

This issue of CDTL Brief is the first of a two-part Brief that features the teaching practices of the 2004/2005 Annual Teaching Excellence Award (ATEA) winners.

Shy Teachers and Large Groups

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The immediate reaction of my dearest relatives and friends, upon being told that I had won a teaching award, was to impugn the integrity, reliability and objectivity of any selection process that could produce such a result. My relatives and friends know me to be a very shy person and they were most surprised that students could even hear me speak!

I will defer discussion on whether I am deserving of the teaching award. However, I do know that I have come a long way since my first lecture, which was done at breakneck speed with sweaty palms and a thudding heart. It was all over in half an hour and I had nothing to say for the rest of the session. Since then, I have gained more confidence in speaking in front of a large audience and learnt how to pace myself when I speak. I have also improved on other aspects of my teaching.

I shall discuss here how a shy person can handle a large lecture group of 40–60 students. However, I understand from a previous *CDTL Brief* article, Tan (2001), the definition of a ‘large group’ can vary from 10 to 400 students. Whatever the actual student figures may be, I hope the following three pointers on what is helpful to me may also be of help to any shy teacher who thinks her group is large.

a) Go in with the right frame of mind

When I was about to embark on my first lecture, someone trotted out a suggestion that I should, to take the edge off my fears, imagine all my audience with no clothes on. The suggestion presupposes that when I see my audience (mentally, of course) in a ridiculous state, I would lose my fear of them.

Now on hindsight, I think such a suggestion may actually start a person off on the wrong footing. The suggestion works on the premise of a ‘me vs. them’ attitude and an underlying assumption that a person can only feel confident by convincing herself that she is

‘superior’ than those she is confronting. However, such thoughts automatically put students (our audience) in an adversarial position.

Over the years, I have found that what actually helped me most is to see the students *as they really are*. That is, recognising that the audience is generally composed of well-disposed, well-meaning and bright people who are in the course for a variety of fairly ordinary reasons (e.g. they would like to learn something about the subject, they hope to earn a good grade). Usually, students are far less threatening and critical than a shy person embarking on her first lecture is apt to think. So, do not assume that students are waiting to pounce on our slightest mistake; or that they are ghouls preparing to feast on our misery. This is scarcely what is on students’ minds when they first come for classes.

b) Focus on students, not ourselves

When I teach, I try to put myself in students’ shoes and figure out what *is* on their minds. I find it helpful to focus on students’ needs and wants (the two, needless to say, do not always coincide) and concentrate on addressing these. For instance, students would, minimally, like to know what is going on in class. So if I see many blank looks while I am making a point, I will focus on trying to get the point across in such a way that more students can understand what I am trying to say. Diverting my energy to explaining a concept to students also helps to distract me from thinking what a disaster I must be as a teacher because I cannot even get a simple point across—a thought that is helpful neither to me nor my students. I find that in concentrating strictly on what needs to be done during my lectures, I soon forget about *how* I am doing and so, forget to feel nervous.

c) Bring along a ‘security blanket’ if necessary

Having the common shy person’s fear that I will suddenly blank out in front of a large group and forget

every fact that I had ever claimed to have expert knowledge of, I used to write out my lectures laboriously word for word. I am ashamed to admit that when I first started lecturing, I used to read verbatim from this prepared script. But having a written script as a 'security blanket' soon gave me the confidence to add a few extempore sentences of my own, then, ad-lib whole points and paragraphs and eventually, whole sections. I am now confident enough to shape the lecture, to a large extent, in the direction of students' interest and depend upon student interaction to structure its content. I still bring in my lecture notes as a sort of ritual, but there is now little correspondence between what is said in

class and what is written on those sheets. For shy and nervous teachers, I think it can be helpful to bring along a 'security blanket' to start with. But the teacher should be very clear that she is not going to wrap herself in it for the rest of her life.

To the other shy teachers out there—if I can lay claim to being a good teacher, so can you!

References

Tan, C.H. (2001) 'Keys to Effective Large-group Teaching', *CDTL Brief*, Vol. 4, No. 5, pp. 1–5, & p. 7. <http://www.cdtl.nus.edu.sg/brief/v4n5/default.htm> (Last accessed: 27 April 2006). ■

Education is not Education without Research

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In the NUS student feedback questionnaire given to students to assess their lecturers at the end of each semester, there is an evaluation item that invites students to evaluate whether "The teacher has helped [them] advance [their] research."

Many colleagues, especially those teaching lower-level undergraduate modules, do not pay much attention to this item on the questionnaire. The common response from these colleagues is "this is probably more relevant for graduate teaching, project work or honours-level modules."

I do not agree. In fact, I consider this evaluation item one of the key aspects of today's education. Research is not a monopoly of senior students; neither is it simply about looking for results to publish nor translating laboratory findings into new technologies. It is about having the enthusiasm to seek new knowledge and the courage to venture into the unknown. Scholars who do not have such a spirit are not scholars. Teachers who cannot nurture such scholars cannot be good teachers. A university that does not emphasise on such is not a great university.

Research is an intellectual activity that must be incorporated as part of education across all levels. One is never too young to engage in such activities. The elements of research—exploration, discovery and innovation are all essential in our quest for new knowledge.

At the primary and secondary school-level, many people often associate research with the project work

students do. However, when one probes further into these projects, there is often a great deal of 'reinventing the wheels'. These students are usually just following prescribed procedures and methods to look for something that has yet to be discovered. While the projects are useful academic exercises, they do not always reflect the excitement of doing real research. In chemistry, we would call the results from such projects 'derivative chemistry' (i.e. science that is new but not novel).

Teachers need to inculcate in students, an enthusiasm for new knowledge and the courage to venture into the unknown. A decent teacher introduces and delivers the subject well, and a good teacher is able to achieve the desired learning outcomes. However, a great teacher goes beyond transmitting knowledge and processes—he/she inspires student to live for new knowledge. For example, if a teacher takes his/her teaching materials entirely from standard textbooks and uses teaching methodologies recommended by standard teaching guidebooks, he/she can probably be a proficient teacher but not a great one. To be a great teacher, he/she first need to find a way to introduce to students 'fresh-from-the-oven' ideas not found in prescribed texts. He/she will also have to develop an intellectual atmosphere where students are excited about independent learning to inspire them to look for new ideas. Finally, he/she needs to cultivate in students an adventurous spirit to venture into 'uncharted waters'—something which very few teaching guidebooks talk about.

Research quenches one's intellectual thirst; the discovery of something novel is in itself a fulfilling exercise. Researchers are most creative, and hence most productive and the happiest when they are driven by their own curiosity; they feel free to go where they want to and do what excites them most. Thus, it is not surprising that almost every (good) researcher in science does not need any incentive to do research. Yet, I know of many who need institutional incentives to commit to teaching. Why is it so?

Teaching according to a prescribed model and a confined syllabus reduces teaching to an obligatory activity that merely checks items off a 'to do' list. Questions on whether such teachers can teach effectively aside, they probably need a lot of incentives to teach. However, I believe that when teaching follows the basic principles of research, it can be just as effective and fulfilling. In fact, the closer teaching is to research, the less incentive one needs. When teaching follows the basic principles of research, teaching becomes effective and fulfilling. Such teaching requires the teacher to be innovative and always on a lookout for new knowledge. When the teacher's enthusiasm is rubbed off on students, they respond positively by learning actively, making teaching a pleasurable activity that needs little or no institutional incentives. At this juncture, teaching and research are inseparable and fundamentally the same.

Some colleagues may contest that it is hard to teach research topics in lower-level undergraduate modules and hence, one cannot help to advance the principles of research with these students. But I think this is where they are wrong. These colleagues have mixed up the research process with the processing skills, confused

knowledge with ideas and underestimated the power of intellectual thirst. The desire to discover is fundamental to all forms of learning. Without such desire, learning will die out like a candle starved of oxygen. Teachers who cannot cultivate such a desire in their students must go back to their 'drawing board'.

When I first taught CM3212 "Transition Metal Chemistry" in Academic Year 2004/05, I did a few experiments with the class. My first experiment was to ask every student to design a new molecule and suggest a synthetic pathway for it—a typical demand for a top researcher in synthetic chemistry. I caused an uproar in class; many students never imagined they would be given such a high-level task. I journeyed with students through the processes, sharing the frustration and agony as we went along. Students could only appreciate what they had learnt at the end of the course. If this experiment sounded too challenging for students, my second one that asked the class to look for an innovation, conduct an interview with the inventor and explain the science behind the technology was even more demanding. It really stretched the students!

In this day and age where the speed of access to knowledge is limited by the processing power of computers or laptops, the determining step in staying ahead lies in one's analytical skills and knowledge processing abilities, and perhaps even more critically, the desire to seek new knowledge. Research aims to cultivate such a desire. Scholars are scholars because they have a desire for new ideas and the ability to harness their curiosity in their quest for new knowledge. Professors who are able to produce such scholars are great researchers and wonderful teachers. ■

Learning German Beyond the Classroom

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I consider myself very fortunate to be a German language teacher at NUS. My students hail from different countries, backgrounds and faculties. These differences, together with varied student motivation, interest and expectation, make the class vibrant and heterogeneous. However, in spite of the obvious differences, all students have one goal in common—they want to learn a new language and they want to learn more about the cultural background(s) of the German language.

German may not be a leading world language but the latest figures from the European Union show that

the number of students learning German as a foreign language is higher than 20 years ago and, in fact, German is the most taught second foreign language in more than one third of the European member states. German is therefore often called a language of encounter, and this is true not only in Europe.

Encounters with other speakers of the language—be it with native speakers, speakers of German as a second or foreign language or other learners—can be considered crucial to maintain a high level of motivation

among students learning the language. Apart from the German language teachers and some exchange students from German speaking countries, moments of authentic encounters are rather rare at NUS. Sources of information about all things German are generally available in the form of written text or recorded audio and video. But clearly, textbook knowledge and classroom experiences, as excellent as they might be, cannot compete with first-hand encounters.

The best way to offer first-hand encounters with the language is, of course, by complementing the already highly interactive and communicative German language classes with language immersion cum home stay programmes at a partner university in one of the German language speaking countries. Over the past decade, more and more students took part in such three- to four-week long programmes during the NUS term break (May to July) and in student exchange programmes. However, not all students can afford to go for such programmes and most can only go once during the course of their undergraduate studies.

A more widely accessible and certainly more affordable way to immerse students in the target language and culture is to organise encounters with native speakers and fellow learners of the language from different proficiency levels. Such contact opportunities will no doubt contribute positively to a holistic language learning experience for all. Although they cannot easily be integrated into classroom-based foreign language learning activities on a regular basis, all opportunities, when they present themselves, need to be carefully considered.

I would now like to introduce two examples of such opportunities for authentic encounters with the German language offered to students in the Academic Year 2005/2006, Semester 2: a Rhythm and Poetry (RAP) workshop for German language learners of all proficiency levels and a project on the BlindCycle Tour 2006 from Germany to Singapore.

The RAP-workshop¹ was conducted by artistes from Berlin with generous financial assistance from the Goethe-Institute Singapore. The workshop matched participants' interests and learning needs perfectly as participants were encouraged to write rhymes using basic to more advanced texts in German and to speak or sing the texts to a hip-hop beat.

Writing rhymes in a foreign language is not only a challenge for language learners of all proficiency levels,

1. This was the second RAP-workshop offered to students at NUS. More information on the RAP workshops is available at: <http://www.musicisthelanguage.de/13.0.html> (Last accessed: 15 August 2006).

it also enables learners to discover something new about the language and makes them more aware of the sound of the language. Moreover, it allows students to use the language freely and creatively without having to conform to the ever so important linguistic rules. During the workshop, the RAP-artistes would go around, listen to the texts, give feedback and provide support mostly in German. Next, students had to find a beat to match their texts and practise singing or speaking it with the correct pronunciation and in tune with the beat. This probably proved to be the most difficult but also the most fun and rewarding part of the workshop. At the end, the RAPs were recorded and will be presented to students on an audio CD.

The BlindCycle Tour 2005/2006 project² was not only learner-centred and task-based like the workshop, but also very much process-oriented. Students taking LAG4202 "German 6" learnt about the tour from a German newspaper article that was read in class. At that point in time, the tour was already approaching Malaysia and reaching Singapore soon.

The eight students agreed spontaneously to make a report on this extraordinary tour as their project topic and set off immediately to divide tasks and responsibilities according to each team member's strengths. Students soon managed to contact the leader of the tour via email, developed a number of interview questions, planned a meeting with the cyclists and even contacted the editor of *Impulse* (a magazine for the German speaking community in Singapore) to ask if the magazine would be interested in an article about such an extraordinary tour.

At the end of the project, the group was extremely proud of their achievement—a beautiful presentation, a video interview and a published article in a German magazine. More importantly, the project presented opportunities for a group of NUS students (from Singapore and Indonesia) to use the German language to communicate with native German speakers for a very authentic purpose! And, who knows, maybe one or two of them will accompany Sebastian Burger and his team on their next cycling tour through China.

Through the various encounters with German speakers as illustrated above, German has become truly a language of encounter, in the classroom at NUS and beyond. ■

2. Students' project presentation, video interview and magazine article on the 'BlindCycle-Tour 2005/2006' are available at: http://courseware.nus.edu.sg/e%2Ddaff/rmn/LAG4202/LAG4202_AY0506_SemII/Interviewseite.htm (Last accessed: 15 August 2006).

My Teaching Philosophy and Approach: Connecting Teaching with the Real World

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Introduction

When I returned to NUS after completing my PhD in 1998, I was asked to teach a fairly demanding final year module, BU4102 “Integrated Construction Technology”. The module required students to integrate what they had previously learnt in areas such as building performance and evaluation, trends in office building evolution, construction technology as well as building systems integration. I was full of enthusiasm; I wanted to impart my knowledge to students. Thus, I tried my best to show students the most advanced building technologies/systems I had learnt in the U.S. and the best building practices I came across in my course of learning. However, when I received my teaching feedback at the end of Semester 1 Academic Year 1998/1999, it was like a bombshell to me. Students’ feedback was very negative and I was ranked in the 28.6% percentile. I consoled myself with the fact that it was my first time teaching such a challenging module and students were perhaps, not used to my style of teaching.

However, in the following year (Academic Year 1999/2000), my teaching feedback for the same module became worse. Not only did I continue to receive negative comments from students, my ranking also dipped to the 16.7% percentile. I was very discouraged. Nevertheless, I decided to take a closer look at what went wrong with my teaching by examining students’ comments closely and talking with some students. From these sources of feedback, I realised that students were having difficulties trying to relate what I had taught them to the real world. Students also complained that my mindset was inflexible and rigid, and unwilling to accept their views.

I decided to change. In my lectures, I started to connect what I was teaching with the real world by showing students relevant newspaper articles. In addition, I showed students information I gathered for my research/industry projects. During discussion sessions, I also tried to keep an open mind and be receptive to students’ views and opinions while encouraging them to think critically and independently at the same time. To my surprise, in Academic Year 2000/2001, my teaching

evaluation for the same module improved tremendously and I was ranked in the 88.9% percentile. Since then, students’ feedback on my teaching has been positive. I also received the Annual Teaching Excellence Awards in 2002, 2004 and 2005.

My teaching philosophy

After having taught in NUS for the past seven years, my teaching philosophy can be summed up by the following three principles:

a) *Be relevant*

Being a teaching faculty in the Department of Building, I am responsible for training students to become professionals in the building industry. As such, students must be imparted with knowledge applicable to their jobs after graduation. I also constantly remind students that technologies are constantly changing and they must keep abreast with the latest building technologies/systems available. I frequently look out for newspaper and journal articles as well as relevant information from the Internet to supplement my teaching.

b) *Be passionate*

Having a passion for the subject is important. When students sense the teacher’s enthusiasm and passion in sharing information with them, it will stimulate them to learn. Though I always try to ensure that my students understand what I am teaching, I make sure that they do not become over-dependent on me. My teaching approach is to first establish that students have understood the concepts well as I believe a good grounding in the fundamentals is helpful in facilitating learning and motivating students to think critically and independently.

c) *Be versatile*

I always believe that a teacher needs to be versatile and be willing to take on modules that may be new to him/her. Over the past seven years, I have been involved in teaching both graduate and undergraduate (full- and part-time) modules. The

subject matter in these modules include construction and maintenance technology, building performance, energy management and computer simulation. I employ a variety of techniques in my teaching. For example, besides lectures and tutorials, I use the problem-based approach by asking students to conduct field studies through a series of field measurements and surveys. I also include state-of-the-art computer simulation to help students conduct parametric studies.

Conclusion

Being a teacher, I strongly believe that teaching is more than just imparting knowledge or skills to students. Teaching is about knowing how students learn, facilitating their learning and motivating them in the learning process. Teaching is also about preparing students for the industry. So, it is essential that we connect what we teach to the real world. ■

Desire is the Root to All Learning— Light My Fire!

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I enjoy teaching, I admire human curiosity and I love medicine. I teach not only because I am passionate about the science in medicine, but also because I want to share the knowledge with anyone who wants to understand and master it.

Early in my career as a doctor, I realised that doctors spend half our lives learning our profession by practising it and participating in an extensive programme of continuing medical education and practice. Thus, we owe it to society to spend the second half of our lives advancing the collective understanding of human diseases.

Advancing medical knowledge through research is complex. On the one hand, we need to enhance our basic understanding of disease biology, on the other, we need to ensure that this new knowledge is translated appropriately into technology that benefits patients. For each disease, we need a constant influx of young researchers who want to study about the disease, and young doctors who can simultaneously translate this research into diagnostic and therapeutic modalities for better patient health.

My students comprise A-level and polytechnic students, science and medical undergraduates, clinical postgraduates, doctoral students, postdoctoral fellows and practising consultant clinicians—all playing critical roles in the healthcare industry.

In order to improve my presentation and delivery skills when I first started teaching, I attended innumerable symposia and workshops on audiovisual aids, adult

learning, tone, pitch and delivery, but with little if any, impact on my teaching. It was then that I realised students will not be motivated to learn if they do not have the drive. Thus, instead of using a didactic approach to teaching, I focus on igniting students' desire for knowledge and keeping that quest for knowledge alive in them throughout the course. This has been my teaching strategy since.

Today, I only give didactic lectures occasionally or when specifically invited. At other times, I dedicate my first lecture entirely to inspiring my students to learn and give their best. I help students identify not only what I expect them to learn in the given time, but more importantly, why they need to learn it. That personal drive to learn created by such a lecture ensures focus, creates in students a thirst for knowledge and a better understanding of the subject, and generates enough momentum to keep students going throughout the course. Once students take off on a self-driven quest for knowledge, I review their progress at pre-defined intervals to ensure students are on the right track. Students do all the hard work and their rewards are knowledge, self-efficacy in learning and self-confidence.

As an educator of medicine, moulding young minds and inspiring in students a thirst for knowledge and a quest to better the medicine of our time is rewarding. Some of my students have gone on to pursue careers as scientists, doctors as well as academics, carrying with them the desire to inspire others and better the human condition. ■

Content Reduction vs. Independent Learning

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In Chemical Engineering, the general approach is to prepare students for careers in i) design ii) process engineering and iii) R & D. In order to be competent, modern day chemical engineers, students need to have i) a good grasp of the fundamental physico-chemical principles and ii) the ability to see the links among them. Mathematics comes into play when these principles are applied to process design. Generally, students do well when it comes to applying the principles to standard, repetitive situations. However, students lack the ability to link and apply the principles to non-textbook (novel) problems.

The above scenario is analogous to teaching basic mathematical operations to school children first and then asking them to solve math word problems. Most children will do very well in questions dealing with basic symbolic operations (category I questions). The children will also be comfortable if the word problems appear at the end of each chapter on a symbolic operation, because they will know which operation is involved (category II questions). The true test of understanding begins when the children are given exercises on word problems taken from different chapters (category III questions). The ultimate challenge for the children would be to ask them to solve word problems that involve the use of multiple dissimilar operations (category IV questions).

At the end of the day, in most of the process-based engineering modules, students should be able to apply the principles covered in the respective modules. In general, the tutorial problems fall under category I questions, quizzes can be classified as category II questions and the exam questions are category III questions (at best). We hardly challenge students with category IV questions to avoid causing a potential disaster.

An example of a question I had set in a postgraduate examination paper is given in Figure 1. A good answer to the question should address the following issues:

- i) What is the controlling resistance?
- ii) If the controlling resistance is on liquid side and the patented solution introduces reaction with absorbed carbon dioxide, then it is possible that the column height will be reduced.

- iii) The claim that the patented solution will give the smallest column height needs further investigation.

The following physical parameters are applicable for absorption of CO₂ in water from its mixture with N₂ (50%) and H₂ (45%) in a packed column. The gas stream is at 20 °C and 5 atm pressure.

Liquid side mass transfer coefficient, $k_L a = 1.67 \times 10^{-3} \text{ gmol/cm}^3\text{-s}$
Gas side mass transfer coefficient, $k_G a = 4 \times 10^{-5} \text{ gmol/cm}^3\text{-s}$
Distribution coefficient of CO₂ between gas and water, $H = 4400$ (mole fraction ratio)

Your company has hired a consultant to design and build an absorption column that will reduce CO₂ at the exit to 0.5 % of inlet value. The consultant has recommended a patented solution as absorbent in place of pure water. It has been claimed that the height of the column will be the smallest if the patented solution is used. Do you agree with the recommendation of the consultant? Why?

Figure 1. An example of a question from a postgraduate examination paper (Semester I, Academic Year 2002/2003).

Less than ten students (out of 116) came close a good answer. The students would have been very comfortable if I had asked:

- i) What is the controlling resistance?
- ii) What can you do to reduce the resistance on the liquid side?

One common criticism encountered in NUS is that there is a general tendency among lecturers to overload students with information. Thus, they are left with no time (and space) to learn independently and think critically. Undeniably, space creation is necessary if we want to encourage independent and critical thinking in our students. However, does space creation mean a mere reduction in students' workload in good faith that independent learning and critical thinking will follow spontaneously?

Let us examine an example. Recently, the Department's third-year laboratory module (CN3108 "Chemical Engineering Process Lab II") was reorganised following the practices in similar laboratory module in two top US chemical engineering departments. Students now spend two days on each experiment instead of one day per experiment prior to the reorganisation. It was expected that students will utilise the extra time to do more critical thinking and independent learning. In reality, did the extra time given bring about any noticeable qualitative changes in students? Based on my personal experience, the answer is not an enthusiastic 'yes'. I had to spend over one hour with each group to ask questions and (through these questions) guide students on how they could make use of the extra time to improve the experiment and

apply the relevant theories covered in lectures to analyse the results meaningfully. The less serious students were, of course, lost. But those who learned the relevant module well could recall the theories I referred to. What students (including top students) could not do was to make the 'connection' on their own. I call this the first step in independent thinking and critical learning. This is just one example, but I think it is a good one to take my point seriously.

We often tend to forget that students have undergone 12 years of schooling, which left a profound influence on how students approach learning and perceive education, before coming to the university. It must not be overlooked that university cannot undo twelve years of grooming in an examination-oriented environment where the ownership of learning was never with the students. When Prime Minister Lee in his first National Day Rally speech said, "We've got to teach less to our students so that they will learn more"¹, he did not say that with reference to the university education; he said that about the education in schools and junior colleges. I thought that was a profound statement and a move in the right direction. Prime Minister Lee recognised that teaching less must go hand in hand with creating an environment where the created space is filled with alternative activities that promote independent learning and critical thinking. He also recognised that sustaining such an environment can be demanding on teachers and that is why he promised to increase the number of teaching positions for the schools and junior colleges in the coming years.

I am not in any way trying to say that NUS should wait until the new waves generated at the schools reach the university. My point is that independent learning critical thinking cannot be forced upon students—it should be a spontaneous part of their upbringing and their everyday environment. Without such induction, any extra space created will be wasted by the majority.

Hence, any move to reduce classroom teaching or other tangible workloads to create meaningful learning space for students must be supplemented by alternative strategies to ensure an environment conducive to independent learning. We must then dispel the notion of equating reduced classroom teaching to a reduction in teaching load. In fact, developing innovative ways and means of promoting independent learning and critical thinking are much more time consuming than the demands of conventional pedagogy. In addition, large classes can further increase the demand for time and resources necessary to implement even tested pedagogical strategies to promote independent learning and critical thinking. Therefore, we must address these issues adequately before launching the next round of content reduction. ■

1. Prime Minister Lee Hsien Loong's National Day Rally 2004 Speech, "Our Future of Opportunity and Promise". Delivered on Sunday, 22 August 2004, at the University Cultural Centre, National University of Singapore. <http://www.gov.sg/nd/ND04.htm> (Last accessed: 22 August 2006).



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