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# ARCHIVES

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**VOICES**
Find out why Teck Whye Secondary School's D&T teachers choose to teach less.


**INSPIRE**
Today's technological advancements have given video games a place in the classroom. But do they really help students learn more effectively?

**IDEAS**
Digital technologies are changing our understanding and practice of literacy. CRPP researchers investigate what this means for learning and teaching in Singapore.

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## INSPIRE

### Get to know the theories and issues that inspired defining trends in educational research, policy and practice.

**Press START to begin**

Video games are challenging, entertaining and fun. We all know that kids love them. But can they really help students learn more effectively?

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## INSPIRE

### Press START to begin

| Print |

**Video games are challenging, entertaining and fun. We all know that kids love them. But can they really help students learn more effectively?**

According to a recent report by Channel NewsAsia, video games are now used to increase the morale of cancer patients, fight childhood obesity and even train jet pilots.

Almost every aspect of our lives has either been influenced or completely changed by advancements in technology and media. When it comes to education, the classroom is definitely no exception.

Views on new technologies such as computer games and the Internet tend to be split into two different camps. Julian Sefton-Green (1998) calls this a case of "binary oppositions"—where technology can either remake education or destroy it. After all, when it comes to preparing children for life beyond school, the idea of playing computer games in class can be a little hard to imagine, much less accept.

Does this mean the end of traditional teaching? Is the Xbox the key to effective learning? The debate on video games and teaching has yet to be resolved.

**The place of learning**

For some educators, video games inculcate warped sexual values and encourage children to be hyper-competitive. Although recent studies have downplayed the link between video games and aggression, games such as *Grand Theft Auto* (where a player gets points for running over helpless pedestrians with a stolen vehicle) leave some teachers doubtful of its educational benefits.

At the same time, there's also the question of whether the classroom is really the place for computer games. Is the school merely riding on the popularity of such games in a desperate effort to make maths and physics interesting? Could this be a sorry case of adults "trying to be cool"?

In spite of the huge number of "educational games" in the market today, the use of gaming does not always ensure that students will be able to learn a lesson more effectively.

According to Gros (2003), the problem with educational video games is that they are actually designed to cater to adults and are too focused on "teaching" a particular subject. In contrast, regular video games focus on the story of the game and what it allows the players to do. Therefore, while students may naturally engage with video games, this does not mean that they'll have the same enthusiasm with their "more educational" counterparts.

From a research point of view, it also doesn't help that little is known about the true effects of gaming on student achievement. While games like *SimCity* have been touted for their educational potential, there is no research that indicates whether its players are actually deepening their appreciation of geography or civic planning.

**The value of gaming**

Yet, despite the lack of evidence on its positive effects, other educators believe that it is still an engaging tool that can be utilised in the classroom. Rather than complain about students' disinterest in books or dismissing them as a generation of non-readers, these educators believe that we should look at what young people do when they interact with these games. In a way, this could help us understand how they deal with different texts, navigate through stories and solve problems.

According to Margaret Mackey (2005) from the University of Alberta, video game playing is actually a form of "reading" too. Only this time, young people read within a framework that requires them to deal with all kinds of media and multimedia. According to her, understanding this new way of "reading" can help teachers develop new ways to teach children literacy in the classroom.

For example, Harvard professor Chris Dede developed the Multi-User Virtual Environment Experiential Stimulator (MUVEES) where students "travel back in time" to solve mysteries set in 19th-century America. So far, results have shown that MUVEES motivates lower ability students or those who are "turned off" to school and doubtful about their ability to learn  In response to gaming sceptics, Dede says, "Repurposing inexpensive devices bought for entertainment to use for learning in and out of school potentially offers powerful leverage for increasing achievement and equity" (Morissette, 2003, para. 11).

If  teachers can use such games to understand how students think, analyse and engage with a certain task, this could eventually lead to better performance in school and effective learning of knowledge.

**Striking the balance**

Could it be, then, that the issue of gaming in the classroom is really more of a balancing act between teaching the lesson and making it fun? Computer games can definitely play a part in the classroom—with proper guidance by the teacher.

In one study, for example, using *SimCity 2000*, Barab and his colleagues discovered that students can definitely learn from the game's exploration of supply and demand and population growth and taxation. But, there is also the risk of developing naïve concepts of how cities actually grow and evolve—with one 6-year-old player believing that people moved to his city when there was electricity because they wanted to have lights to see in the dark (in press, cited in Squire, 2002)!

As Kurt Squire (2002) aptly puts it, "the educational value of the game-playing experience comes not from just the game itself but from the creative coupling of educational media with effective pedagogy to engage students in meaningful practices" (para. 13). As with all technologies, at the end of the day, it's really all about good teaching.

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# ARCHIVES

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## IDEAS

**Discover innovative ideas on teaching through thought-provoking articles on the latest research findings by NIE academics and researchers.**

### Digital Literacy in the Classroom

Digital technologies are changing our understanding and practice of literacy. Read on to find out what this means for teaching and learning in Singapore.

Click here to read more.

### Learning to THINK

NIE's Learning Sciences Lab (LSL) and the teachers of Temasek Junior College explore how problem-based learning can help students learn science.

Click here to read more.

# IDEAS

## Digital Literacy in the Classroom

| Print |

**Digital technologies are changing our understanding and practice of literacy. Read on to find out what this means for teaching and learning in Singapore.**

Imagine curling up with your favourite book, engrossed as each turn of the page unfolds something new.

Now, compare that with sitting in front of a computer, clicking your way through a maze of hyperlinks, images and videos, reading and interacting online through tagboards and discussion groups.

Feels quite different, doesn't it?

According to UK academic Gunther Kress (2003), whereas writing and the printed book used to dominate, multiple modes of representation such as visual images and audio tracks, and the media that support those multiple modes, are now taking over. These media include the Internet and other forms of information and communications technologies (ICT).

What this means is that people are increasingly communicating with each other and processing information in multiple modes, different forms, and through myriad sources.

**Enter the new**

So what are the implications of this new landscape for schools? Should our students also be learning in this kind of dynamic digital environment?

This is where *digital literacy* comes into play. Digital literacy is not about knowing how to use a computer, but the ability to comprehend and use information via the Internet and other digital technologies (see Lanham, 1995; Gilster, 1997, cited in Hedberg, Brudvik, Tiu, & Towndrow, 2006). In other words, it is about the content.

Closely related to this is the concept of *multimodality*, or the use of a variety of semiotic resources (i.e., resources of any nature which can be used for meaning making, such as linguistic, visual, aural, and more) to communicate with others and express our ideas. (See O'Halloran, 2002, cited by the Digital Curricular Literacies Team [DCLT], 2006.)

Cognisant of the increasing relevance of digital literacy and multimodality, the Centre for Research in Pedagogy and Practice (CRPP) initiated the Digital Curricular Literacies (DCL) project.

**What the project is about**

The DCL study was a suite of three interrelated research studies centring on ICT-oriented learning activities in Singapore's classrooms. Its focus was on the teaching and learning of Science and History in Secondary 1 classrooms.

Why Science and History? According to Dr. Guo Libo, one of the project's principal investigators, the two subjects represent "two ends of a continuum". "A historian in the

making might be very different from a scientist in the making," says Dr. Guo, thus it would be useful to investigate how ICT is used differently for teaching and learning in these two disciplines.

Together, the study looked at different aspects of classroom practice:

> **DCL1:** how classroom interactions are framed by ***teachers*** to prepare students to work on extended ICT learning activities.
>
> **DCL2:** how ***students*** search and collect information from the Internet for their tasks.
>
> **DCL3:** the types of ICT-oriented ***tasks*** teachers set for their classes, and the types of writing and semiotic ***resources*** students use for the tasks.

The studies proceeded in 3 phases, and involved 27 teachers from 7 schools in Singapore. Between August 2003 and April 2005, a total of 27 History and 68 Science lessons were observed.

**The first phase: What's going on in the classrooms?**
First, researchers observed some lessons to get a general picture of the prevalent use of ICT in Singapore schools. The information they collected served as "baseline data", with which comparisons could be made later. These were some of the things Dr. Guo and his colleagues observed:

- There was very little use of ICT. When used, it was more likely than not to be a teacher, seldom the students, presenting lesson contents via PowerPoint slides.
- The tasks the teachers set tended to be "closed" and highly restrictive. There is usually a correct solution or method that the students have to adhere to, and alternative strategies would not be accepted. In fact, only 5.7% of the tasks observed allowed for multiple strategies to a moderate to large extent. (DCLT, 2006)
- Students' work heavily favoured text as they did not make use of other resources, other than images (3.4% for History and 15.8% for Science). Even then, these were used in a cursory manner as they did not expand or extend on the meaning of the written text.
- When surfing the Internet for information, their searches tended to be quite "wide". Their search strategies were not very refined and thus led them to many irrelevant websites. There was also a strong tendency to look for "concrete" and "instant" answers that they could use unaltered, rather than for information from which they could derive their own conclusions. (Bilal, 2001, cited in Hedberg et al., 2006)

**The second phase: Let's talk (work)shop**
After analysing the classroom observations, researchers held a series of workshops for teachers on aspects of classroom practices that they thought could be further explored. "We were trying to improve pedagogic practice and student learning in terms of ICT use, in terms of disciplinarity, and in terms of multimodality," says Dr. Guo.

The research team was particularly concerned about how students often used information from the Internet in a "wholesale", unquestioning manner, which goes against the grain of authentic learning. "There must be some purpose, conscious awareness of why they [students] are searching for this piece of information. There must be some critical thinking involved in the online search," which according to Dr. Guo, were rarely observed in the baseline data. Instead, cut-and-paste and mass-lifting of information from the Web were the norm.

The clarity, or lack thereof, of teachers' instructions was another concern. "Sometimes the task was given in an ambiguous way, but the teacher apparently did not realise this might be a potential problem, and as a result, students responded to this task in various ways." This in turn translated into different grades. The quality of student work could be improved with better scaffolding or support by the teacher.

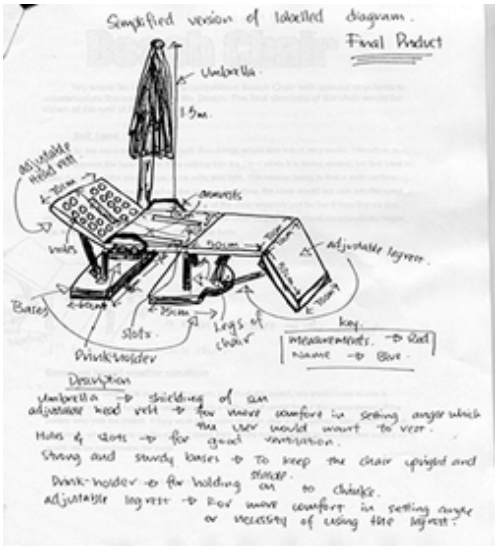
With these in mind, the project team first introduced key ideas such as multimodality and task design to teachers, and explained why they are important to students' learning. They discussed how these concepts can be applied specifically to the teaching and learning of History and Science.

**The third phase: Back to the classroom**
After the workshops, researchers once again returned to the classrooms, this time to observe whether and how teachers would translate the ideas discussed into actual

practice.

They observed "a big jump" in the number of open-ended tasks, allowing for multiple strategies and outcomes. According to Dr. Guo, multiple-choice worksheets were very common in the first phase, but after the workshops, they saw more tasks that gave students greater leeway for different approaches and ideas.

For example, in a Science class that was learning about force and pressure, the teacher told students to think of themselves as groups of designers who had been tasked to design beach chairs for a resort.




In designing the chairs, they had to take into account conditions such as how portable and comfortable the chairs would be, the climate, and even the condition of the ground on which the resort was built. They also had to pitch their designs to the resort "owners" (another group of students) (DCLT, 2006).

"It's not that this kind of multiple-strategies [tasks] is necessarily better than multiple choice," says Dr. Guo, but that at some point a mix of both would do the students good. Such an activity lets them apply various types of knowledge and represent their work in multiple modes (DCLT, 2006), as attested to by the sketches, 3D models and presentations they produced.

Other encouraging changes were also observed, including the significant reduction in the width and number of searches on the Internet by students, suggesting that search strategies were better thought out; and stronger scaffolding by teachers to aid students in their ICT tasks. Students were also using other semiotic resources slightly more in their work.

**Bringing about changes through research**
As a researcher, this project was significant to Dr. Guo as it sought not only to describe and document, but also to bring about positive changes in the classrooms by having teachers and researchers work hand in hand.

He believes that the more intensive the collaboration, the greater the benefit to the teachers, and eventually the students. "Work with the teachers on their concerns, share your ideas and perspectives with them and see whether this researcher-teacher collaboration improves students' projects and products," he says.

> More about DCL

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# Digital Curricular Literacies and Project Work

**A suite of three studies**

These three projects were directly related to the Ministry of Education's (MOE) recent initiatives on "Extended Learning Tasks" and "Digital Curriculum Literacies" (DCL) or the use of Information and Communication Technologies (ICTs) in school learning. This involved the way ICTs support knowledge acquisition and production in multiple modalities while calling upon various combinations of literacy capabilities. Twenty-six classes from 7 secondary schools participated in this study.

The first project, DCL 1, focused on classroom activity. This included how teachers work with students and prepare them to use a variety of sources throughout a project. Based on the transcripts, researchers observed that History was practised as a receiving-and-providing discourse in both its "delivery systems" and its goal. Meanwhile, Science activity entailed the active reproduction of knowledge through experience and labelling. This can have important implications for the ways in which a discipline expert differed from a novice.
On the other hand, the third project, DCL 3, analysed the products that students crafted for their extended learning activities. According to research results, students spent little time writing extended essays, particularly in Science lessons where short answer questions are the norm. They also wrote a limited range of text types both in History and in Science. Text types that were produced had the tendency to be no more than 2 paragraphs in length.

While most students had a basic grasp of writing in History and Science, very few could produce coherent, clear essays. They were also relatively weak in identifying a topic, developing it and using language features. At the same time, students did not seem aware of the potential of semiotic resources other than language. Teachers themselves varied considerably in their mastery of task design. As a result, some learning tasks were much better designed than others.

In the end, researchers recommended including concrete examples to illustrate theoretical underpinning when working with teachers. This was based on the researchers' experience working with Science teachers on multimodal meaning making and task design.

## Project Brief

**Project Number:**
CRP 4/03 PF; 5/03 PF & 6/03 PF
**Research Focus:**
ICT
**Keywords:**
Teaching strategies; classroom interactions; online inquiry; digitised curriculum
**Start Date:** Sep 2003
**Status:** Completed May 2006

## Project Team

**Principal Investigator (s):**

- Lim Cher Ping

## Related Links

**Project Publications**

# IDEAS

## Learning to THINK

| Print |

**NIE's Learning Sciences Lab (LSL) and the teachers of Temasek Junior College explore how problem-based learning can help students learn science.**

The general goal of science education has shifted from an acquisition of knowledge to focus on the process of science inquiry and on thinking skills. It is moving away from learning *about* science to *doing* science, bringing the practice of real-world scientists to the classroom.

In response to this change, schools have been trying out innovative approaches to science learning.

One approach to learning that is quickly gaining popularity in Singapore schools is problem-based learning (PBL). Keen to explore the impact of a PBL approach on students' learning outcomes, Temasek Junior College (TJC) initiated a collaborative project with the National Institute of Education's Learning Sciences Lab (LSL).

**What is this project about?**
First pioneered in the medical schools of McMaster University in Canada, PBL was not originally developed for science learning. However, it has since been adapted for use in secondary and junior college science education.

As an engaging and constructivist learning process, PBL gives students the agency and power to direct their learning, with the teacher acting as a metacognitive coach. The key features of PBL include initiation of learning with ill-defined problems in an authentic context and collaborative problem solving among students.

As the approach is adapted from a foreign context, culture and discipline, the impact of this approach on our students' learning outcome is not immediately understood. But given its increasing popularity and its potential scalability in local schools, LSL researchers felt it was an important area of research.

**What did we want to find out?**
Since the PBL approach is new to many students, we need to examine how the learning environment can be designed to help students deal with the messiness of real-world problems for learning to take place. Also, when introducing a new approach, we need to collect evidence to help make informed decisions on the subsequent iterations of design.

We are interested in finding out the impact of the approach on students' learning outcomes in terms of meaning making of science concepts, beliefs about learning, and the kind of interaction patterns that occur in the learning community. More specifically, this study aims to find out:

1. how learning can be designed to support interaction in science meaning making;
2. how students' beliefs about science learning change in the process;
3. how interaction patterns evolve in the learning community as students engage in a problem-based learning approach.

**What did we do?**

***Student-teacher collaboration***

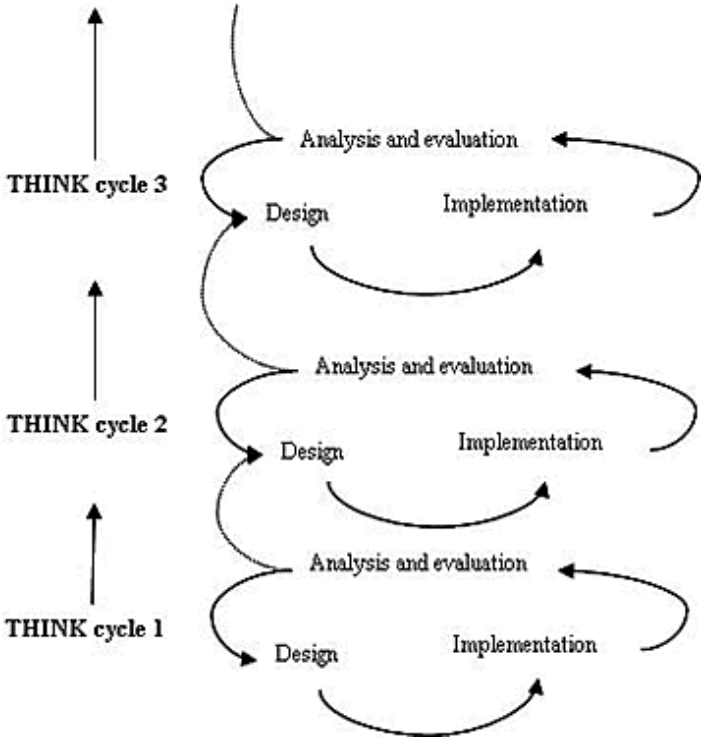
TJC's science department designed a problem-centred approach to science learning, called the *THINK* cycle. Modelled after the PBL approach, the THINK cycle is a 5-stage instructional model for problem solving. Students go through problem-based learning using the THINK framework: ***T****rigger,* ***H****arness,* ***I****nvestigate,* ***N****etwork and* ***K****now*.

In this approach, students in TJC's Integrated Programme work in groups of 4-5 to solve simulated real-world problems (*T*). They then identify learning issues that they need to investigate (*H*), before embarking on a series of investigations (*I*), which may include searching for information and testing of hypotheses. Throughout the process, students work collaboratively with their team members and teachers to find a solution to the problem (*N*). Finally, they present their solution to a panel of judges (teachers and classmates) to display their knowledge gained (*K*).

In each cycle, the teacher acts as a facilitator in the process of problem solving. A computer-supported collaborative (CSCL) system is used to mediate the interaction among the members in the problem-solving community.

***Teacher-researcher collaboration***

This study adopts a design-research approach, where teachers and researchers work collaboratively in designing, implementing and evaluating each THINK cycle through an iterative process (see figure below).




The researchers worked closely with the teachers to brainstorm trigger problems and to discuss the kinds of activities and tasks for the students in each cycle, as well as assessment modes for the cycle. They joined the teachers in the classroom and act as co-facilitators during the activities. They also videotaped classroom events and student interactions, collected students' work, and interviewed the students to find out their reactions to the activities.

Weekly meetings were held to reflect on what was observed. The findings then informed the design of interventions for the next cycle.

**What have we found out?**

This study has been ongoing for a year. Preliminary results reveal that students in this programme have developed a more inquiring mind, seeking to refine ideas by asking higher order questions. They learned how to critique others' ideas. They have also

grown to be less reliant on teachers and are able to work with uncertainty.

The researchers also found that there needs to be a balance between problem solving and learning of science concepts and principles. For instance, while an emphasis on problem solving often elicits creative and innovative solutions from the students, sometimes, the students do it at the expense of learning intended content knowledge. They may be able to come up with innovative solutions but are unable to articulate the scientific principles that were employed. The converse is also true.

An emphasis on content knowledge often leads to decontextualised knowledge acquisition, low levels of interest in solving the problem, and individualistic attitudes. Hence, the objectives of problem solving and knowledge acquisition have to be balanced so that one does not overshadow the other.

It was found that at least at the initial stage of PBL, a more structured approach with well-defined stages of problem solving may be more beneficial to students. Each of these stages should direct students' attention to either knowledge construction or problem solving in a more structured manner.

**How teachers will benefit from the research?**
Through this study, we hope to be able to provide useful knowledge for policymakers and teachers on to how to design science curricula using a PBL approach, and how to scaffold student inquiry in a technology-mediated environment. This would be relevant to schools offering the Integrated Programme as well as schools seeking to reform their science curriculum.

*This research project is led by Associate Professor Tan Seng Chee and Associate Professor Looi Chee Kit, with the assistance of Jennifer Yeo, Jarina Peer and Tang Kok Sing.*

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# ARCHIVES





## VOICES

**Learn from fellow teachers as they use research to reflect on, question, and voice out improvements for their own practice.**

### Of Their Own Design

The Design and Technology (D&T) Department of Teck Whye Secondary School (TWSS) has discovered an innovative way to make students critical problem-solvers, creative thinkers and independent learners. The best part is: They've been doing it even before they heard of "TLLM"!

Click here to read more.

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### Game for Learning

*SimCity* in the classroom? Why not, said a team of mathematics teachers from Coral Secondary School. Since computer games already pervade our students' personal lives, they thought it might be worthwhile to introduce it into the classroom.

Click here to read more.

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### Trying a Job for Size

Wondering what it's like to "be attached"? *SingTeach* talks to NIE lecturer Madonna Stinson and Lakeside Primary School teacher Nagarathinam Annamalai about their experience with the Teacher Work Attachment (TWA) programme.

Click here to read more.

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## VOICES

### Of Their Own Design

| Print |

**The Design and Technology (D&T) Department of Teck Whye Secondary School (TWSS) has discovered an innovative way to make students critical problem-solvers, creative thinkers and independent learners. The best part is: They've been doing it even before they heard of "TLLM"!**

It's hard not to be surprised when talking to the D&T teachers of TWSS. This is because for all the precision required by their subject, they have chosen an approach that is open to mistakes and exploratory. The teachers were also quite comfortable with leaving students to work on their own.

Before anyone shouts "Teach Less, Learn More!" (TLLM), Head of Department Sean Jalleh begs to disagree. "I don't think it was a conscious effort to fit TLLM. It just so happened that the model fit us!" In fact, when TLLM was first introduced to their school, they looked at each other and said, "That's us!"

**Keeping it practical**

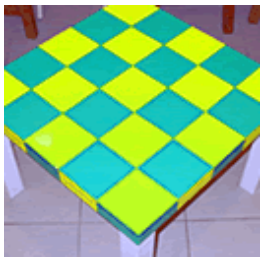
So why use such an approach to teach a subject like D&T? "With our subject, you can't just use classroom time," explains Sean. "We only have 1-2 hours with students, then they have to do things on their own. So when we give them something to do, they decide how to manage the project." This highlights the need for students to be motivated enough to learn on their own.

Of course, students had to learn the skills and knowledge of D&T as well. For teachers, this means ensuring that students are ready for the O levels by the time they reach Secondary 4. Interestingly, these D&T teachers did so by choosing an unexpected solution: not following the syllabus.

Instead of teaching students "a little of everything", the TWSS programme specialises in one topic per year—from basic electronics at Secondary 1 to structures and advanced mechanics at Secondary 3. This leads up to portfolio-building in Secondary 4, where students need to make use of all their previous knowledge and skills.

Topics are chosen based on the students' ability to comprehend the lesson. As a result, there needs to be significant planning in segregating these topics and allocating them to the different levels. In a way, this is like saying, "While this is all you'll learn now, you will learn it well."

**Keeping it interesting**
At the same time, teachers also take pains to think of projects that students would genuinely enjoy. "It's changing perceptions," says Sean. "So in Sec 1, they enter the class and say, 'Hey, this is quite fun!' Then, go on to Sec 2 and say the same thing. By the time they get to Sec 3, they're already quite excited."



As a result, TWSS's D&T students find themselves making toys, designing table tops, and even spray-painting graffiti art on school walls! But don't think this was just about making pretty objects. Students are also given the opportunity to contribute to the school and society, thereby raising the self-esteem of those who were not doing well academically. For example, tables designed by the Normal (Technical) students were auctioned to raise funds for the Singapore School for the Deaf. "They were really proud," beams Indra bin Ahmad, a Sec 2 teacher. "They enjoyed it tremendously."

D&T teachers keep their projects challenging as well. This year, students were asked to design posters to advertise TWSS's strengths, in line with the school's 40th anniversary.


There was just one interesting twist: They had to create easels which would be as eye-catching as the posters themselves! This way, students were encouraged to be creative and yet keep a specific purpose in mind.

"It's important to encourage them to design something really abstract or amazing and then slowly bring them back to what we know they can make. If not, they can end up making a box!" laughs Sean. "It's very comfortable but they're not going to learn much."

The D&T teachers hope that with this type of projects, students are challenged to make imagination the key driver in their approach to the design and eventually, their approach to life.

**Teach Less Plan More**
Of course, designing such a programme was easier said than done. Currently, the D&T teachers meet weekly just to make sure that everyone is in line with the plan. At times, this means being willing to do extra research.

"We have to be knowledgeable of course," says Noor Azhar bin Ahmad, a Sec 1 teacher. "We need to come up with new ideas so if we feel limited by the textbook, we have to go beyond it and explore." True enough, the D&T department has already removed the textbook from the Sec 2 programme and will do the same for the Sec 1 programme in 2007. This allows the department to see the textbook more as a guide rather than a crutch.

Of course, planning a new syllabus comes with its own challenges. "For me, the biggest worry is whether the programme is going to be successful," admits Indra. "For example, we need to select the kind of mechanism for the students and when you to talk of mechanism, there are thousands! You can do it in 5 minutes but can they do it in half an hour? Those are the questions that go through your mind." "So maybe that's what TLLM is," jokes Sean. "Teach less, learn more, but plan more!"

**Prepared for life?**
TLLM calls on educators to prepare students for life. For the D&T teachers, this means using giving students practical skills that can be used beyond the classroom.

"We looked at the textbooks and tried to use these to find real-world examples for the students," says Kok Hian, who teaches Sec 3 students. "We need to ask the question, 'Can the student really learn what this is about?'"

This extends to other activities as well. D&T students learn software used by professional designers, take field trips to graphic design companies, and solve classroom problems based on everyday objects.

"They get an idea of what's going on outside the

classroom," says Sean, "and they don't think that D&T is just going into a workshop and cutting wood."

Of course, students must also be prepared for workplace, where there won't always be a clear set of instructions on how to get things done.

"We want them to have a kind of mindset where they are able to know where and how to start solving a problem instead of just thinking, 'I'll just go back and do something else'," says Alvin Tay, a Sec 3 teacher.

True enough, this approach has been successful enough for the teachers to note the difference. "I believe that in lower secondary, they're a bit more dependent—just a bit," adds Azhar. "But when they go on to Sec 3, you can see a change in them. They're more independent and they can solve problems on their own. They're willing to try different solutions, do trial and error, and learn from their mistakes."

**Tips for Teachers who would Like to Teach Less**

**1. Motivate students with engaging lessons**
Differentiate learning from teaching. The two areas will only come together when you link learning requirements to the teaching methodologies. "If you can get the student interested in your lesson, this is what will drive them to do their projects on their own," says Azhar.

**2. "Show" rather than "tell"**
For example, Alvin had his students build a paper structure that should be able to support a chair in order for them to learn about the concept of reinforcement. "They can see the relationship themselves—building the structure with reinforcements and without, using the theory and without the theory. They see the difference," he says.

As a result, students were able to immediately apply what the teachers wanted them to learn and see the impact of such knowledge through their application.

**3. Take note of your students' abilities**
"Don't just assign a humongous project and expect the students to be able to do it," says Azhar. Coach your students and slowly bring them to the level where you envision them to be. Don't leave anything to chance and assume that students should know what to do.

**4. Be open and honest with each other and with yourself**
"If you're going to plan the entire programme, you have to be honest in that there are certain aspects that will fail," warns Sean. "It's important to accept them and move on." Adds Indra, "Sometimes, you can look at your work and say, 'This is very good!' but your colleague will be able to see its weaknesses."

Creating a culture where people acknowledge the positives rather than pick on the negatives will allow innovation and creativity to surface. People will take more risks and accept criticism knowing that its purpose is to improve and develop and not point outlook for one's faults.

**5. Don't give up!**
"You will probably not get sweet success on your first try," advises Sean. "You should just improve on it and get better."

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*Published in SingTeach, December 2006*

SingTeach

# ARCHIVES





## VOICES

### Game for Learning

| Print |

**_SimCity_ in the classroom? Why not, said a team of mathematics teachers from Coral Secondary School. Since computer games already pervade our students' personal lives, they thought it might be worthwhile to introduce it into the classroom.**

Can playing computer games really help to improve the learning of mathematics?

Well, that's what team members Loo Liat Siang, Dennis Teo, Doris Tan and Rafi bin Mohd Rais wanted to find out. So they carried out a pilot action research study to examine the effects of *SimCity™ 4* on the learning of problem-solving abilities in mathematics.

**Why?**
Noting that students nowadays engage in more technology-based pastimes, such as playing video games, online chatting and blogging, the research team sought to capitalise on these pastimes to develop their students' problem-solving skills.

Their review of the literature had also turned up research on how computer simulation can motivate and promote interest in learning, and make learning more fun (Aldrich, 2004). Therefore, this seemed like a good way to make the learning of mathematics more interesting and relevant to real life.

"It's a different way to teach mathematics," explained Dennis, who is the project team leader. "In the past, students can just sit still and listen to the teacher teaching, but nowadays students are not like that. We need to engage them in much more innovative ways. So using computer games is just one way that we explore to teach maths in a different way."

The teachers believed this new teaching method was also in line with the call to "Teach Less, Learn More", to better engage students in their learning, beyond the traditional method information transmission.

**Who?**
A small sample of 15 Secondary 3 students from a Normal (Academic) [N(A)] class were selected to participate in this study. These 5 girls and 10 boys were of mixed mathematical ability.

"One of the reasons why we introduced it for N(A) was to really get the students more interested in learning mathematics," explained Mr Loo, who heads the mathematics department. "So we introduced this game to make them more motivated."

These students were asked to participate in a 4-day enrichment programme held in October 2005, after their year-end examinations.

**How?**
The team took 4 months to design and trial a lesson package, which they named "Go Build a City". It incorporated the use of *SimCity 4*, a city-construction simulation game, as well as some mathematical content.

*SimCity 4* was chosen because it met the four key ingredients of effective game design proposed by Aldrich (2004):

1. Authentic and relevant scenarios;
2. Applied pressure situations that tap on users' emotions and force them to act;
3. A sense of unrestricted options; and
4. Re-playability.

Said Mr Loo, "When we designed the package, we are very clear about our objectives. We wanted students to learn the problem-solving steps," referring to a 4-step problem-solving framework in the mathematics curriculum. "We also factored in mathematical content, that is, taxation and arithmetic problems, which provided the contexts to apply the problem-solving steps."

A pre-test comprising mathematical problem-solving questions was administered on the first day of the programme. On the second day, students were given a realistic scenario—as the mayor, lead in the rebuilding of a city that had been razed by a natural catastrophe—and taught how to play the game.

Using scenarios from the game, the problem-solving steps and the concept of taxation were imparted to students through direct teacher instruction on Day 3.

On the last day, students were challenged to see who could build a city to generate the highest profit. A post-test was administered at the end.

The students were observed by two team members throughout the intervention. The team also conducted focus group interviews and two convergent interviews to obtain more information from some of the participants. A rigorous process of data analysis was carried out to validate the team's findings.

**What they found**
The team identified five key problem-solving effects:

1. Increased student engagement;
2. Improved retention of knowledge;
3. A more reflective mindset;
4. Learning of interdisciplinary skills and knowledge; and
5. Transference of problem-solving skills to daily life.

The team found that the first two effects have translated into improved problem-solving abilities, as post-test scores have generally increased by 4 points, and the t-test has shown the increase to be statistically significant.

In addition, the team also found a significant correlation between in-game profit and improvement in test scores, which suggests a link between playing the game and improvement in problem-solving abilities.

The team was particularly surprised to discover the latter three effects, as they were not central to the teaching and learning of mathematical problem solving.

Nonetheless, they were important to help individuals function effectively in the future workplace.

"When we were doing our interviews with the students, what they said provided evidence that there are other skills that they picked up from the game, other than academic knowledge and skills," noted Dennis. "For instance, a few students said that

after playing the game, they were able to manage their finances better. The game helped them to think ahead and make decisions wisely on the things to spend on."

"The students have learnt important lifeskills but they didn't realise it until we started questioning them deeper, especially during the convergent interviews," added Rafi. "Maybe that was because some students had pre-conceived notions about computer gaming - that games are a waste of time or addictive. But in the end, we found out that students had learned quite a bit."

**Looking forward**

While a larger scale study is needed to validate the findings, the preliminary findings are encouraging, showing that the use of computer simulation games is a potentially effective methodology for the teaching and learning of mathematics.

These teachers hope that their findings would encourage further studies into the use of computer simulation games in the teaching of mathematics as well as in other subjects.

"I think that's the way to go," said Mr Loo. "In the workplace, people are already using simulation for training purposes, and students nowadays are so in tune with such things, so it should be something they are familiar with and they are passionate about. So I think this is something we can tap on to bring about greater student engagement."

*This project was one of many that teachers at Coral Secondary School have engaged in. Check out the school's action research website to read more about their research programme and projects.*

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*Published in SingTeach, December 2006*

## VOICES

### Trying a Job for Size

| Print |

**Wondering what it's like to "be attached"? *SingTeach* talks to NIE lecturer Madonna Stinson and Lakeside Primary School teacher Nagarathinam Annamalai about their experience with the Teacher Work Attachment (TWA) programme.**


Imagine taking a break from work and trying out another job, just to see if you liked what was involved. This is exactly what Nagarathinam Annamalai (Anna), a teacher from Lakeside Primary School, was able to do when she applied for a Teacher Work Attachment (TWA) at the National Institute of Education in May 2006.

The TWA aims to broaden teachers' experience by placing them in an industrial or community setting where they get to experience anything from event management to marketing.

Hopefully, this will be enable them to gather new ideas that will inform their teaching.

**Getting a job**

For Anna, her work attachment was also an opportunity to see how lecturers work. She was particularly interested in NIE because of their direct involvement in "nurturing MOE teachers".

"I wanted to learn how research organisations carry out programmes for teachers and see if I could take away some learning points from the experience," she recalls. "I was also very interested in using drama as a tool for language teaching and wanted to observe how a Drama course is conducted."

Luckily, this is exactly what Madonna Stinson, a lecturer from NIE's Visual and Performing Arts Academic Group, needed as well. "I was looking for someone who wanted to gain an understanding of workshop management," says Madonna. "Anna was very positive and I could tell she would work hard. The long days didn't seem to worry her either. That was important, too."

**Doing the work**

For one week, Anna worked with Madonna in organising and documenting the "Supporting Language and Literacy Through Drama Workshop" led by Dr. Joe Winston from Warwick University, UK. Twenty-five teachers from primary schools throughout Singapore participated in the workshop and Anna was immediately introduced to the huge amount of organisation and paperwork needed to bring an international academic to the NIE.

This meant arriving before 8:30 in morning to register attendance for all the participants, joining the workshop, and taking notes and photographs to document the learning opportunities during the day.

Anna even checked on catering, helped the workshop leader with stationery requirements and handled other unforeseen needs. Her last day was spent writing a report that documented the three-day workshop. This remains in the archives at NIE.

**Looking back**
In spite of the limited time they spent together, both Anna and Madonna are grateful for the TWA experience. While her TWA work was definitely different from her regular teaching duties, Anna believes that she was still able to bring something back to the classroom.

"Throughout the workshop, a variety of drama techniques were introduced," she explains. "These techniques can easily be used in either primary or secondary schools to support and enhance language and literacy acquisition."

Madonna is equally inspired as well. "It was useful for me to see the work through a newcomer's eyes. Sometimes, when one is so familiar with the field, it is easy to forget or underestimate the impact of really good quality drama," she says. "Anna's surprise and excitement that the techniques were so engaging and yet so cognitively complex allowed me to think more about this."

In the end, both Anna and Madonna recommend the TWA programme as a great opportunity for teachers to "step out of their comfort zone"—even if it is only for a short period of time. "I think all teachers should go on a TWA at least once in their teaching career," Anna says. "Sometimes teachers are like frogs in a well and don't know what is happening beyond their school. The TWA dispels this."

"I would encourage all teachers to take advantage of this opportunity," Madonna adds. "Not only will you learn a great deal but you will have an opportunity to make a contribution outside your school."

**Thinking about doing a TWA?**
Anna and Madonna offer some tips to help teachers make the most of their TWA experience.

**1. Be specific**
Given that most TWAs only last from 1-4 weeks, Madonna feels it is important that teachers state objectives that are clear and specific. "I chose Anna for this attachment because, though she had no experience in drama, her objectives for the TWA were very clear and manageable," she explains. "Don't expect too much, especially for short-term attachments."

**2. Be open-minded**
"See how what you have learnt can benefit your school," says Anna. "Do make it a point to share and apply the things you've learned so that your school can benefit from your TWA experience as well."

**3. Be self-confident**
"Be proud of what you can offer in terms of you own knowledge and skills," says Madonna. The TWA is not only meant to benefit teachers alone. Host organisations also have a lot to learn from teachers themselves.

> Visit the Teachers Network website to learn more about the TWA programme.

*Madonna Stinson is a lecturer in Drama and Drama Education with the Visual and Performing Arts Academic Group , and a researcher with the Centre for Research on Pedagogy and Practice. Her research interests include drama praxis and arts and drama curriculum models.*

*Nagarathinam Annamalai is an English teacher at Lakeside Primary School.*

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*Published in SingTeach, December 2006*

# ARCHIVES





## SHARE

**Get teaching tips and advice as we share our reviews of books, websites and teaching aids, written especially for the Singapore context.**

### Assessment Reform in Science: Fairness and Fear

By Benny H. W. Yung (2006), Springer, ISBN 1-4020-3374-5 (HB) or ISBN 1-4020-3408-3 (e-book), 293 pp.

Click here to read more.

### Mediated Learning Experience with Children: Applications Across Contexts

Edited by Alice Seok-Hoon Seng, Lucy Kwee-Hoon Pou and Oon-Seng Tan (2003), McGraw-Hill Education (Asia), ISBN: 0-07-123217-6, 210 pp.

Click here to read more.

### DiscoverySchool.com

http://puzzlemaker.school.discovery.com

Click here to read more.

### How Can I be a Good Teacher-facilitator?

Dr. Rita Silver shares some advice on how to be a good facilitator and create a student-centred environment in the classroom.

Click here to read more.

## SHARE

### Assessment Reform in Science: Fairness and Fear

| Print |

**By Benny H. W. Yung (2006), Springer, ISBN 1-4020-3374-5 (HB) or ISBN 1-4020-3408-3 (e-book), 293 pp.**


An area of increasing interest in educational reform is the shift towards using assessment as a tool for improving teaching and learning. Benny Yung's book, *Assessment Reform in Science: Fairness and Fear*, is a report of research findings relating to teacher professional development and science pedagogy.

Yung offers a case-driven account of how 10 teachers in Hong Kong taught and assessed A-level biology through a continuous marks-based scheme called the *Teacher Assessment Scheme* (TAS). Readers familiar with the *Science Practical Assessment* (SPA) in Singapore will see an immediate connection.

The book has 15 chapters, and includes 2 appendices which explain the theory and methods used in the study.

Following Chapters 1 and 2, which provide background information to the study, Chapter 3 portrays how the teachers implemented TAS. Using the frequency of dialogic interactions between teachers and students during the conduct of practical work as the principal unit of analysis, it was found that teachers who were more concerned with assessment issues in their laboratories tended to interact less often with their students than those teachers who were not.

In Chapters 4 to 11, eight narrative-based case studies are presented that describe teachers' personal, educational and professional backgrounds, their stated beliefs about science practical work and pedagogy. Each case is supported with interview and lesson transcripts and includes a useful summary at the end. It is immediately noticeable that the teachers' practices in the various case studies were markedly different.

In Chapter 12, the author shows how tensions arose when teachers were caught between the dual roles of teaching and assessing in TAS. In Chapter 13, three differing views of TAS implementation are described and analysed. It was found that the teachers' discourses were dominated by, and their classroom actions were influenced by, their notion of fairness. They were fair in the sense of (1) assessing students on a fair basis; (2) not jeopardising students' chances to learn the subject matter while they are being assessed; or (3) not depriving students' of opportunities of receiving an all-round education.

For teachers to implement the new assessment scheme successfully their existing understanding and beliefs concerning assessment had to be challenged and opportunities provided for them to come to terms with the philosophy of the new assessment scheme. Most importantly, the teachers themselves had to undertake such a learning process.

Chapter 14, "Teacher Professionalism and Policy Interpretation" is perhaps the most insightful of Yung's analyses. He revisits five of his cases to show the bases upon which his informants derived their interpretations of TAS. What emerge are threshold points in the teachers' capacity to make discretionary judgements in their classrooms relating to

assessment.

Chapter 15 recaps the research questions and presents an overview of findings in the study. Of particular interest are Yung's views on what could be done to assist teachers in raising teachers' professional consciousness and confidence in dealing with assessment reforms. A role is identified for continuing professional development that promotes collaboration and sustained effort.

In our opinion, this book brings across the many interpretations and realisations of the same policy change that are possible by different teachers. Meaningful learning experiences can only be formed if teachers are aware of their own beliefs and also those of others in the same profession. Awareness and comparison can lead to constructive dialogue between teachers which will lead, hopefully, to more thoughtful implementation of change.

**About the reviewers**

*Phillip A. Towndrow and Tan Aik Ling are researchers in the Centre for Research in Pedagogy and Practice at the National Institute of Education. They are involved separately and collaboratively in studies relating to science education, science assessment and teacher professional development.*

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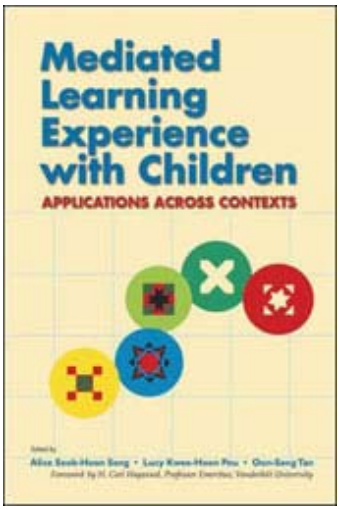
## SHARE

# Mediated Learning Experience with Children: Applications Across Contexts

| Print |

**Edited by Alice Seok-Hoon Seng, Lucy Kwee-Hoon Pou and Oon-Seng Tan (2003), McGraw-Hill Education (Asia), ISBN: 0-07-123217-6, 210 pp.**

*"Intelligence is not a static structure, but an open, dynamic system that can continue to develop throughout life." —Dr. Reuven Feuerstein*




This book is a great read as it provides a fresh look at the concepts, theories and applications of Mediated Learning Experience (MLE), a theory based on the work of Reuven Feuerstein.

The first section of the book explores the four theoretical aspects of MLE. This includes the following:

A theoretical introduction to MLE based on the works of Piaget, Vygotsky and Feuerstein;
A presentation of a multi-dimensional, meta-theoretical model that extends the theories of Vygotsky, Feuerstein and other scholars in the area of MLE;
A review of the strategies and techniques that were used in the application of Feuerstein's theory; and
A discussion of how children are the main interacting agents in MLE.

The first chapter of the book provides a comprehensive explanation of the theoretical framework of MLE. It offers different scenarios to help readers better understand the foundation on which MLE is built upon. Besides looking into the basic theoretical framework of MLE, this chapter also examines theories developed by Piaget, Vygotsky and Feuerstein and relates them to the functions of MLE.

As this first chapter is introductory, it is crucial for those who have little or no idea about the theoretical concepts of MLE to read this it first in order to grasp the concepts in the later chapters, where MLE is explored in greater depth.

The book's next three chapters explore the other theoretical aspects of MLE such as the multi-dimensional meta-theoretical framework and the multidimensional modifiability. The insightful descriptions provide readers with a better understanding of the theories and frameworks underlying MLE.

The latter part of the book focuses on the application of MLE across different domains. In particular, it deals with specific groups of people such as preschool children, children with disabilities, and even parents (as they too have an important role to play in the application of MLE). The book presents the techniques and strategies of MLE as well as their results and implications, so readers have a clearer picture of the kind of results to eapect if they were to try out MLE for themselves.

The last chapter of the book discusses some test tools such as the Children's Analogical Thinking Modifiability (CATM) Test, the Children's Inferential Thinking Modifiability (CITM) Test and the Complex Figure Test. All these are available for the assessment of children's cognitive abilities.

Overall, this book provides readers with a good understanding of MLE and the different pedagogical intervention programmes that are based on its theory and concepts. The book may even inspire some readers to factor MLE into their teaching strategies. However, this book is not an instructional manual so readers who expect a more systematic reference on how to implement MLE may be a little disappointed.

**About the reviewer**

*Seet Jun Feng is a Research Assistant at the Centre for Research in Pedagogy and Practice. He is involved in a project on fostering critical thinking in primary school students. He is also interested in teaching holistic Chinese Language learning through Philosophy for Children.*

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# ARCHIVES

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## SHARE

### DiscoverySchool.com

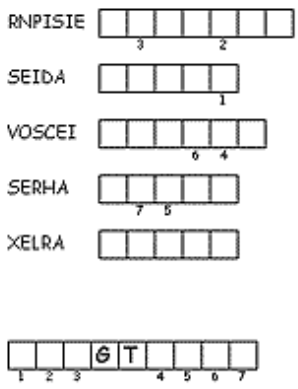
| Print |

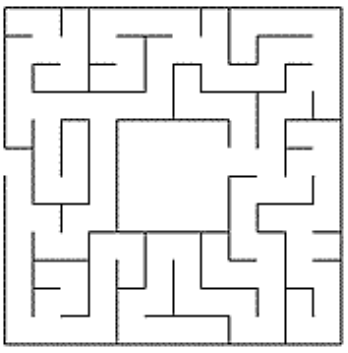
**http://puzzlemaker.school.discovery.com**

Need a quick way to engage your students? Try DiscoverySchool.com. There are many online resources for creating puzzles and crosswords, but Discovery School's Puzzlemaker has got to be among the best.


This puzzle generation tool makes it easy for parents and students to customise their own puzzles. There are at least 10 different types of puzzles to choose from, including crosswords, word searches, mazes and maths puzzles.

Puzzlemaker is so easy to use—not to mention so much fun—that you'll want to try all the puzzles. Just key in the answer and the clues, and the computer does the rest, all within minutes. The puzzles can be printed from the browser, or saved and incorporated into worksheets.



Two teachers who have found this a useful tool in their teaching practice are Mrs Sylvelin Wong and Ms Amelia Anne Silvarayan from Coral Secondary School. They discovered the website while trying to figure out how they could inject a fun and competitive element into their English Literature classrooms, to get their students more engaged in learning.

The students had been studying the Literature text for two terms already when their teachers brought them to the computer lab.

Mrs Wong describes the process: "We gave them a few guidelines on how big we wanted the crossword puzzle to be. From there, they basically did their own self-enquiring process, searched through the text, and came up with questions on their own. And after that, we just printed out the puzzles from the website."

This whole activity took two periods (about 70 minutes). They then used the puzzles to pit their skills against other groups in the class, to see who could create the most challenging puzzle.

"We used DiscoverySchool.com because they enjoy crossword puzzles, and this one gives them an opportunity to create it," explains Ms Silvarayan. "When they type in the clues, it makes them think a lot about the content of the text and the kind of questions that they want to ask, which is a bit of a higher order skill—they have to think about the questions themselves.

"And because of that challenge, competing with one another, they don't want to give questions that are too easy, so they go into a process of self-evaluation, questioning each other, and looking and analysing the questions. So we found that to be a very useful tool for them to create something of their own."

So, the next time you need to inject some fun into your classroom, be sure to check out DiscoverySchool.com's Puzzlemaker!

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*Published in SingTeach, December 2006*

## SHARE

# How Can I be a Good Teacher-facilitator?

| Print |

**Dr. Rita Silver shares some advice on how to be a good facilitator and create a student-centred environment in the classroom.**

*Editor's note: The following article arose from a question posed by Ho Chok Sin from Admiralty Secondary School. To see the rest of Dr. Silver's response, refer to SingTeach's* ***ASK A QUESTION*** *section.*

In the article *Closing the Gap Between Learning and Instruction* by David Nunan (1995), he suggests that there is a continuum of learner-centredness, where a class cannot be defined as "learner-centred" or "not learner-centred" but more or less learner-centred. He also proposes that, along with the academic content, we need to teach learners how to learn so that they can make better choices in their learning.

While Nunan is speaking specifically about English as a Second Language teaching, I believe that he has some useful pointers for all of us. His main point is that students sometimes don't learn what we are trying to teach them because they have their own ideas and their own agendas. This means they are sometimes busy learning something other than what we have in mind. So, our class might be more or less learner-centred but we still have to deal with this potential gap between what we and our learners expect.

So what does a good facilitator need to do to be more learner-centred without creating chaos in the classroom? Here are a few tips from Nunan:

1. Make learners aware of your goals for the class, the unit, the lesson. Also, make them aware of what you are doing with the different materials and activities, why you are using them, and what you expect them to learn from these activities and materials.
2. Find out about the students' goals and try to address those. When possible, select materials that match student interests and use activities that are congruent with student goals.
3. Involve students in adapting goals and classroom content where and when possible.
4. Link the content to the world beyond the classroom

A few comments on each of these points, with the Singapore context in mind:

**1. Make learners aware**

This can simply mean that you tell them your objectives for the lesson. This can be both useful and motivating to students.

However, sometimes the language of objectives doesn't resonate with students so try rephrasing them in a more conversational manner. You can put these statements on the board or somewhere visible throughout the lesson/unit so that students are reminded of them.

**2. Find out about your students' goals**
You can find out about your students goals and interests informally by talking with them and observing them, or more formally by using questionnaires. You can even build this into classroom activities by having them interview each other, having them survey their textbook to see if the topics match with what they expect, etc. You can refer to their goals and expectations when you talk about your own goals and expectations for the class.

Yes, this includes noting when their expectations don't match yours and can't be met. The students might be disappointed but at least it helps them reconcile their expectations with the realities of the syllabus or the course requirements.

**3. Involve your students**
In Singapore, syllabus requirements are a given and many of our teaching materials are pre-set. Nevertheless, you can also involve students in making decisions sometimes.

For example, you can sometimes ask if they prefer to do an activity in class or at home, together or individually, in writing or through conversation with a partner. These are small adjustments to your teaching but they involve the students on a regular basis.

**4. Go beyond classroom**
Most importantly, there is certainly a mentality among our students that they are only doing things because "it is necessary for the exam" or "because my teacher told me to". That is sometimes the case and we can't get around it, but how sad if all of our teaching is reduced to that!

Linking our classroom learning to the real world can help students see the relevance of what they are learning. Likewise, bringing the world into our classrooms can be very motivating. This can, of course, include field trips and research projects that involve students in observation, interviews and sourcing for their own information, but these are very time-consuming and not feasible for our everyday teaching.

On an everyday basis, you can refer to where you got information that you are using in class (hopefully all of our information doesn't refer to the textbook!), comment on how it relates to something outside the classroom, and provide brief anecdotes about this applies to your own life. These connections to the world outside the class may be brief but they can capture the imaginations of learners.

What I've written so far are fairly general guidelines. I suspect you'd like more specific answers as well. So let me present the primary attributes for a good facilitator:

**Be a good observer**
Watch carefully to see how your students are responding, which students are responding, who is speaking and how they are doing things. Pay attention not only to the product but also to the process. Not only what they get done but how they are getting it done.

**Be a good listener**
This means you must listen not only to hear if students give you the answer you want but also to hear how they give their answers and in what ways they do or do not understand. Sometimes, this means pretending to not pay attention when in fact you are.

Try standing next to a group of students so that you are at an angle rather than "face on". Turn your eyes away but turn your ears toward your students. You can discover quite a bit about what your students are or are not learning by paying close attention to what happens while they are working.

Two simple but effective techniques to help you be a good observer and a good listener are:

> ***Come closer***
> Move away from the front of the class, away from the computer, and away from all of the other teacher paraphernalia. Get closer to where your students are working and find out what is going on. Put yourself at their eye level: kneel down or sit with them rather than always making them look up at you.
>
> I know one teacher who used to carry a big bucket to class. It was a container for his teaching supplies going to and from class, but during class he emptied it out, turned it upside down, and used it as a seat so he could sit with individuals or

groups while they were working!

***Move farther***
Sometimes, you can get a better idea of how students are working when you watch them from the back. Likewise, there is sometimes a tendency, especially during group work, for the teacher to hop from group to group, without pause, depending on who is loudest. In that case, you never get an overview of the class. It might be better to stop a moment, stand back, and look at what is going on throughout the class.

**Provide timely intervention**
This requires that you allow things to happen in class. Sometimes, this means letting students be temporarily confused rather than trying to ensure that everything goes exactly to (your) plan. As the facilitator, you intervene as and when needed. Intervention can include giving direct feedback to let students know they are on the wrong track, but it especially means asking and answering questions.

Asking questions can be particularly useful if they are open-ended questions which encourage thinking rather than questions that have only one right/wrong answer. Another very useful type of question is the one that "turns it back" to the students. Rather than answering immediately, you can ask if someone else in the group or in the class has an idea.

Timely intervention can also mean giving compliments which not only makes the students "feel good" but also lets them know they are meeting the lesson goals. In this case, positive reinforcement is not only motivating but it also has a classroom management function.

**Plan and prepare well**
Lastly, planning and preparing as a facilitator is essential. This means you must think about the learning activities and materials in new ways - not in terms of how you can "delivery" them - but in terms of how the students can appropriate them and what you need to do to help make that happen.

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