**Liberal Arts Education in the Age of STEM**

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Liberal Arts Education in an Asian context: Achievements, challenges and perspectives

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**[title slide]**

Thank you. Congratulations to Lingnan University on its 50th anniversary. And congratulations to all members of the Alliance of Asian Liberal Arts Universities.

Colleagues, it is a great honour to speak with you today, on this topic, in this place and at this crucial time. A time when there has been a forking of the path between the global East and global West.

**[contents slide]**

North America and Europe, shaken by economic globalisation and migration and the fall-out from growing income inequality, are struggling to retain workable and legitimate political systems, and to maintain open societies and the Enlightenment regime of rational public discourse founded on an ethics of truth. Science has become a political target in the United States. Universities fear restrictions on the inward mobility of faculty and students and a populist backlash in which they are stigmatised as both globally cosmopolitan and socially elite, which are seen as being the same thing. East Asia, regardless of the political system shares the challenge of maintaining societies that are stable and open, internally and externally, at a time when a more bounded form of nationalism is gaining ground. However, the state of universities in the East remains positive. China continues its amazing rise in the economy, and in science and higher education. Higher education will be twice boosted by the Double World-class project and One Belt One Road. Universities are also flourishing in Singapore, especially, and South Korea, and remain strong in Japan and Taiwan despite underfunding and the administrative burdens of corporatisation.

 What I want to do today is begin with the not fully satisfactory place of liberal arts and science education in the present, and then move to the possible future. I will make an argument for a more extended form of liberal university education and its central role in the East-West dialogue, which is also a dialogue about the emerging world society.

**[1. Introduction: The need for liberal arts education]**

First, then, the present situation, and liberal education within it.

**[Spread of higher education and science]**

At world level we see the unprecedented growth of participation in tertiary and higher education, and in R&D funding and the output of published science. At the same time, in certain respects universities have become narrowly defined, and in some countries, are seen to worsen social stratification and political polarisation.

**[World GDP, population and tertiary enrolment, 1970-2013 (1970 = 1.0)]**

As the graph shows, for a long period the growth of enrolments in post-school education moved in lock-step with the growth of world GDP. But in the second half of the 1990s, something changed. You see this in the trend line in many countries. After 1995 the worldwide Gross Tertiary Enrolment Ratio jumped from 15 to 35 per cent; and in sixty systems, half or more of the school leaver age cohort enter tertiary institutions, meaning two years full-time or more. Levels of enrolment and rates of completion vary by nation but already, about one quarter of all young people enter degree programs. If the worldwide enrolment rate keeps growing by one per cent a year, in three decades 50 per cent will enter degree programs and take an advanced level of education into the workforce. This is a tremendous expansion in the intellectual, economic, social and cultural capabilities of humans.

**[Number of science papers 2005-2014: USA, China, other East Asia]**

On top of more educated populations we also see the spread of science across the high and middle income countries and growth in the number and size of research-intensive universities. The birth of the Internet around 1990 triggered the emergence of a dominant world system of published English-language science. With the partial exception of the US, most technological innovations are sourced not from national science systems but global science. To access global science nations must have their own trained people who interact continually with researchers abroad, and World-Class Universities, global research universities, to house them—just as all nations want clean water, viable banking and stable governance. Almost everywhere research has moved from the margins of policy to the normal business of state. Both the number of R&D nations and total scientific output is growing rapidly, especially in the rising science nations, in Brazil, in Iran and above all in China and East Asia.

**[Leading in high citation STEM research]**

It’s the Age of STEM in higher education, especially in East Asia, and especially in the applied sciences in engineering, computing, medicine and related areas. In China research output has grown by 15 per cent a year for almost two decades. Total spending on R&D, and total output of published science, will pass the United States in the next half decade. The surge in science is primarily in Physical Sciences STEM. In China and Singapore, the number of highly cited papers is expanding very fast. East Asia now out-performs the rest of the world in research in mathematics and computing, with Tsinghua the world number one and Nanyang number two, and in Physical Sciences STEM as a whole, Tsinghua just shades MIT. The US has four of the top seven but China six of the top 15, and Singapore two, compared to US five.

**[Education vs. post-truth populism]**

Yet higher education is in question in a new way in the US, the UK, France, Germany, the Netherlands and elsewhere in Western Europe. In the populist backlash against cosmopolitan urban elites, both real and imagined, higher education is a primary indicator of political polarisation. People with no tertiary qualifications voted overwhelmingly for Donald Trump and Brexit in the UK. People with degrees voted overwhelmingly for Hilary Clinton and to stay in the EU. Young people in the UK, the most educated generation in UK history, voted overwhelmingly for the EU. International education is also newly questioned. Last week the Danish minister of education announced that cross-border student numbers would be cut back because foreigners took places from local students. So is the knowledge-based mission. In the 2016 Brexit referendum in the UK university ‘experts’ were derided by one leader of the Brexit campaign, who is a former minister of education. In the US the science of climate change—indeed, a scientific world—has long been under sustained political attack and these attacks are now given repeated comfort from the White House.

**[‘I love the uneducated’ – Donald Trump, 2016]**

Most serious is the deconstruction of public discourse, which calls into question the Kantian nexus between knowledge, truth, public virtue and public interest, and the continuing improvement of societies. In last year’s American election, the hit rate on fake news items in social media equalled the hit rate on standard journalism. In the crucial last month fake news clearly outpolled real news. This is big trouble.

**[A ‘half-educated’ tech sector]**

So the STEM-educated leaders of the tech sector have developed a new form of public space which is not just contaminated by but *captured* by a populist politics that radically undermines the values of higher education and validated and creative knowledge, and deepens the divide between universities and the public interest. Higher educators need to respond, especially in the countries most affected.

 I draw two conclusions from all this. First, by continuing to expand the rate of participation in higher education, by making the sector less elite in social terms, we eat into the electoral basis for anti-intellectual populism of the Trump kind. It was H.G. Wells who first said that civilization is a race between education and catastrophe. That’s looking more true now—but if mass higher education is to lift the level of public literacy, then the level and engagement in mass education must be sufficient. This is not the case in every country. And MOOCS are not enough.

**[Existing liberal arts provision in universities]**

Second—and this is a caveat to the first point—if higher education is so dominated by applied STEM-based disciplines and business studies that it largely excludes the critical social sciences and humanities, or if it is so occupied by generic programmes, and social networks building that it excludes foundational cognitive development in fields of knowledge, it is unable to sustain the Kantian or Humboldtian nexus between knowledge, truth, public virtue, public interest and social improvement.

 Which brings us to the liberal disciplines, the missing piece of the puzzle.

**[Arguments for a liberal arts approach]**

You are familiar with the main arguments for liberal arts programmes, or liberal arts and science, which is the better approach. The three rationales are a mix of positive and defensive. They’re not clearly specific to the liberal arts and sciences. After all, all university programmes should provide generic skills. Interdisciplinary mechanisms and education of the whole person have a larger role than just in liberal disciplines.

 What’s not always clear is the intended division of labour between the liberal arts and sciences, and other university or college programmes. Or the distinction between general education of the type offered in the United States and in part in Asia, and liberal arts and science education. The three rationales might apply better to general education programmes, than to a discipline-based liberal curriculum. In relation to the confusion attendant on this domain I make four points.

First, in the first instance liberal studies is about disciplines not the dissolution of knowledge boundaries. Only a deep engagement in particular fields—philosophy, physics, genetics, psychology, history, languages etc—enables cross-disciplinary work.

Second, general programmes in the early years tend to lack depth and status with students. Faculty must work very hard to ensure depth in one year or 18 month liberal programmes. Majors really need at least three years. The bona fide liberal arts and science programme is a full degree course, whether in a stand-alone institution or a feeder faculty in a research-intensive university, and is probably preliminary to a professional or specialist programme at Masters level. The first degree colleges attached to the Dutch research universities, and the US liberal arts colleges, are both examples.

Third, the role of choice can be over-played. In the preparation of rounded citizens, focused on the local, national and global public good, some disciplines might be considered primary. We would hope that all students would have knowledge of history, for example. Knowledge of a second language is important. Economics and psychology are each powerful fields of knowledge that permeate modern life. Engagement with mathematics seems highly desirable, as does some knowledge of both the physical and biological sciences. It should not be possible to opt out of, say, mathematics or languages simply because they are difficult.

Fourth, there’s not enough liberal arts and science education in total, taking all forms of it together. Specific liberal arts are a relatively small field of elite preparation, and one that is often often uncoupled from science. There’s not enough, also, of those more attenuated, less formative liberal programmes that fade into general education. And even if general education with some liberal studies is actually growing in weight within higher education at world level (unlike liberal arts college enrolments), this general education remains a minority activity, and often has insufficient gravitas in the eyes of those who take it.

**[2. Grounding a larger role for liberal arts and science]**

In the remainder of the presentation I want to outline one possible grounding for a larger role for the liberal disciplines in higher education.

**[Higher education as self-formation]**

I start from the premise that modern life is characterised by the reflexive self-formation of individuals and of societies. Except for people with living standards at subsistence level, the development and transformation of identity and capabilities, amid moving and changing settings—that is, the development of one’s own *agency*—has become central to normal life.

Here higher education is an advanced kind of self-formation where the potentials of the self, the mind and applied learning are explored through the lens of one or more fields of academic knowledge. Educational research tells us that the choice of field or fields is very important. The disciplines are associated with differing values and behaviours in graduates, more so than gender, or ethnicity, or age, or the status of institutions. This is a strong argument for multi-disciplinary access to more than one set of values. And indeed, students seek to form themselves in diverse ways for diverse reasons—to expand their knowledge and skills, to improve their social status and position, to increase their employability and their earnings, to augment their social networks and their cultural capital, to expand their friendships and find a marriage partner, and so on. The theory of human capital investment, the theory of positional goods, the educational explanation—all are true, but only partly so. None provides a holistic explanation of higher education, and none are relevant in exactly the same way for everyone. Self-formation is nuanced.

The idea of higher education as self-formation, in which the student becomes increasingly aware of her or his own development and of the resources that can be deployed to assist, is radically different to the idea of higher education as a consumer market in which the student chooses between pre-given products. The true product is the self. Ultimately only the student does the learning but the student partly does so through conversations with others, especially significant others who are teachers.

**[Forms of freedom]**

Self-formation is also self-determination. If higher education is a process of reflexively developing personal and social agency, then I believe it should be understood as a medium of *freedom*, and as the enabler of other freedoms.

**[Core elements of self-determining freedom, all of which are advanced by higher education]**

We are indebted to Amartya Sen for his account of forms of freedom. First, there is ‘freedom as control’; freedom from *direct coercion* by external powers whether governmental or commercial or managerial; ’negative freedom’ as Berlin calls it. This is the most commonly referenced form of freedom in English-language countries. Higher education provides personal confidence and social status that help graduates to manage direct coercion. Second is what Sen calls ‘freedom’ as power’, or ‘*effective freedom*’, roughly similar to what is often termed ‘positive freedom’, which is the predominant form of freedom in the Chinese academic tradition. A person with no resources might be free of coercion but without the means or opportunity to exercise effective freedom. Higher education is an important source of information and cultural resources. Third is what Sen terms *agency freedom*. ‘Agency’ suggests an intrinsically active and proactive human will, able to imagine to act on her/his own behalf. Agency freedom is the most crucial element of freedom. As I’ll show in a moment, higher education directly fosters individual agency, and, especially in multi-disciplinary form, it constitutes a rich mental landscape of imagined projects.

**[Research finds that people who achieve higher education, on average …]**

Higher education as self-formation, and self-formation as a mode of freedom. This is not empty rhetoric, it happens. The OECD publishes data on the social contributions of higher education, beyond measurable individual economic benefits. The consistent story is that higher education builds individual agency and that expands sociability. For example, being a graduate is closely associated with skills in information and communications technology. People who finish tertiary education are more likely to believe they have a say in government, and more likely to say that they trust others.

Higher education also augments cross-border mobility. The OECD’s *Perspectives on Global Development 2017: International migration in a shifting world* compares the cross-border mobility of people with, and without, university degrees. For those *without* degrees the tendency to move across borders is correlated to income. As income rises people are more likely to move. Makes sense, doesn’t it? *But* among those with degrees the pattern is different. First, at a given level of income, those with degrees are more mobile than those without: higher education democratizes mobility. Second, for those with degrees, as income rises, once a modest threshold level is reached, there is little change in mobility. The propensity to travel is income inelastic. In other words, in helping graduates to achieve greater personal agency in the form of the capacity to move across the world, higher education weakens the effects of economic determinism on their imaginings, choices and decisions. Significantly, *degree level education directly constitutes greater personal freedoms*. We see here that the balance between structure and agency is not a constant, because it is shifted. This is what we do in higher education.

**[Individual and social]**

The formation of individual agency is only possible in social contexts and has relational consequences for the broader society. Eastern and Western thought have approached this differently. John Dewey emphasises that individual and society are two parts of the same thing. You cannot imagine one without the other. Vygotosky shows how in the developing child self-formation is socially nested, in the first instance in the emergence of speech. The child is proactive, self-forming. She or he reaches out to the adult, calling in the exchange. CP Mead makes a parallel point. People learn through successive social encounters.

**[*Weiming Tu quote*]**

All the same, Western epistemology also developed methodological individualism. Some strands of psychology and economics found it possible to set aside the social, so that higher education policy focuses only on the economic benefits for individual students without regard for the public or social benefits that universities create. It is less easy to do this in Confucian thought. Weiming Tu says that the changing self is a “flowing stream” and not an island. The individual stream meets and mingles with other streams.

**[Inequalities data: China and United States]**

East and West are subject to common problems in the social realm, such as the dramatic increase in inequality of incomes in the last generation. Yet arguably, East and West bring different sensibilities to bear in understanding self-formation as also social formation.

Wen Yu Chai cites the neo-Confucian Song Dynasty idea of the “eight stages to the realization of self-cultivation” that proceed from self-formation to social-formation: investigating things; extending one’s knowledge; making one’s intentions sincere; rectifying one’s mind; cultivating one’s personal life; regulating one’s family; governing one’s state; and setting the world at peace and harmony.”

**[3. Self-formation East and West]**

Arguably, the Western and Eastern traditions have a differing capacity to grasp human society as relational society. This shows itself in both the epistemological foundations and in educational practice. In terms of knowledge, in the Western tradition, inquiry focuses on a single field of knowledge as an end in itself, leading to contending claims for a single transcendent truth. The claims are holistic, yet each based on partial slices of the world. Rui Yang argues that Chinese higher education was traditionally focused less on truth seeking within a single field of knowledge—truth was changeable—and more on practical knowledge of statecraft and society, and connectedness and integration.

The traditional Chinese intellectual world view was essentially hybrid. The sages were not system builders, systemisers, they were *synthesisers* of different and conflicting schools of thought. This suggests the as yet under-developed potential for a Confucian-influenced social science. The relational sensibility integral to Confucianism could be especially helpful, for social science, in understanding human relations in a multi-polar global world.

In education, the two traditions both developed the idea of higher education as self-formation, but this has differing roots in East and West. The older and stronger tradition is Confucian self-cultivation. East Asia is “a learning civilization”, says Weiming Tu. In Europe the most developed form is the German Bildung. For Kant and Humboldt the aim of education is “the active autonomous person within the framework of social life”, a rational subject who uses reason in a public way and “lives in the public sphere among other individual beings”. The ultimate outcome of Bildung in higher education, as in Confucian tradition, is social improvement. Two traditions of higher education as self-formation. I believe that they coincide in the end point of the project, but they are also associated with often differing approaches to learning.

Jin Li uses subjects’ word association to compare beliefs about learning in China and the United States. The Americans in his study were more reflexive about the learner’s mental functioning, inquiry and imagination, and often referred to external conditions affecting learning. The Chinese were more reflexive about their progress and effort, focusing less on the external conditions and more on “how learners actively seek learning on their own”. They were normative, talking about learning in terms of attitudes and action, and hardship, and virtues such as diligence and steadfastness, terms that never surfaced in American talk. The Chinese saw learning and knowledge is “indispensable to their personal lives” and the path to becoming a better person.

***[Rui Yang quote]***

The obvious point is that when the self-conscious awareness of mental processes and curiosity-driven inquiry into the world are combined with this exceptional drive for personal transformation you have a potent learner, a person most strong in reflexive self-formation. This again points to the role of the liberal non-science disciplines, where inter-cultural learning is possible, and there is wide potential for cultural and educational East-West hybrids, what Ulrich Beck calls the ending of the “global other”. It is a stretch, but many people are thinking about this. Rui Yang suggests that in China’s universities, which have been strongly impacted by European and especially American modernization, tradition has partly blocked the adoption of certain strengths of the Western form such as curiosity-driven inquiry. A deeper synthesis between East and West is needed, to ground a distinctively Chinese form of modernization, of continuous transformation, in education and science. Again, the synthesis comes more naturally to Eastern than Western thought. As Rui Yang puts it, Chinese thinkers often “appreciate opposing poles as a driving force and see opportunities in contradiction.”

**[4. Challenges for liberal arts education]**

So liberal arts and science education has the potential to play a catalytic role in what might be the core strategic problem of our times, which is the need for a deeper reconciliation between American-European and Chinese ways of thinking, living and governing. But if the liberal arts and sciences are to move from the margins and play a more strategic role on a larger scale they have three challenges to overcome.

**[STEM and the lack of balance]**

The first challenge is the lack of balance between the disciplines in social esteem, policy, funding and often in university provision.

**[The Age of STEM: Shanghai ranking criteria]**

It is STEM, especially in engineering and medical and biomedical research, that triggers government approval and drives ranking performance, even though the graduate employment records of many STEM graduates are not that flash

 Here the difference between a liberal arts approach, and a liberal arts and sciences approach, is vital. The arts and humanities cannot afford to become locked into opposition to *all* fields of science. The ideal structure is for liberal arts and science first degrees to become foundational to STEM-based professional programmes such as medicine and engineering. This provides more depth under the professional degree.

**[Human capital and employability]**

The second and most immediately difficult challenge is the stranglehold of human capital theory in policy and the public mind. The idea that there is—or should be—a simple linear relationship between degree and work downgrades the liberal disciplines. Yet we know that many graduates work in jobs other than those for which they were trained. Specialist positions are often filled by non-specialist graduates, or the wrong kind of specialist. Other positions are generic ones. And as many speakers here have said, jobs are changing rapidly and radically.

***[Stephen Hawking quote]***

We also know that students have a less instrumental take on higher education than often expected. In the UK a recent survey of 9000 students at 123 institutions found that only 34 per cent of respondents believed universities should be accountable for poor graduate employment but 68 per cent believed they should be accountable for poor teaching. When asked which factors best demonstrate a university has excellent teaching, graduate employment came last out of the seven choices in the survey

**[Educating the elite]**

The third and hardest challenge is the way that in many countries the liberal curriculum has been confined to the education of the social elite.

***[Bill Kirby and Marijk van der Wende quote]***

Here not only are the benefits of liberal arts education denied to the mass of students, liberal education becomes trapped as a permanently poor relation within elite education. A related problem is the positioning of programmes for educating global citizens as solely elite tracks, though much global mobility is not privileged. Ultimately the best way out of the trap is to establish liberal arts and science programmes as the normal first degree, followed by the professional Masters.

**[5. Concluding remarks]**

National systems of higher education need to find ways of drawing on the strengths of both kinds of institution, the stand-alone liberal arts college and the large research university.

They also need to correctly configure the liberal and professional disciplines without setting them against each other; and to configure the sciences and non-sciences without setting them against each other.

In the double structure of liberal first degree/professional Masters the relation between the liberal and professional disciplines is mutually nurturing rather than oppositional. This is the curriculum structure of the Melbourne Model, at the University of Melbourne, where I worked before my present job at UCL. I have no doubt that it is the optimal higher education. It does not necessarily lead to more years of study in total; the cost of the extended liberal preparation are wholly or partly counter-balanced by reduction in the length of the professional degrees. The students gain markedly in each of breadth, depth, social connectedness and global awareness.

 I have also no doubt that in future years, the contents of the self-forming liberal arts and sciences will become more hybrid, more East/West in character. Cultural and epistemological diversity will continue, within the framework of the relational all-under-heaven.

 Thank you for your patience in listening to my poor thoughts.

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