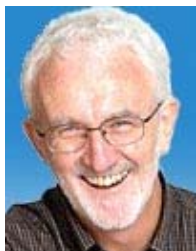


David Berliner is Regents' Professor of Education at the Arizona State University. He has taught at the Universities of Arizona and Massachusetts, at Teachers College and Stanford University, as well as at universities in Australia, The Netherlands, Denmark, Spain and Switzerland. He is a member of the National Academy of Education, and a past president of both the American Educational Research Association (AERA) and the Division of Educational Psychology of the American Psychological Association (APA). He is co-author of the best seller *The Manufactured Crisis, of Putting Research to Work in Your School*, and of the textbook *Educational Psychology*, now in its 6th edition. He is co-editor of the first *Handbook of Educational Psychology*, and of the books *Talks to Teachers and Perspectives on Instructional Time*. His newest co-authored book, *Collateral Damage*, is about the corruption of professional educators through high-stakes testing. Professor Berliner has also authored more than 200 published articles, technical reports and book chapters.

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David Hogan, [National Institute of Education](#), Singapore



David Hogan is Professor and Dean of the Office of Education Research. Prior to that, he was Professor of Education at the University of Tasmania. He had earlier held an Associate Professorship and act as Director of the Education, Culture and Society Program at the Graduate School of Education, University of Pennsylvania. Prof Hogan has won a series of awards for his work, including the American Educational Research Association Outstanding Book Award (1986), the Henry Barnard Prize, the History of Education Society Award, a Spencer Fellowship and a National Endowment of the Humanities Fellowship.

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Erica McWilliam, [National Institute of Education](#), Singapore

### The Knight's Move: Its Relevance for Educational Research and Development

Many of the changes we have predicted have been proven wrong - the millennium bug, the paperless office, more leisure time - all flawed predictions. Meanwhile we continue to see crucial changes which few of us ever anticipated - an African-American in the White House, global fiscal meltdown, the powerful impact of email on work, the Stanley knife used as a weapon of mass destruction. In this century we will continue to confront a future that is neither more of the same nor a predictable process of gradual improvement or decline. Change in the 21st century will be of an order that William Gosling calls "the knight's move". In other words, change will not be linear or regular in the future, yet neither is it likely to be chaotic. In anticipating irregular patterns of 21st century change, we are challenged to re-think "straight road" programmes of educational research and development, and the assumptions they make about the linear-cumulative nature of learning. Denied the "straight road", the knight is a powerful chess-piece in its ability to make strategic, irregular moves. It works best in the thick of the action, rather than on the margins. The knight is also somewhat differently deployed by Eastern and Western players. The knight's move can thus be a useful metaphor for imagining relevant moves in research and development in a new century. With an understanding of the knight's strengths and limitations, and its similarities and differences across East and West, we are better placed to understand the challenges of designing relevant programmes of educational research and professional development. In doing so, we can hope to build more epistemologically agile learning communities that can be proactive and powerful at the centre of the learning action.



Erica McWilliam is Professor of Education with the Centre for Research in Pedagogy and Practice at the National Institute of Education, Nanyang Technological University, Singapore. She is also an Adjunct Professor at the Queensland University of Technology and a co-leader of the Creative Workforce Program in the Australian Research Council Centre of Excellence for Creative Industries and Innovation. Her scholarship covers a wide spectrum, as is evidenced in her numerous publications on creative capacity building, innovative teaching and learning, research methodology, and training and educational leadership and management. She is currently series editor of *Eruptions: New Thinking Across the Disciplines*, an academic series for Peter Lang Publishing, New York. Her latest book, *The Creative Workforce*, is published with UNSW Press in Sydney.

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Magdalena Mok, [The Hong Kong Institute of Education](#), Hong Kong

### Redesigning Pedagogy: Exploiting the Assessment-Learning Nexus for School Improvement

Globalisation and the knowledge economy demand a renewed vision on pedagogy. Within this vision, Self-directed Learning Oriented Assessment (SLOA), in which learning and assessment are tightly integrated, offers a feasible alternative. There are three components of SLOA, namely, assessment of learning, assessment for learning, and assessment as learning. This presentation focuses attention on assessment for learning and will present a field-tested model of implementation, comprising the design and development of a school-level assessment system; re-designing courseware for assessment and learning integration; effective use of the Rasch measurement model; development of continuous measurement scales in English and Mathematics; establishment of classroom-level Computer Adaptive Testing systems; and development of a Web-based reporting system for teachers, students and parents. Outcomes of

the implementation will be drawn from empirical data from schools in China, Hong Kong, and Macau.



Magdalena Mok is Director of the Centre for Assessment Research and Development and Professor at the Department of Educational Psychology, Counselling and Learning Needs at the Hong Kong Institute of Education. She is internationally recognised for her research in educational assessment. Her particular research focus is Self-directed Learning Oriented Assessment in school education. She has undertaken numerous consultancy projects for the governments in Hong Kong and Australia on assessment policies and practice, one of them being the parallel projects entitled SAVIS and APASO, completed in 2002, of which outputs are used by primary and secondary schools in Hong Kong for external and internal school reviews.

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Hannele Niemi, [University of Helsinki](#), Finland

### **Why on the top? Reasons of the PISA-success - Reflections from the Finnish perspective**

The Finnish education system has received attention from all over the world because it came out on top in the PISA surveys. Finnish 15-year-olds have been number one in terms of skills in science, mathematics, the reading of literature and problem solving, and only very few students fall within the lowest PISA categories. Likewise, the differences between schools are small. A major reason for high learning outcomes can be seen as a result of a purposeful educational policy and a high standard of teachers. According to researchers, the educational policy has purposefully aimed at equity in education and has promoted the common comprehensive school model. In the process, many important decisions have been made. One of those has been the decision that all teacher education including primary school teachers was raised to the MA level (5-year programme). The structure and contents of teacher education aim at research and evidence-based orientation. Professors and supervisors of Finnish teacher education have the responsibility to guide students in the research-oriented aspects of their education. The main object of this guidance is not the completion of the Master's thesis itself, but actually to further the process by which students come to see themselves as actively studying and working subjects.



Hannele Niemi serves as the first Vice-Rector responsible for academic affairs, university libraries, quality assurance and equality issues. She has acted as a researcher and scientific director of numerous international projects dealing with teaching and learning, and has served as an expert for the European Commission and the OECD. She has sat on or chaired a number of working groups related to higher education and teacher education. Her research interests focus on teaching and learning, the development of teacher education, technology-based learning environments as well as on ethical questions and values related to teaching. She has served as a keynote lecturer in several international forums. A highlight in her international career was her membership in the Steering

Committee of the Teaching and Learning Research Programme in Britain between 2003 and 2008.

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Roy Pea, [Stanford University Human Sciences and Technologies Advanced Research Center](#), USA

### **Fostering Learning in the Networked World: Trends, Opportunities and Challenges for Learning Environments and Education**

The combination of "always on" mobile computing, location-aware services, open platform technologies, participatory media culture, immersive worlds and games, and increasingly open educational resources provides an exciting horizon for the next decade of research and practice on technology-enhanced learning at all age levels. Exceptional resources for human learning and action will become continuously accessible through networks of information, people, and services. I will argue for the value of re-conceptualizing the nature of learning - from its goals to its infrastructures - and highlight key major research and theoretical challenges.



Roy Pea is Stanford University Professor of the Learning Sciences and Co-Director of the Human Sciences and Technologies Advanced Research Center. He has published widely on such topics as distributed cognition, learning and education fostered by advanced technologies including scientific visualisation, on-line communities, digital video collaboratories, and wireless handheld computers. His current work is developing a new paradigm for everyday networked video interactions for learning and communications, and for how informal and formal learning can be better understood and connected. He is a Co-Principal Investigator with the LIFE Center, one of several large-scale

national Science of Learning Centers funded by the National Science Foundation. He was co-author of the 2000 National Academy Press volume *How People Learn*. He founded and served as the first director of the learning sciences doctoral programmes at Northwestern University (1991) and Stanford University (2001). He is a Fellow of the National Academy of Education, American Psychological Society, the Center for Advanced Study in the Behavioral Sciences, and the American Educational Research Association. In 2004-2005, he was President of the International Society for the Learning Sciences. Roy also serves as a Director for Teachscape, a company he co-founded in 1999 that provides comprehensive K-12 teacher professional development services incorporating Web-based video case studies of standards-based teaching and communities of learners.

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