

**Nurturing the Talent of Tomorrow:  
Global Education for a Globalised World**

**Tsinghua Global Vision Lecture  
delivered by Prof Tan Chorh Chuan  
President, National University of Singapore  
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Good afternoon.

The topic I have been asked to address today relates to the role that global universities can and should play to nurture students who will succeed in the globalised world, and who will make major contributions to society.

**“The empires of the future are the empires of the mind”**

I start with this memorable quote from Winston Churchill. In a speech at Harvard University in 1943, he said: “The empires of the future are the empires of the mind.”

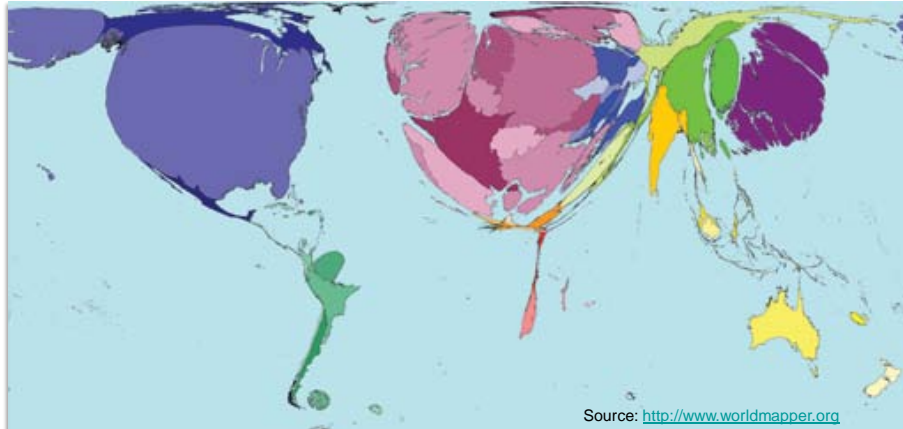
His words, spoken in a different time and context, are still highly relevant to us. Today, it is widely recognised that the ability to create important new knowledge and apply it in the global arena is crucial for the advancement of societies and individuals.

The rapid and fundamental changes which the world has experienced in recent years has been driven largely by the process of globalisation. Globalisation has resulted in an unprecedented degree of integration and interconnectedness between economies, societies and individuals, as well as rapid flows of information, capital, goods and people across national boundaries. Our world is also changing rapidly because of the increasing impact of knowledge societies and economies. These knowledge societies generate novel ideas which become new technologies, products and services, many of which are adopted across the world and have a “game-changing” influence.

The recognition of the value of knowledge creation is reflected in the substantial increases in R&D expenditure, particularly in Asia. Historically, the largest R&D expenditures have been in the industrialised countries particularly the US, Europe and Japan. Correspondingly, these regions contribute the greatest share to the world’s scientific output as reflected, for example, in the number of papers published, citations and patents. But this situation is changing quickly. The rate of increase in scientific

output is rising fastest in Asia (outside of Japan) and particularly in China. We should expect that this will help further accelerate the dramatic economic growth which Asia, and especially China, has been making in the past decade.

## Science & tech research\*



\* Scientific papers cover physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering, technology, and earth and space sciences.

The question is: What does this mean for students, and for universities?

### Global universities

Many universities have responded positively to these changes and trends by pursuing strategies to become more “global”. A wide range of interesting initiatives and programmes have been launched by institutions across the world, and these have enriched the higher education landscape and provided high-quality educational options for students.

However, key questions remain: What does it mean to be a “global” university? How is a “global” university different, and better, than one that is not? What is the unique value proposition of a “global” university?

These questions can be approached in a number of ways but I believe that there are at least seven general characteristics that should be integral aspects of a global university.

First, the vision and aspirations of the institution must be global. This is not as self-evident as it may appear. Innovation and extension of educational and research

programmes beyond the boundaries of individual institutions and countries is, correctly, a critical dimension of the vision of the global university. In some cases, the establishment of overseas campuses and facilities increase access and choices for prospective students in those locations and facilitate high-impact research. Looking beyond these, however, we need to consider the distinctive value propositions that global universities can further provide. For example, global universities, working with others in research, education and thought-leadership, can make important contributions to addressing some of the most critical issues and challenges that we face today. For national universities, such as NUS, we believe that we can bring greatest value to Singapore by being a global university, as an active player and leader in key international academic alliances and initiatives.

Second, global universities recruit from across the world for the best students, faculty and administrators. This is necessary in order to contribute and to compete effectively on the world arena.

Third, global universities should lead in innovating education that is adapted for, and capitalises upon unique opportunities in, the globalised world.

Fourth, these universities are research-intensive because the creation of important new knowledge must necessarily precede its dissemination and application.

Fifth, universities which are global would pursue, and contribute to, international benchmarks in education, in research, in service, and best practices. In this regard, global universities should endeavour to innovate new models of education, research and service that could serve as exemplars for others.

Sixth, they would be key nodes in influential global networks, be it academic networks or consortia type of arrangements with academic institutions and industry.

Finally, they would also contribute towards thought-leadership on global issues.

### **NUS – a global university centred in Asia**

Since I became the President of NUS, we have evolved this concept further by positioning the vision of NUS, not just as a global university, but one that is a global university centred in Asia. In doing so, we recognise the continuing and very rapid and profound rise of Asia on the world stage.

In this vision, NUS aspires to be a leading global university, which also has special expertise, insights and partnerships within Asia. The students within NUS would have a strong appreciation of issues of global importance while incorporating relevant perspectives from Asia. The university would also endeavour to exercise significant thought-leadership in issues of greatest relevance to Asia.

## **Nurturing the Talent of Tomorrow: Global Education for a Globalised World**

I turn now to the main theme of my lecture. I have been asked to share some of the philosophy and approaches of NUS in nurturing talent, particularly in science and engineering, and to address the question of how university students can best prepare themselves to meet the challenges as well as to seize opportunities in a globalised world.

As there are many students in the audience today, I would like to address this by trying to answer this question: “What should you be prepared for after you graduate?”

There are many things that you have to be prepared for after you graduate, but there are two particularly important shifts worth highlighting.

### ***“A lifetime of careers” and not “a career for life”***

In the past, many graduates would have a career for life, or at most, they would work in 3 or 4 jobs during their lifetime. This has changed. Many graduates will instead have to be prepared for a “*lifetime of careers*”. For example, the US Department of Labour reported in 2008 that the average college graduate will have held 10.8 jobs by age of 42. Nearly two-thirds of these jobs were held before age 27.

It should also be expected that some of the jobs our graduates will take in the future will be in completely different fields from what they were initially trained in. When we carried out a survey of new NUS graduates in 2008, 41.3% reported that their current jobs were not directly related to their course of study.

In fact, science and technology are changing so fast, that some of the most in-demand jobs in the future may not even exist today. I had the privilege of attending a very interesting lecture by Dr Charles Vest, President-Emeritus of MIT, in Singapore last week. Dr Vest said that if we ask the brightest young Engineering students and graduates what the frontier technologies of tomorrow are, most would reply “Bio, Nano, Info”. This is indeed true, but a very important point which Dr Vest made is that Bio,

Nano and Info deal with “Tiny Systems” whereas the most pressing problems of the world today, namely health, energy, environment, logistics and communications need “Large-scale Systems” to solve them. Furthermore, these areas would need to rely not just on physical sciences and engineering, but to a much greater extent, on social sciences research as well.

These considerations raise a very interesting and challenging problem: How do you prepare graduates who will be effective in many possible areas of work, often in different sectors, and for jobs that may not even exist today?

Before we go into this, I would like you to answer a little quiz. The three pictures below show 3 research laboratories: one is in the US, one is in China and one in Singapore. I would like you to tell me, which of these labs are in which countries.



A.



B.



C.

*\*Photo of Tsinghua’s laboratory by the National Science Foundation & the University of California, Riverside; photo of Cornell’s greenhouse by Cornell University. Both images reproduced with kind permission.*

It turns out that “A” is a lab in Tsinghua in China, “B” is a lab in NUS in Singapore, and “C” is a lab in Cornell in the US. The point is that our graduates should expect that whether they are in Tsinghua, Singapore or the US, they will be working with many people from many different nationalities and cultures.

### ***Education for global settings***

The little quiz highlights the second really important thing students must be prepared for after they graduate. That is, graduates must appreciate and be able to work and live effectively in diverse cross-cultural settings. In other words, in university, the education must be for “global settings” and not only for “local settings”.

### **Perspectives from NUS: Preparing graduates for a globalised world**

With this as a backdrop, I would like to share some perspectives from NUS on how we endeavour to prepare graduates to be successful in a “lifetime of careers”, even for jobs which may not have been created yet, and at the same time, to be effective in diverse cultural settings in a globalised world. The NUS approach focuses on key qualities that we would like to help our graduates nurture during their time in university.

### ***Critical thinking***

The first is “critical thinking”. There are many dimensions to critical thinking, but there are three worth highlighting. I would rate the most important one as the ability to look at an issue or problem and think about it very differently. This often leads to a fresh way of framing the issue, thereby opening up the possibility of radically new solutions. Given the explosive increase in knowledge, it is also crucial to “learn how to learn”, across disciplines and long-term throughout the graduate’s career. This is particularly important when you think about a graduate who may move through different sectors, say finance, to a technology-related area and then into a managerial position. To do this effectively, the university must provide a broad-based education so that graduates will have sufficient familiarity across a range of disciplines, while developing a strong foundation in their major areas of study.

### ***Responsible Global citizens***

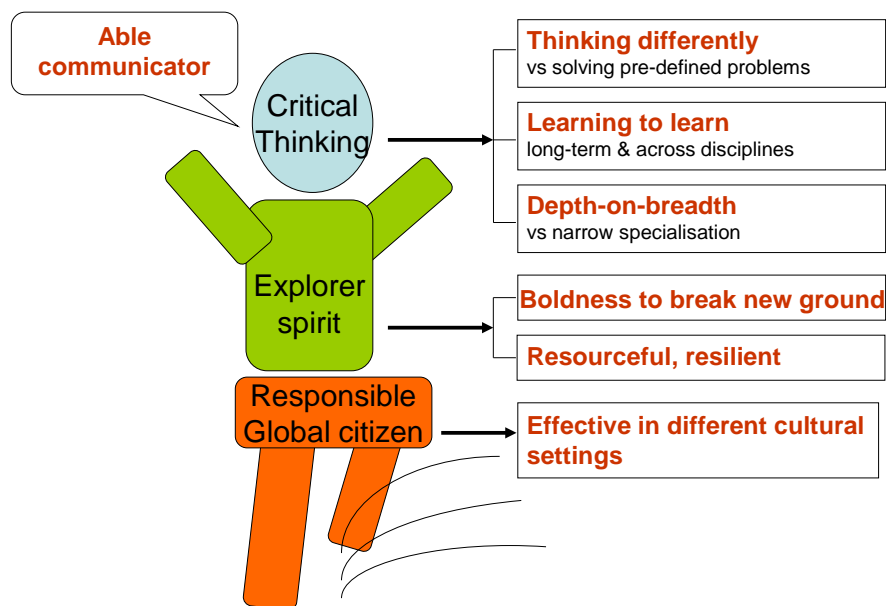
Second, to nurture responsible global citizens, that is, graduates who are able to appreciate cross-cultural differences and be effective in diverse settings. At the same time, it is important that our graduates become responsible and constructive members of society.

## ***The Explorer spirit***

Third, the success of our graduates will depend not just on their academic abilities but equally on their personal qualities. NUS seeks to imbue our students with the Spirit of the Explorer: the willingness and the boldness to break new ground, to try new things, take some risks, and at the same time to be resourceful, and to be resilient to the challenges and setbacks they will face along the way.

## ***Able communicator***

Fourth, being able to communicate well and clearly. Speaking and writing well are founded on clarity of thinking, and these are all core skills that our graduates must possess if they are to make a difference. At NUS, we also emphasise fluency in English, as this is the language used for business, research and work in many parts of the world.



## **NUS' approach**

How does NUS go about nurturing these qualities in our students?

At the heart of it, we aim to attract bright young people and excite them with the thrill of discovery.

## ***Critical thinking***

To nurture critical thinking, we use pedagogies that centre around inquiry and discovery, and provide a very broad-based and flexible education. For the latter, about 25% of the courses which the typical NUS undergraduate would take are general modules on subjects outside his or her major.

## ***Problem-based learning***

To illustrate, let me touch on problem-based learning which was introduced in the NUS Yong Loo Lin School of Medicine since 1999, and more recently, as team-based learning, in the Duke-NUS Graduate Medical School since 2006.

The traditional approach to medical education – and this still applies in some other disciplines including engineering – is that the student first has to learn vast tracts of basic science, only after which, the student is meaningfully introduced to how this knowledge can be applied to practical issues and problems.

There are several problems with this approach but the most serious one is the risk of killing the students' interest in the basic science foundations of the discipline. To address this, NUS introduced problem-based learning in several of its courses. In medical school, problem-based learning comprises about 25% of curriculum time and makes use of clinical-based scenarios which teams of students work together on from the beginning of the course.

Let me give a quick example to illustrate.

Imagine that this is your first month in medical school. You would not have learnt much of the basic sciences like anatomy, biology and physiology, but your team of students is given a case to look at, that might go as follows:

A woman and her son think they are obese. The case scenario challenges the student team to explore what obesity is, how it is defined and classified medically and the implications of these classifications. In the case scenario, the woman adopts a high-protein diet and loses weight. The students have to work out how and why this happened. In order to do this, they need to look for additional information involving nutrition, biochemistry and physiology. The case scenario continues with the son taking thyroxine tablets and losing weight as well. The question for the students is why thyroxine should lead to weight loss, a question which requires knowledge of physiology and pharmacology.



The real value of problem-based learning, in my view, is that it stimulates the students' interest in the basic medical sciences by presenting a real-life set of questions and issues, where they have very little background knowledge. The students learn how to identify the key issues and questions, and read the relevant basic science subjects with keener interest, and in the process appreciate the value of basic science in clinical medicine.

Research- and inquiry-based curricula

To achieve a similar objective, the NUS Faculty of Engineering is introducing a new design-centric curriculum which is being phased in from July 2009. In the new curriculum, students work in teams on design projects and modules, and the basic engineering and science courses are built around these. The design projects that students can choose from are in three broad themes, which are also major research thrusts for the faculty: future transportation systems, engineering in medicine and smart cities. To mention one example, students in Mechanical Engineering have been involved in building their own formula one race cars for 8 years. This year, they did well in the Formula Society of Automotive Engineering (FSAE) competition, emerging with the rank of 19th overall. For the second year in a row, another team of engineering students built an eco-car – an energy-efficient car – from scratch, securing fifth place in the Shell Eco-marathon. With the new design-centric Engineering curriculum, the students will not just carry out such research projects but will also have their courses built around the project so that they can experience the thrill of applying sophisticated basic knowledge to an exciting practical problem.



← NUS FSAE 2009 Car  
(ranked 19<sup>th</sup>)

NUS Eco Car 2009 →  
(Ranked 5<sup>th</sup>)



## ***Responsible Global citizen***

I would like to move on to the ways in which NUS endeavours to nurture responsible global citizens.

We do this by “bringing the world to NUS”, and “bringing NUS students to the world”.

In bringing the world to NUS, we have consciously created a very diverse environment on the NUS campus in Singapore. 20% of our undergraduate students, and 70% of our graduate students come from overseas, as do 50% of our professors. They come from more than 100 countries.

At the same time we have many joint degree programmes which are run out of Singapore. For example, the Duke-NUS Graduate Medical School enables students to obtain a joint degree from Duke University as well as NUS. We have joint research programmes where students can obtain a Masters degree from MIT and NUS; and a dual Masters degree between Georgia Tech and NUS in logistics. There are, hence, many opportunities for our students to engage in programmes run with overseas partner universities while studying at NUS.

NUS also has a very active student exchange programme, with more than 1,200 exchange students from overseas from all parts of the world coming to NUS each year. They add greatly to the diversity of the student community and help create a global learning environment within the NUS campus in Singapore.

In parallel with this, we also bring NUS students to the world. We have a very active study abroad programme: 50% of our undergraduates will have some overseas education exposure, and 20% will spend 6 months or more in exchange programmes around the world. In addition, we have 66 joint and double-degree programmes with top universities around the world. Many of these involve students spending significant time in these overseas universities. Students get the benefit of accessing high-quality courses in some of the best universities overseas while obtaining a rich overseas cultural immersion.

## ***Spirit of the Explorer***

NUS has also taken many measures to try to nurture among our students the Spirit of the Explorer: the willingness to take risks, to break new ground, to be resourceful and resilient. These attributes cannot be taught in a classroom; instead, they need to be learnt experientially, outside the classroom. Our university, as I am sure Tsinghua

University does, provides many opportunities for students to try things out, to challenge them to move out of their comfort zone, and to surprise themselves by doing things they did not think they were capable of achieving. In this respect, the NUS Overseas College programme is our flagship programme in experiential education.

### NUS Overseas Colleges

The NUS Overseas Colleges immerse NUS students in the most entrepreneurial hubs in the world. Students who are selected spend one year in these hubs, working as full-time interns in high-tech start-ups or innovative companies. These are carefully chosen to provide students opportunities to learn directly from the founders and entrepreneurs in these start-ups. At the same time the students take entrepreneurship-related or discipline-based courses at NUS partner universities at these overseas locations.

There are currently six NUS Overseas Colleges. The first NOC which was started in Silicon Valley, is mainly focused on technology start-ups with students take courses from Stanford University. The other NOCs are in Philadelphia with UPenn; in Shanghai with Fudan University; in Stockholm with the KTH Royal Institute of Technology; and in Bangalore with the Indian Institute of Science.

## Six NUS Overseas College (NOC)

### *NOC in Silicon Valley (2002)*

- Courses in Stanford
- Focus on tech startups in Silicon Valley

### *NOC in Philadelphia (2003)*

- Courses in UPenn
- Focus on bio/med tech

### *NOC in Shanghai (2004)*

- Courses at Fudan University
- Focus on China-related business

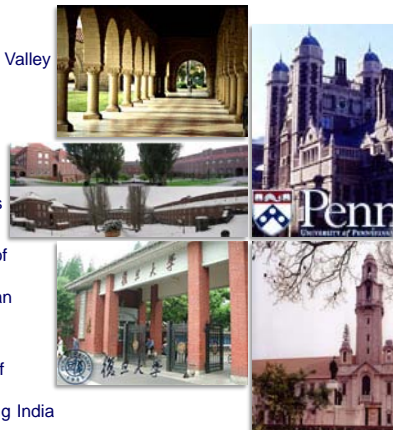
### *NOC in Stockholm (2005)*

- Courses at KTH Royal Institute of Technology
- Focus on mobile/IT with European perspective

### *NOC in Bangalore (2008)*

- Courses at the Indian Institute of Science
- Focus on understanding/engaging India

### *NOC in Beijing (2009)*



This year, we have started an NOC college in Beijing and we are honoured to be partnering Tsinghua University in this very exciting programme. The first batch of NUS students in NOC Beijing will be starting in July 2009. They will do internships in technology and innovative start-ups in Beijing. At the same time, they will take

entrepreneurship-related courses at the Tsinghua School of Economics and Management.

The NOC programme, though new, is showing promising results. The students who have gone through this programme have described it as “life-transforming”. NOC alumni have started up 33 companies, while others have collaborated with their host companies to set up branches in Singapore.

### **Path-finding programmes**

Moving ahead, NUS is focusing on three programmes which we feel represent potentially path-finding initiatives in global education.

#### ***NUS Global Engineering Programme***

The first is the launch of the NUS Global Engineering Programme in August 2009. This programme is built around the new design-centric curriculum but it allows the very best students to accelerate their studies so that they can finish the entire Bachelor of Engineering course at NUS in three years, including one year spent overseas. They are able to do this because the programme has great flexibility, with Advanced Placement Credits as well as Independent Study Modules. In the one-year overseas component, they can choose to pursue a specially tailored Undergraduate Research Opportunities Programme with one of NUS’ partner universities.

After the GEP students have finished the 3-year Bachelor of Engineering course, they can, with credit recognition, go on to do a Masters programme in either Cambridge University or MIT in their fourth year. So at the end of four years, the student will have obtained a Bachelor of Engineering degree from NUS, and a Masters from either Cambridge University or MIT. For those selected for the Global Engineering Programme, NUS will be providing full scholarships for the Bachelor of Engineering course at NUS, and financial support for the graduate studies in Cambridge University or MIT under this programme.

#### ***NUS Graduate School for Integrative Sciences & Engineering***

The second, very important, programme is the NUS Graduate School for Integrative Sciences & Engineering (NGS). NGS, which was set up in 2001, is special for a few reasons. NGS is highly selective in the students admitted and NGS faculty are selected from among the best professors in NUS who are also working in multidisciplinary

research. The coursework is personalised and flexible. The research supervision is generally cross-disciplinary, so that students will typically have supervisors from more than one discipline working together on multidisciplinary projects. This is very important as NGS endeavours to educate students for the future who are able to work well in multidisciplinary programmes and environments.

NGS provides very competitive scholarships for the duration of the PhD programme. In addition, students can also compete for a number of global 2+2 opportunities. Students who are selected for the 2+2 programme will spend 2 years in NUS and 2 years in a partner university overseas, while pursuing their NUS PhD. During the two years that they are overseas, NUS will supplement the students' stipends to make it affordable for them.

The most important determinant of quality graduate education is the quality of the faculty and research. In the past two years, NUS has competed successfully for funding to establish three Research Centres of Excellence in Quantum Technologies, led by Prof Artur Ekert, originally from Cambridge University; in Cancer, led by Prof Daniel Tenen who was previously from Harvard University; and in Mechanobiology, led by Prof Michael Sheetz and Prof Paul Matsudaira who were previously in Columbia University and MIT respectively. These Research Centres will provide a very rich and stimulating learning environment for our graduate students.

## Graduate education built on research excellence



Centre for Quantum Technologies, headed by Prof Arthur Ekert

Mechanobiology RCE, headed by Prof Michael Sheetz (centre) & Prof Paul Matsudaira (right)

Cancer RCE, headed by Prof Daniel Tenen

The attention that NUS is placing on quality graduate education is bearing fruit, as reflected for example by the fact that eight students from China pursuing graduate studies in NUS won the prestigious National Excellent Overseas Graduate Award 2008 awarded by the China Scholarship Council. NUS, with 8 award winners, had the most winners among the list of participating universities.

### ***NUS University Town***

Finally, the programme which we are most excited about is the new NUS University Town. Work is in progress to develop five residential colleges for undergraduate students, a graduate student residence, an Educational Resource Centre and an Edusports complex by 2013, with the first phase scheduled for completion in 2011. Just across the road from the main NUS campus, University Town will house, when fully developed, about 4,500 students.

## **NUS University Town**



A distinctive feature of the University Town will be its rich diversity. The student community will comprise about 60% local students and 40% international students from the four corners of the world. The students will come from all disciplines, in Science, Technology, Arts, Humanities and Social Sciences. Uniquely, University Town will have programmes that will foster close interactions between graduate and undergraduate students.

University Town will transform undergraduate education in NUS by providing Residential College learning. The undergraduate students staying in the residential colleges will take a number of modules together in their Colleges, including freshmen seminars, senior seminars as well as special programmes. Taking advantage of the very diverse student population, the special programmes will have students working in small groups to explore issues of global importance while drawing on relevant Asian perspectives. There will also be many opportunities for students to interact with top scientists in University Town, as well as to pursue Undergraduate Research Opportunities with them.

## **Conclusion**

Globalisation and the rising impact of knowledge societies are changing the world fundamentally, creating many challenges as well as exciting opportunities in higher education.

Global universities can play an important role in the evolving landscape, in particular by providing what I would term “transformative global education”, that nurtures graduates who are well prepared to succeed and contribute in a complex globalised world.

This lecture has attempted to outline NUS’ thinking and approach in relation to nurturing thinking graduates, who are responsible global citizens, who have the explorer spirit and are able communicators.

Notwithstanding the current global financial crisis and economic downturn, students and young graduates have much to be optimistic about. Despite the challenges, there are also many rich possibilities for bright young women and men to make a real impact. The future is therefore bright, particularly for those who take full advantage of global education opportunities and who set out to boldly “seize the day”.

Thank you.