



Founded 1905

NATIONAL
UNIVERSITY
of SINGAPORE

CDTLink

Centre for Development of Teaching and Learning

March 2001

Vol. 5 No. 1

INSIDE

STUDENT ASSESSMENT

On Examinations as a Student Assessment Method	3
Types & Objectives of Assessment	5

TEACHER APPRAISAL

Student Feedback: Strengths & Limitations	6
Some Reflections on Teaching Evaluation	7

CDTL NEWS

1st ASEAN Conference on Problem-Based Learning in Health Sciences	8
CDTL Brief Goes Interactive!	8
Conference on e-Education	9
2000 Statistics at a Glance: Who Came to CDTL's Staff Workshops & Seminars	9
In Appreciation	12
Welcome	12
Calling All Writers	12

FROM THE FACULTIES

Teaching & Learning Highlights	10
--------------------------------------	----

TEAM WORK

Supporting Team Work in a Computer Science Course	13
---	----

TECHNOLOGY & YOU

The Real Estate Development & Investment Game Goes Online	14
---	----

Teaching, Learning & Assessment at the Faculty of Law: The Quest for Harmonisation



Associate Professor Tan Cheng Han
Vice-Dean, Faculty of Law

A widespread problem in higher education is the failure to truly appreciate the importance of harmonising its various constituent elements. Broadly speaking, the process of education involves three perspectives: the teacher, the student, and assessment. The ultimate goal is for student learning to take place and this can only happen if modes of teaching and assessment facilitate, encourage and reinforce learning. While this may appear self-evident, the reality across many universities is that insufficient thought is given to the divide between teaching and assessment on the one hand, and student learning on the other.

For example, many teachers would consider successful teaching to have taken place if information has been transmitted to students. However, simply because teaching in this traditional sense has taken place does not mean that learning has taken place, or perhaps more accurately, that meaningful learning has taken place. While people often equate teaching with learning and vice-versa, such assumptions are often unfounded and it is useful to regard them as separate elements even if they may be part of the educational process. Broadly speaking, teaching focuses on the role played by the lecturer or tutor while learning focuses on the student. It is sometimes easy to overlook the fact that the most well-intentioned teaching does not inevitably lead to meaningful learning. For example, many teachers pride themselves on their ability to convey information clearly and comprehensively to students. While this is no bad thing, it does not of itself lead to students being able to apply knowledge, inquire and think independently, and articulate ideas. Simply transmitting information does not lead to such learning outcomes. In fact, it might even be said that teaching that does not pay conscious heed to the need for student learning to take place encourages students not to stretch

themselves. For example, a lecture that is overly comprehensive in terms of the information transmitted may leave many students with little incentive to read and think about the subject matter for themselves, not to mention the problem of information overload.

This is not to say that there is no role for the transmission of information. It is still an important element of teaching but a good teacher must not assume that learning takes place simply because students are in possession of



A/Prof Terry Kaan Sheung-Hung (Vice-Dean, Faculty of Law) interacting with students

Continued next page...

Teaching, Learning & Assessment at the Faculty of Law

...continued from previous page

knowledge. Knowing how to look for information, how to apply it, how to critically evaluate and communicate such information, are also important aspects of education. The failure to maximise student potential often arises not because teachers are unaware of such matters but because teachers understandably approach education from their perspective and inadvertently fail to consider the effect of modes of teaching and assessment on their students.

To facilitate desired learning outcomes, the assessment process must also be consistent. Students will not feel the need to think and inquire within a subject if the assessment process simply requires them to remember facts and figures. Students are pragmatic and more than capable of adapting to a particular system. If all that the assessment process requires of them is to be able to recall information (and this will determine their grade point average), they will condition themselves to perform best within such a system and downplay calls for them to think critically about the subjects they are reading.

These issues confront all disciplines and Law is no exception. What is intended in the rest of this article is to outline the modes of teaching and assessment at the Faculty of Law bearing in mind the need for teaching, learning and assessment to be consistent with desired outcomes. It should of course be said that it is not the intention of this article to represent the Faculty of Law as a model for others. Indeed, the quest for improvement can never end.

The most widely used model for teaching at the Faculty of Law is the lecture-tutorial method. Many teachers in the Faculty consider the lecture a useful means of outlining the subject matter, raising issues and posing questions. The tutorial assumes greater importance, however, for it is in the context of a small-group tutorial session that students are expected to engage in discussion and debate with their tutors. This is not to say that the lecture cannot be used as a forum for student interactivity but to say that it is more intensively done in tutorials in the Faculty of Law. The problem-based learning method (PBL) is predominantly used in these tutorial sessions. PBL allows students to better integrate knowledge and ideas in the context in which they are to be used. In such tutorials, students are encouraged to develop critical thinking and analysis, and to apply, analyse and evaluate knowledge. The tutorials are not intended to be alternative forums for knowledge dissemination.

The other model that is widely used in the Faculty is the seminar method. This is the method that is used for many optional courses which students take in their Third and Final Years. In the seminar method, there are either no lectures or very few lectures. Students are expected to work independently and be ready to discuss and analyse issues and problems during the seminar. The size of each seminar group varies from around 20 to as many as 50. Although students do not have the benefit of lectures to guide them, they will be provided with reading lists, and questions and issues that may be discussed during seminars. They are expected to understand the subject matter by working independently or

with their course-mates. Any difficulties or queries can be taken up during the seminar through the discussion and debate that is facilitated by the course teacher. Essentially, the seminar operates as a dialogue between the teacher and the students.

The philosophy underlying the predominant models used is that students are expected to be the principal authors of their own learning. Transmitting information is only one part of the process of learning. To maximise the potential of every student, they must develop the right skills and mindset for independent, life-long learning. To do this, the modes of teaching must send a clear signal to students that education is not a one-way process. It is a collaborative process between teachers and students as a community, with the students being the more active participants. It is after all their education that we are involved in and we must be careful to ensure that the teaching processes in place do not hinder their learning. Through seminars and small-group tutorials, the Faculty of Law tries to maximise the collaborative, interactive nature of learning.

Modes of assessment also play an important role. There is a wide range of assessment methods used in the Faculty. For example, open-book examinations have been in place for more than 40 years and the majority of courses in the Faculty are examined on an open-book basis. Continuous assessment is also important through tests, take-home assignments, reports, and performance during classes. In some courses, there is no final examination and the students are assessed entirely through continuous assessment. Wide flexibility is given to individual course teachers to select the modes of assessment that they feel fit in best with the desired educational outcomes in the context of their specific subjects. The Faculty also has a University Research Opportunities Programme (Directed Research). Students are encouraged to opt for this programme and indeed, all academic staff are expected to offer themselves as supervisors.

Through these various modes of assessment, the Faculty aims to reinforce the message that students must be the masters of their own learning. For example, open-book examinations are only effective if the questions require students to think, analyse and apply information beyond what may be found in textbooks or articles. In fact, the irony of true open-book examinations is that the materials that a student can bring into the examination hall are unlikely to be of much significance except that it does away with the need to memorise basic knowledge. To examine in such a way, the teacher must first and foremost design a curriculum and teach in a manner that will fairly allow students to perform in such examinations. The way we teach determines how we can examine and the way we can examine is dependent on how we teach.

In conclusion, facilitating learning requires a consistent and harmonious relationship among teaching, learning and assessment. As with other Faculties, this is a challenge that the Faculty of Law continually grapples with and tries to improve upon. ■

On Examinations as a Student Assessment Method

Professor C.Y. Kwan

*Department of Medicine, Faculty of Health Sciences
McMaster University, Hamilton, Ontario, Canada*

In this essay, I will adopt a Problem-Based Learning (PBL) approach using a newspaper article as a trigger to prompt reflection on student assessment. Last August, Professor Tsui Lap Chee, the prominent Canadian research molecular geneticist and the 53rd Lee Kuan Yew Distinguished Visitor at NUS, was featured as follows in *The Straits Times* on 1 August 2000:

Be flexible on varsity entry criteria

Universities should not be too fixated on accepting students who have a string of straight As.

There should be some flexibility and some open-mindedness in their student admission, said a visiting molecular geneticist, Professor Tsui Lap Chee.

He said he himself did not qualify for university. He did brilliantly in biology, but merely passed his other subjects. He said: "... In a system where you evaluate by grades, I couldn't get into university."

... If the university had not bent the rules, he would not be where he is today.

To facilitate discussion, I will refer to Prof Tsui also as Mr Tsui at the time when he was a young student seeking university entrance. What learning issues on student assessment can be derived from the above passage? Clearly, students are first being assessed during university admission, frequently if not exclusively, according to their previous examination performance. But there are also many other points to ponder.

Issue #1: Why do we assess students?

Student assessment is used to: (a) differentiate high and low performers, (b) provide feedback on students' learning, (c) help teachers improve their teaching, and/or (d) decide which students can advance further (be rewarded), and which need to undergo remedial training/be detained (be punished). 'Formative' assessment helps improve performance via feedback, whereas 'summative' assessment decides on rewards or punishment. What should be the proper balance between formative and summative assessments? Students are usually assessed on the substance (what do they learn?) and process (how do they learn to go this far?) of learning



through the assessment method of examinations. But which do examinations predominantly assess: the substance or the process of students' learning?

Issue #2: How are students selected for university admission?

The summative assessment process, used by universities to select students with high grades for admission purposes, may exert a profound effect on a student's behaviour and future. In the case of Mr Tsui who was brilliant only in biology, he could have been rejected by the Chinese University of Hong Kong's admission office and never had the subsequent opportunity to go to North America where he was groomed to reach his present-day eminence.

So the questions raised by Prof Tsui's comments are as follows: When assessing students for admission, how far can an institute make exceptions and still justify the spirit of consistency and fairness? Besides achieving excellent marks in Biology, what other qualities could Mr Tsui have possessed to prompt a Dean to justify him as being an 'exceptional' case? Should a Faculty's assessment policy be influenced by the Dean's personal favour/bias? Can the Dean's intervention in the normal admission process as a special favour to one student, though based on goodwill, be misinterpreted as a possible under-the-table deal, an event prevalent in Hong Kong society during the 1960s? Can such 'underhandedness' happen today when public

Continued next page...

On Examinations as a Student Assessment Method

...continued from previous page

awareness of legal rights is more prevalent and when the admission process has become more competitive since the 1960s? Why did Prof Tsui advocate to the media about the need for a flexible university admission process? Will/should this suggestion coming from a prominent figure like Prof Tsui have any impact on the way a university assesses students for admission?

Issue #3: How are students being assessed in general?

When Mr Tsui sought university entrance in the late 1960s, grades were the main yardstick in evaluating students for university admission and courses. Students with straight As were naturally labelled as 'good' students, thus deserving entrance into medical school. This attitude was basically an extension of the same assessment system existing in secondary schools where grades represented nothing more than the degree of retention of taught factual knowledge, usually acquired via rote learning and taught via didactic teaching.

As a product of the same educational system as Mr Tsui, I did reasonably well in Biology and Chemistry and scored in Religion when I was a young student. However, I did so badly in English that I did not stand a chance to be admitted into the University of Hong Kong, the then Oxford of the Orient. Twenty-seven years later when I assumed the Chair of Physiology at this University, I was surprised to find that the assessment of the University's medical students had remained practically unchanged: the Medical Faculty was still merely testing students on the retention of factual biological knowledge.

When evaluating medical students, shouldn't other qualities be considered to adequately prepare them for a highly respected, community-wide and humanistic profession that deals with life and death? What about assessing the process, attitude and behaviour of learning (e.g. abilities for life-long learning and cooperative learning)? What about assessing the competency expected of a medical professional with regards to team spirit, professionalism, communication/critical thinking/problem-solving skills, etc.?

While at the University of Hong Kong, I was glad to witness that such deficiencies were being identified and addressed. Major curriculum reform took place such that new assessment methods/criteria were developed to test the competency levels set in the new hybrid-PBL curriculum. However, why did the University take so long to realise a need for change? What finally triggered curriculum reform? Is student assessment successfully being correlated with curriculum structure and affecting students' learning behaviour positively?

Issue #4: Should assessment methods be in keeping with educational goals?

The simplest, fastest and most comfortable way of adopting assessment methods is to follow tradition, perhaps with some cosmetic modification. If one major goal nowadays is to educate students to take an active role in learning and become life-long learners, then the traditional examination format can no longer serve a positive steering influence on students' learning behaviour. Instead, novel assessment methods are needed. But seeking novel assessment methods requires patience to cope with the slow, anxiety-ridden process of careful experimentation. Whatever mode taken, assessment methods should be in line with the product competency, curriculum and institutional mission. Consequently, assessment methodology should not be judged as being good or bad, but rather how compatible it is with the curriculum.

The grades referred to by Prof Tsui presumably result from competitive examinations. But how reliable are examination grades in defining a student's academic performance? Do the grades measure students' memory capacity or learning ability? If grades truly measure the former, are examination grades a valid method of assessment? Are other assessment methods available? Why aren't they being used? How often do teachers and educational administrators think of assessment issues and their improvement, despite the need to fulfil the university's mission? How often are student assessment exercises performed to yield a reliable outcome? What is the advantage of continuous assessment over segmental assessment and what are their respective disadvantages? Should there be a general awareness of proper assessment design for all faculty members or should it be the responsibility of a special task force?

Through this PBL approach, I have raised a host of issues on student assessment. Similarly, the same principle can be applied to reflect upon the quality assurance of teacher assessment, programme assessment and curriculum assessment. I have purposely kept most questions open-ended, as it has not been my intention to make pronouncements on assessment and provide solutions, given that assessment is not a single or a fixed commodity. There are possibly no solutions to some of the questions. An effective way to seek answers would be to think about, debate on, and discuss the questions. Answers or solutions will come, as they will. ■

Professor Kwan has practised PBL in medical education for nearly two decades. From June to November 2000, he acted as a PBL consultant for NUS' Faculty of Medicine.



Types & Objectives of Assessment

Associate Professor Goh Lee Gan

Department of Community, Occupational & Family Medicine

Assessment is the third part of the educational process, the other parts being learning objectives and teaching methods. There are two kinds of assessments—formative and summative—each with a different purpose.

Objectives

The main goal of formative assessment, whether in the form of a self- or trainer-administered test, is to find out how much the learner has learnt. The results chart the process of learning and point directions to where improvements need to be focused. Obviously, formative assessment should be carried out along the duration of a course, rather than at the end. The challenge is to make it easy to conduct and be part of the learning process. In contrast, summative assessment exists primarily to determine if the candidate is qualified or not to practise his or her area of learning.

Criteria of Good Assessment

Both formative and summative assessments make use of tests as instruments of measurement of mastery of learning and competence. There is a need to ensure that such tests satisfy the qualities of:

- **Validity**—a test is applied to what it is supposed to test, e.g. testing blood sugar for diabetes
- **Reliability**—a test is repeatable
- **Objectivity**—independent examiners agree what is a good answer
- **Practicality**—a test is easy to use
- **Relevance**—a test examines that which is useful in real professional life

Formative Assessment

Formative assessment can be used to assess mastery of learning in any of the six levels of Bloom's Taxonomy of Learning (*see Figure 1*). Learning should go beyond recall and interpretation to higher levels. Interpretation of knowledge and beyond need not always be related to closed-book examination. In contrast, the higher the level of learning, the more suitable it is for open-book examination. Examination drives learning. If the level aimed at is only recall, then the candidate will not go beyond that level of learning.

Figure 1: Levels of Learning—Bloom's Taxonomy

- | |
|-------------------------------|
| Level 1: Recall knowledge |
| Level 2: Interpret knowledge |
| Level 3: Apply knowledge |
| Level 4: Analyse knowledge |
| Level 5: Synthesise knowledge |
| Level 6: Evaluate knowledge |

Instruments that can be used for formative assessment include:

- Confidence Checklist
- Multiple Choice Questions (MCQ), Modified Essay Questions, Essays, or Picture Quizzes
- Random Case Analysis
- Problem Case Analysis (Case Study)
- Reading Assignments

Summative Assessment

Summative assessment may use the same instruments as those used in formative assessment and usually tests all of the following domains:

- **Concepts.** Some forms of summative assessment examine the understanding of concepts and their application. Instruments such as MCQ, Essays (long and short answer essays) and Slide Interpretation test the ability to recall knowledge, interpret facts, and apply knowledge to analyse problems.
- **Skills.** Practical Examinations test hands-on skills. The scientific subjects usually have such a component. In the context of medicine, we have long and short cases. The long cases test the ability of the doctor to collect clinical information and use them to come to a diagnosis and decide on treatment. The short cases test psychomotor skills, interpretation of information, and application of knowledge.
- **Ability to respond appropriately.** Oral Examinations test the ability of the learner to think on his or her feet. They can give information of the trainee's ability to interpret information, to apply knowledge and analyse problems. Although the reliability of Oral Examinations is not absolute, they can be used to help decide on whether students pass or fail in borderline cases; they may also be used to decide which of the potential distinction candidates deserves such merit.

Where summative assessment is concerned, it is important that the learning objectives are made explicit from the start. Unless this is achieved, the learner may experience extreme anxiety when faced with summative assessment as he or she tries to guess what will appear in the examinations.

Conclusion

When examining students, one must be clear about what type of assessment one is using and why: summative assessment certifies a learner's fitness to be released into society as a practitioner, whereas formative assessment tests mastery of content and helps the learner to chart further courses of learning. In other words, one should use assessments wisely. ■



Student Feedback: Strengths & Limitations

Mrs Ann Wee

Senior Fellow

Department of Social Work & Psychology

No society rewards adequately the excellent teacher; nor adequately penalizes those slobs who, slobbishness notwithstanding, somehow manage to hang on in the profession.

—Anon

6

The author of the above words was on the right track: the influence of the teacher on the individual can last a lifetime, and at a macro level impacts on the quality of a nation's human capital. The nation that cares what is happening to its young—and to its budget for education—must devise means of making a fair assessment of how its teachers (from kindergarten assistants to senior professors) are performing.

The challenge is not so much a scale that distinguishes the most scintillating of stars from the more abysmal of the category 'slob': fairly crude measures will achieve this. The brilliant stars are clearly visible, and one way or another sludge usually gets flushed out of the system. Much more challenging is to arrive at a measure which distinguishes between various middle levels of stardom, and which identifies lower stardom from upper stodge and so on down the line.

A refined and adequate evaluation of teaching quality is a complex challenge. The video/closed circuit TV pursuit of us all, through all our lectures, tutorials and in-office mentoring, would provide no doubt, rather comprehensive evidence on which to base assessments. But this is highly unlikely. Fortunately the 'finance boys' and 'girls' of any foreseeable establishment would view the costs of such a system (if not the other ghastly implications), as too horrible to contemplate.

Grades and exam results tell only part of the story. Teaching focused entirely on high marks achievement can become the very negation of its true purpose—the cultivation of educated minds. Moreover, it is students' progress rather than the absolute grades, which tells the most about the quality of teaching, and measures of progress are more complex to programme than records of grades.

Whatever other measures are selected, the consumers' view of the whole process is clearly an essential component, as was recognised from the early days of NUS. We have by now a long history of revising the student feedback format, in search of the most effective instrument. Our primordial efforts, fuelled equally by zeal and good intention, called for very detailed inputs. By the time they had covered all their lectures and tutorials, students were staggering with feedback exhaustion. They fed-back on this phenomenon, by haemorrhaging out of feedback altogether, in such large

numbers that no fair assessments could be drawn from the anaemic bundles of returns available for analysis. We learnt, and after a range of trials and errors, have now arrived at a streamlined and apparently acceptable model.

Much has been written overseas about methods, and about the value and limitations of the whole student feedback process. It is, for example, a limitation that what students look for, may not be totally in line with the objectives of education. The literature notes that staff who grade strictly do not find favour. Students value their alma mater's reputation for high standards, but find the implications of this less than palatable when translated into demands for high standards from them individually. My own experience illustrates this sad fact. In more than a decade of reasonably favourable feedback, there appears one single-semester drop in student esteem, as marked as an arctic storm on the weather chart of a temperate clime. Feedback took place the day after term papers had been returned to the class.

The qualitative section in the form, which allows students to comment in their own words, can be especially valuable, but is relatively little used. There may be cultural factors which hold back the use that Singaporean students make of this opportunity, as we all bring to the giving of feedback our own personal experience of being on the receiving end. Many Chinese students have grown up in very caring homes, but where scolding (or something more severe) for undesired behaviour, has been the parents' main child-rearing strategy. No oral response to the news that their child has topped the class, but parental pleasure perhaps shown by a family outing to a restaurant: everyone understanding the reason for the outing, and warm feeling all round, but nothing actually said. Only those with very modern parents have received much articulated praise. The inherited wisdom teaches that praise can lead to slackening of effort, and should be used very sparingly if at all.

The giving of praise, like so much of what we do in our everyday lives, is learned behaviour. Reflecting their personal experience, it is small wonder (but also cold comfort) that students who are satisfied with their lectures and tutorials, tend to leave blank the space which allows them to comment in their own words. The entry, "no complaints", perhaps epitomises a typical outcome of the conservative growing up experience!

Continued on page 12...



Some Reflections on Teaching Evaluation

Assistant Professor Grant Shen

Department of English Language & Literature

Examinations, not module introductions, guide students. In a similar way but to a lesser extent, teaching evaluation guides teachers. Among the five sources that provide the bulk of information for teaching evaluation at NUS, Peer Review and Teaching Portfolio have not yet been systematically put into practice university-wide. This leaves Student Feedback, Examination Questions, and Module Folders to meet much of the practical need. But the operational mechanism of these three still has room for improvement.¹

Student Feedback

By far, Student Feedback is the most visible and prevailing component of the system, serving many purposes. It reflects certain teaching qualities, saves users the trouble of reading vague words, makes unambiguous comparison among teaching staff, gives the appearance of numerical accuracy, empowers students and compensates their frustration, etc.

However, the method in calculating Student Feedback often distorts the collective voice of a student body. Each student is allowed to rate the teacher on a scale of 1 to 10. This would be fair if the average were 5.5. Yet we know from experience that the average is often 8 and above. Thus the voting power of a student who totally rejects a teacher with a score of 1 is much greater than that of a student who absolutely adores the teacher with a score of 10. For example, when the average score is 8.2, it will then take four 'adorners' to balance a single 'rejecter'.²

This skewed voting power has repercussions: the most critical

students (sometimes the least successful ones) have the loudest feedback voice; teachers learn not to challenge students in order to avoid radical feedback. Accordingly, intellectual stimulation is not encouraged or rewarded by this mechanism.

A fairer calculation, I propose, is to discard a certain percentage of the highest and lowest votes in Student Feedback. In a class of 25, for instance, when 8% of the votes at each end are excluded, four votes—the two highest and the two lowest—are not counted. The other 21 middling votes are then averaged as the Feedback score. This method of ignoring extreme votes, a common practice in sports competitions such as diving and gymnastics, is fair play. The purpose is to avoid one judge's radical score severely distorting other judges' decision.

Examination Questions

Do Examination Questions successfully reflect the quality of teaching? Questions that test only familiarity with knowledge content and mechanical application suggest that students need only memorise facts or operational procedures as a result of taking the module. Such modules are usually not judged as having high quality. In contrast, questions that require the thinking abilities of a higher order suggest a stimulating process of learning and an intellectually successful module.

The problem in teaching evaluation, however, lies in the fact that the nature of Examination Questions is not self-evident. A critical- or analytical-looking question may demand no critical thinking or analytical skills on the students' part at all. We have seen Examination Questions that trouble a teacher while posing no challenge to an

average student. The secret? These questions have been lectured on or discussed in class/tutorial sessions. What is being tested is still the students' ability in memorising the answers.

In order to determine if higher order thinking has been achieved from a module that appears to promote higher order thinking, we probably have to look beyond Examination Questions. I propose that a comparison of a few Examination Answers will suffice. Uniformity in wording, examples given, and details suggest a memory competition, while diversity in feasible approaches testifies for an academically vibrant module. Given the quality of teaching is judged by the learning outcomes, evaluation of Examination Answers is more justifiable than that of Examination Questions.

Module Folders

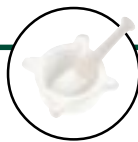
Module Folders, to a certain extent, demonstrate a teacher's attitude. But they are unreliable sources of data for judging the quality of teaching.

First, a significant part of a Folder is teaching plans. They bear no witness as to what will be taught, which only takes place after their composition. As a result, they probably will not give more valid testimony to a module than a textbook does.

Second, a Module Folder, conventionally filed before the semester ends, is not responsive to how the module has been taught.

Third, a Module Folder, usually a teaching but not learning record, gives little evidence if the teacher has enhanced students' learning experience. Not only may teaching not lead to learning, but learning may also occur without teaching.

Continued on page 12...



1st ASEAN Conference on Problem-Based Learning (PBL) in Health Sciences

The 1st ASEAN Conference on Problem-Based Learning (PBL) in Health Sciences was held on 20–22 November 2000 at the Clinical Research Centre Auditorium. This conference was jointly organised by the Faculty of Medicine, the Faculty of Dentistry and CDTL.

More than 230 health science educationists attended the conference. They came from the region and beyond, from countries such as Malaysia, Indonesia, Thailand, the Philippines, Cambodia, Hong Kong, Japan, Pakistan, Australia, Canada, South Africa, etc. The conference was also strongly supported by the local health science educationists and practitioners, with representatives from Singapore General Hospital, Tan Tock Seng Hospital, KK Women's and Children's Hospital, etc. Participants also included NUS staff from the faculties of Medicine and Dentistry.

Four experienced PBL practitioners presented the plenary lectures. They were Professor Louise Samson, University of Montreal; Associate Professor Jacques Corcos, McGill University; Dr Scheltus J. van Luijk, University of Maastricht; and Professor David Kwan, McMaster University. The proceedings, divided into four



symposium sessions, dealt with the different issues of PBL such as assessment and quality assurance.

Three of the plenary speakers also conducted the pre-conference workshops. Each workshop focused on a different essential aspect of the PBL tutorial exercise. The workshop on 'How to Function as a PBL Small Group Tutor' was led by Prof Kwan; A/Prof Corcos conducted 'Evaluation of Student Performance and How to Give Feedback in PBL'; and the design of problems used in PBL sessions was discussed in Prof Samson's workshop.

Another highlight of the conference was the Round Table Discussion of Deans. Six Deans from the Universities of British Columbia, Glasgow, Hong Kong, Melbourne, and NUS (Faculties of Medicine and Dentistry) shared their experiences in leading their respective institutions in the implementation of PBL.

The conference also witnessed the successful formation of the Asia-Pacific Association for PBL in Health Sciences (APA-PHS). The second ASEAN Conference on PBL in Health Sciences will be held this year in Malaysia, hosted by the University of Malaya. ■

8

CDTL Brief Goes Interactive!



CDTL Brief, the sister publication of CDTLink, has gone interactive with effect from the first issue of 2001. Launched together with the print version's release in February, the inaugural interactive online edition of CDTL Brief features:

- discussion forums
- instant feedback forms
- hyperlinks to websites and illustrations related to the topics discussed

So check out the new interactive CDTL Brief at <http://www.cdtl.nus.edu.sg/brief> and let us have your feedback instantly! ■



Conference on e - Education



On 9 January 2001, CDTL held a one-day conference entitled 'e-Education: Environments; Effectiveness; Economics; Expectations' at the NUSS Kent Ridge Guild House. It was attended by 66 NUS staff members and 183 educators and IT professionals from various institutes of higher learning, junior colleges, secondary schools, Ministry of Communications and Information Technology, Ministry of Education, Info-Communications Development Authority of Singapore, SAFTI Military Institute, various private organisations, and members of the press. The conference was declared open by the guest of honour, RADM Teo Chee Hean, Minister for Education and Second Minister for Defence.



The day's programme was divided into 4 consecutive sessions dealing with different aspects of e-Education: Environments, Effectiveness, Economics, and Expectations. There were three speakers for each session, with a Q & A segment at the end of each session. The 12 speakers, consisting of educators and IT professionals, were from Ngee Ann Polytechnic; Singapore Polytechnic; Temasek Polytechnic; NIE; SAFTI Military Institute; Ministry of Manpower; and NUS' School of Computing, Computer Centre, Centre for Instructional Technology, Institute of Systems Science, Kent Ridge Digital Labs, and CDTL.



The participants have generally found the conference "informative" and appreciated the "wide coverage of different aspects". Other comments include:

"Excellent speakers overall. Logical organisation of presentations and break schedules. Good representation from the various institutes. Excellent coverage of realistic practical issues like bandwidth, learning culture change, etc."

"The real case studies, statistics, experiences. Attempts (all brave) to define e-learning—on this, I think the consensus is that 'e-learning' is a much broader concept than we thought initially."



Judging from the participants' feedback, the conference has indeed provided a unique and timely forum for information sharing, collaborative planning, and discussion of how institutions might work together to maximise their efforts in e-Education.

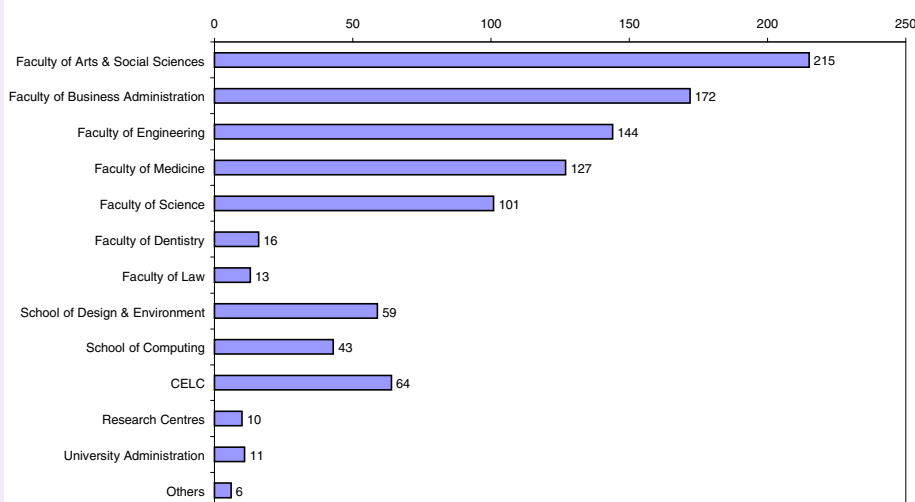
In the closing address, Prof Lee Soo-Ying, Director of Research, NUS, challenged: "We face an exciting and uncertain future in e-Education... There are risks to be taken, and many twists to be expected on the road ahead. But the refusal to look ahead, to take calculated risks and to move forward may be the greatest risk of all. This is reason enough for us to want to host another similar conference."

Echoing the words of RADM Teo Chee Hean in the opening address: "I am glad that educators and industrial experts are gathered at today's conference to learn from each others' experiences in e-Education," we are indeed glad to have hosted this very first conference on e-Education in Singapore. ■



2000 Statistics at a Glance:

Who Came to
CDTL's Staff
Workshops &
Seminars



TEACHING & LEARNING highlights

Faculty of Engineering

Virtual Three-Dimensional & Interactive Demonstrations

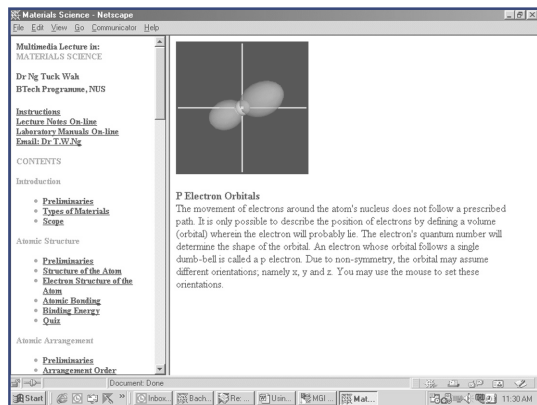


Figure 1: 3-D image of an electron cloud available on the Materials Science course webpage

Many concepts in science and engineering require the description of bodies that are partially obscured or in motion. That static material remains the primary means to describe the appearance and behaviour of obscured and moving bodies presents a major obstacle to effective teaching and learning. Fortunately, there exist a wide variety of tools today to help the educator present dynamic visualisation exercises.

One useful tool is the Virtual Reality Modeling Language (VRML), which enables one to create 3-D virtual exercises that have high levels of interactivity. These exercises can be incorporated into existing web teaching material. This gives students the opportunity to view them repeatedly from wherever they are using a browser. Figure 1 shows a type of electron cloud, an example from the course on Materials Science. It is possible to rotate the cloud in three dimensions by simply dragging and clicking the mouse in tandem. Figure 2 shows a type of atomic arrangement. By moving the mouse over the model, the atomic arrangement will rotate. In the process of rotating, the outer layer of atoms will disappear to show the inner layer. The possibilities for creative expression are limitless. ■

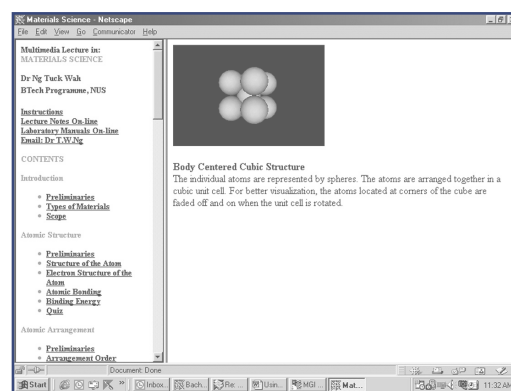


Figure 2: 3-D image of an atomic arrangement

Use of IT to Facilitate Learning in Unit Operations

In the Unit Operations module, the students learn to design the common operations that constitute a chemical process. Examples of these operations are pumping, heat exchange, distillation, absorption, etc., some of which are dynamic in nature (e.g. gas-liquid mixing in distillation and absorption).

After exploring some of the recent developments in IT resources, it was found that 3-D video clips on the above topics could convey the concepts more effectively and in less time than the 2-D (static) viewgraphs that were used in previous years. Several 2-D animation and interactive clips have also been developed to illustrate several important concepts. The interactive clips allow the students to visually see and therefore better appreciate the interaction among the operating variables of a process. The clips have been implemented on the NUS Intranet at <http://courses.nus.edu.sg/course/chesf/cn2113/Nus/Html/mainpage.htm#>. The video, animation and interactive clips facilitate learning and in many cases give such details that are not even achievable from plant visits.



Screen capture of a video demonstrating vapour-liquid mixing: sieve tray in a distillation column

This project would not be possible without the help of Mr Lim and Mr Teo, Process Engineers at Shell and part-time Teaching Assistants (CN2113), and Mr Eugene Hiew, Media Producer at CIT. ■

Faculty of Medicine

Universitas 21 Deans of Medicine Meeting

The Faculty of Medicine, NUS, and the Faculty of Medicine, Dentistry and Health Sciences, University of Melbourne, jointly organised the inaugural Universitas 21 Deans of Medicine Meeting on 23–24 November 2000 at NUS' Clinical Research Centre. The meeting was attended by 27 medical faculty members from 13 universities from Auckland, Birmingham, British Columbia, Edinburgh, Freiburg, Glasgow, Hong Kong, Lund, Melbourne, New South Wales, Nottingham, Queensland, and Singapore.

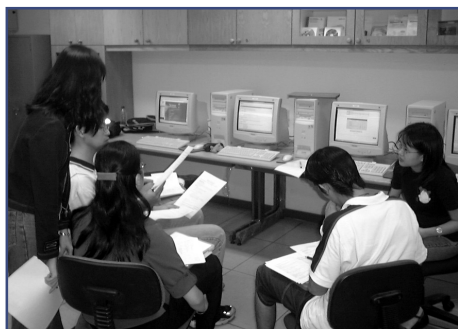
Universitas 21 is a network of 18 universities in 10 countries, aiming to provide a framework for member universities to pursue programmes that would be beyond their individual capabilities. This 2-day meeting was successful in achieving its key objective of sharing among the Deans curricula development, including multimedia programmes and other means in achieving good outcomes in education and research. Other areas of discussion included research exchanges and collaborations, student and staff exchanges, benchmarking research performance and teaching programmes. Another meeting is planned for September 2001 in Vancouver to follow up on some of the key outcomes of this inaugural meeting. ■



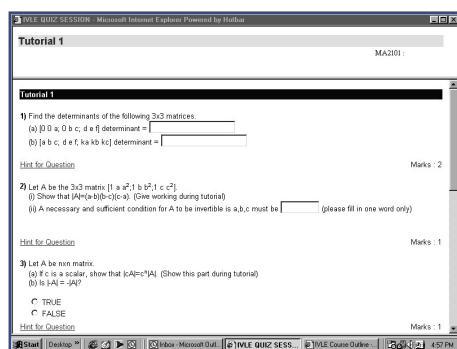
Participants at the Universitas 21 Deans of Medicine Meeting

Faculty of Science

Online MA2101 Tutorials



An MA2101 tutorial at work



Sample of an online tutorial available on the IVLE

The normal size of a Mathematics tutorial class is 25. With such big classes, it is not easy for tutors to attend to all the students. Also, the tutors usually cannot cover everything in the tutorial within 45 minutes. To help solve this problem, the MA2101 course lecturer has used the IVLE tool 'Online Quiz' to create an online tutorial, on a trial basis, to assist the tutors. The questions are of the multiple-choice, true-or-false and fill-in-the-blanks formats. Students just need to type in their answers, which are automatically marked (by the computer). They can view the online hints and correct answers if they encounter difficulties dealing with certain questions. The lecturer can also get a summary of the students' performance from the system.

At the moment, the proving (essay)-type questions, which are not feasible for online assessment, are the type of questions the tutors will focus on in class. Nevertheless, some hints can still be put up to guide the students in dealing with such questions. As the 'Online Quiz' tool is originally meant for the students to take quizzes, several suggestions have been made to the IVLE team to modify it to make it more suitable for the purpose of tutorials; not to completely replace the traditional tutorial session but to supplement it. ■

(The online tutorial can be viewed at the MA2101 course page in the IVLE facility.)

School of Design & Environment

Architecture Design Education on a 12-Day Building Expedition

It was common knowledge that Singaporean engineers and doctors were the two civilian professions active in communal aid overseas but one seldom knew of architects and designers doing the same. The opportunity came in the form of the Singapore International Foundation (SIF)'s Youth Expedition Project to construct a village school canteen within 18 days in Ban Patai, Thailand. It was a chance to get a team of architecture students overseas to build a useful structure and learn from the practical experience at the same time. Sponsors included the Singapore Institute of Architects, the Lee Foundation, the Construction Industry Training Institute and the National University of Singapore.

The 20 students from the Masters, Final Year, and Industrial Design programmes worked (and learnt) in two 6-day stretches, broken by days of outdoor recreation, village visits, and SIF's cultural exchange activities. The hands-on project was completed on 17 December 2000 and proved worthwhile for the design students who require knowledge of construction and assembly consideration when planning their design solutions on the drawing board. The construction sequence for the scale of the building selected (15m x 9m single storey structure in tropical hardwood) could not be effected on lecture slots in weekly intervals. Also, a building of this complexity and scale would require approval from the Building Control Authority over a 6-month period on any Singapore site. ■



The jubilant team with the result of their hard work

We thank A/Prof Grace Ong, Vice-Dean (Faculty of Dentistry) and Head (Dept of Preventive Dentistry); and Dr William Koh, Assistant Professor (Faculty of Business Administration) for their valuable inputs during their term of office as Associate Directors of CDTL (1 February 1999–31 December 2000).

In Appreciation

We also thank our CDTL Affiliates:

- A/Prof W.A.M. Alwis (*Dept of Civil Engineering*)
- Dr Gambhir Bhatta (*Dept of Political Science*)
- A/Prof Clive Briffett (*Dept of Real Estate*)
- A/Prof Rethy Chhem (*Dept of Diagnostic Radiology*)
- A/Prof David Chua (*Dept of Civil Engineering*)
- A/Prof J.B.X. Devotta (*Dept of Electrical Engineering*)
- A/Prof John Elliott (*Dept of Social Work & Psychology*)
- A/Prof Gan Cheong Eng (*Dept of Building*)
- Prof Goh Suat Hong (*Dept of Chemistry*)
- A/Prof Khoo Hoon Eng (*Dept of Biochemistry*)
- Dr Kwong Koon Shing (*Dept of Statistics & Applied Probability*)
- A/Prof Lee Kwok Hong (*Dept of Mechanical & Production Engineering*)
- A/Prof Lee Soo Teck (*Dept of Mathematics*)
- Dr Li Yi (*Dept of Materials Science*)
- A/Prof Lim Lum Peng (*Dept of Preventive Dentistry*)
- A/Prof Lin Jianyi (*Dept of Physics*)
- A/Prof Jeffrey Pinsler (*Faculty of Law*)
- Ms Shu Moo Yoong (*Human Resource Management Unit*)
- A/Prof Benito Tan (*Dept of Biological Sciences*)
- Dr Gary Tan (*Dept of Computer Science*)
- Mr Tan Tuck Choy (*Dept of Computer Science*)

for their valuable contributions during their term of office (22 October 1999–31 December 2000). ■

Welcome

Taking over from A/Prof Grace Ong and Dr William Koh as Associate Directors are **A/Prof Lim Lum Peng** and **A/Prof Ter Kah Leng**, representatives from the Faculties of Dentistry and Business Administration respectively. Their term of appointment will run from 1 February 2001–31 December 2002. We welcome both A/Prof Lim and A/Prof Ter and look forward to working closely with them.

We also welcome **Mrs Angeline Leigh Carpenter-Ames** who joined us on 2 January 2001 as our new Research Assistant. ■

Calling All Writers...

CDTL invites articles on any teaching and learning topic for its various newsletters and information sheets. The specifications for each publication is as follows:

- **CDTLink** (700 words maximum per article; photos & illustrations in hard/digital copy are welcomed)
- **CDTL Brief** (text-only newsletter; 1000 words maximum per article)
- **Ideas on Teaching** (text-only information sheet; 500 words maximum per article)
- **Successful Learning** (text-only information sheet; 500 words maximum per article)

To submit articles for consideration or to obtain more information, please contact:

Ms Verena Tay
Centre for Development of Teaching & Learning
National University of Singapore
10 Kent Ridge Crescent, Singapore 119260
Email: cddtayv@nus.edu.sg
Tel: 65-874 8047 • Fax: 65-777 0342 ■

12

Student Feedback: Strength & Limitations

...continued from page 6

So where does this leave us? Certainly not in 'scrap-feedback' mode. But it does leave us grateful that the powers-that-be do not regard student feedback as the ultimate tool in the staff assessment process. And we must hope that, as family life becomes more articulate, students will become comfortable to give more rounded feedback on their educational experience.

On one hand, responsible feedback from students can be an invaluable component in the teacher's own professional growth and development. On the other, the responsibility to provide feedback gives the students a powerful role and institutionalises in a special way their 'insider' status. Being asked to give feedback will not by itself counteract the potentially alienating experience of receiving education in a mega institution. But a good feedback system can play a significant part in the complex of strategies necessary to counteract that potential. ■

Some Reflections on Teaching Evaluation

...continued from page 7

As Module Folders are thus thrice remote from teaching results, I would urge caution to be exercised when it comes to using them as a reference base in teaching evaluation. It is quite possible that a dynamic semester appears dull at its humble planning stage. It is also possible that a brilliant teaching manifesto never takes physical shape in the classroom. Consequently, it can be legitimately said that only a good teacher, not the best Module Folder in NUS, will guarantee a successful module.

Endnotes

1. The following thoughts were inspired by an email discussion in August 2000, triggered by Prof K.P. Mohanan, in the Department of English Language & Literature.
2. I was recently informed of a new Student Feedback scheme, in which the scale ranged from 1 to 5. Such a scale would reduce the rejecter's voting power by 25% at the expense of 50% precision. It would need three adorers to offset one rejecter. ■

Supporting Team Work in a Computer Science Course

Dr Gillian Dobbie

*Department of Computer Science,
University of Auckland/Formerly of School of
Mathematical & Computing Sciences, Victoria
University, Wellington, New Zealand*



While in university, students are told that they must do their own work and not copy others', and that they must work as individuals. However in industry, most software projects are not individual efforts, but are accomplished by teams of qualified professionals. This is because of the size of software projects and the link between teams and performance. Katzenback and Smith noted in *The Wisdom of Teams: Creating the High Performance Organisation* that "teams out perform individuals because they bring together complementary skills, create a situation where problems are solved more quickly, provide a social framework for working, and create a fun atmosphere in which to work".

To better equip our students for working in industry, we, at the School of Mathematical & Computing Sciences at Victoria University (Wellington, New Zealand), run a semester software engineering project course in which the students work in teams. We realised only recently that we were asking our students to work in teams without taking into account that they have had little experience of team work. As of 1997, we restructured the team work component of the course. To facilitate the team process, we now provide both direct and indirect support mechanisms.

Directly Supporting Team Processes

We directly support the team process by providing details of the experiences of previous students and presenting a lecture about team work. Teams can learn from the experience of others, especially when that experience is very close to their own. At the end of the course, students write an essay on 'Managerial Lessons Learned'. We put the essays on the web and ask current students to read the comments of past students.

Teaching students about the team process makes them aware of some of the difficulties they can face when working in a team. During the first half of the lecture, we cover how to set realistic project goals, wisely allocate tasks to team members, run meetings, manage time, and communicate and manage shared group documents (like meeting minutes and design specifications). We also describe the roles of both team leaders and team members. An invited speaker who has

extensive experience with teams in industry and academia conducts the second half of the lecture, giving a talk entitled, 'When Group Work Doesn't Work: What to Do About It'. Besides addressing problem areas, the speaker shares his methods for creating 'energised' groups. This lifts the discussion about the team process away from problems to rewards.

Indirectly Supporting Team Processes

We indirectly support the team process by providing timely technical assistance and the framework in which the teams are to work. Technical support is available from school programmers and a dedicated tool assistant. The programmers ensure that the programming environment is operational and both the programmers and tool assistant give tutorials about tools that are available to the teams. The tutorials are carefully timed so tools are introduced before students require them.

The process guidelines, stated clearly at the beginning of the course, include due dates for major documents and a marking scheme. The marking scheme rewards individual contributions to the team process, encouraging all team members to contribute to their team.

We define the team structure and provide each team with a client and a supervisor. An expert in the project domain, the client clarifies project requirements and resolves ambiguities as they arise. The supervisor acts as a mentor that guides, motivates and provides feedback to the team. Teams are required to choose a team leader.

A questionnaire that asks students to list their preferred team mates, skills and work habits is used in team formation. Based on the feedback, we assign students to teams. Similarly, students are asked to select their preferred project from a list of available projects. Providing a list of projects, rather than allowing teams to propose their own project, helps the team get down to work more quickly. The projects usually require students to develop software that is useful to someone in our school. Teams are more motivated if they are working on a project they are interested in and if the resulting software

Continued next page...

Supporting Team Work in a Computer Science Course

...continued from previous page

product has potential real use. We allow more than one team to work on the same project so no team is given preference over another when projects are allocated.

Conclusion

Students have found our course to be rewarding but exhausting. These comments (both positive and negative), from the essays on 'Managerial Lessons Learned', summarise the course experience for some students:

"All the hard work pays off...in the long term... I enjoyed the course very much and believe that a lot of that had to do with what the team and I made of it and put into it."

"[This course] will probably be the most stressful, headache inducing, time consuming, sleep depriving, rewarding, interesting and useful course you will ever do."

The course has been valuable to the students in many ways, but students often cite the team experience as being the most rewarding part of the course.

"I have learnt a lot from doing this course. Most of all, I learned a great deal about the management aspect of team work."

"The primary value of this course is not in the credits at the end of a semester. Its value is reflected in the exposure you receive to software project development in a team environment."

Almost all students make some comment about the value of having a team leader. This occurs even in a team where the team leader does not show strong leadership abilities.

We also carry out surveys at the mid-point and end of the course. Our main finding so far have been that: (a) learning to work as a member of a team is a necessary skill for computer science students; and (b) teaching and supporting the team process, both implicitly and explicitly, provides a better learning environment for the students.

References

1. Katzenback, J.R. & Smith, D.K. *The Wisdom of Teams: Creating the High Performance Organisation*. Boston: Harvard Business School, 1993.
2. Gersting, J.L. & Young, F.H. *Content + experience = curriculum*. Proceedings of the twenty-eighth SIGCSE (Special Interest Group in Computer Science Education) technical symposium on computer science education, 1997, pp. 325-329.
3. Proulx, V.K., Richard, R. & Fell, H. *Foundations of Computer Science: What Are They and How Do We Teach Them?*. Proceedings of the conference on Integrating Technology into Computer Science Education (ITiCSE), 1996, pp. 42-48.
4. Villarreal, E.E. & Butler D. *Giving Computer Science Students a Real-world Experience*. Proceedings of the twenty-ninth SIGCSE (Special Interest Group in Computer Science Education) technical symposium on computer science education, 1998, pp. 40-44. ■

Dr Dobbie was a Visiting Scientist at NUS' School of Computing (1 December 1999–31 January 2001).

The Real Estate Development & Investment Game Goes Online

Associate Professor Ong Seow Eng, Dr Sing Tien Foo,
Mr Ho Khee Kien & Ms Pearlyn Ang
School of Design & Environment

Introduction

The Real Estate Development and Investment Game (REDIG) was originally conceived as part of a research project undertaken by the Department of Real Estate (School of Design and Environment) and has since evolved into a valuable teaching tool. The REDIG was first developed in 1998 for the undergraduate module EM2108 Real Estate Finance where students participate as developers and investors in a simulated environment/economic experiment. The objective of the REDIG is for students to appreciate the risk of property development and investment, and how return is commensurate with risk.

Risk is often taught as if it is a static concept. Typically, risk is quantified in terms of standard deviation or variance, and further appreciated in a Monte Carlo simulation analysis.

However, no amount of statistical or simulation analysis can adequately communicate the concept of risk in real time; hence a simulated environment was needed for students to understand the meaning of risk.

Experimental Design

The basic experimental design is to structure the students into two cohorts: developers and investors. Developers acquire land, develop and sell the completed property units to investors. The objective of developers is to maximise profits. So do investors, who purchase and sell property units with the objective of reaping capital gains and income. Each game comprises several discrete time periods and students are evaluated over at the end of the game.

The main stochastic variable is property price. A prevailing property price is ascertained exogenously each period and

announced to all participants at the start of the period. The prevailing property price reflects the price of property transacted in the secondary market and is not determined by the developers. Developer pricing is thus differentiated from the prevailing property price in that developers ascertain the prices of new properties while the prevailing price is market-determined. Needless to say, developer pricing must be guided by the prevailing price.

Relevance & Role of Games in Teaching

After the inaugural game in 1998, a follow-up survey was conducted with the participants of the REDIG to evaluate the relevance of the game in helping students appreciate certain concepts in property investment and development, and to elicit students' perception on the usefulness of such a game in teaching.

Relevance of Game

Students were requested to rate the relevance of the game (10: very relevant; 1: no relevance) in respect of understanding:

- Risk
- Return
- Role of Income
- Role of Financing
- Role of Capital Gains
- Attitude towards Risk
- Timing of Purchase/Sale
- Pricing Strategy (for developers only).

Figure 1 shows the mean (simple average) rating. All categories show mean rating in excess of 6.5, and in fact, the mean rating exceeds 7 in 6 out of 8 categories. Figure 2 shows the distribution of ratings by way of histograms. It is clear that the histograms are highly skewed to the right. In particular, students evaluate highly factors such as risk, pricing strategies and timing.

Role of Game in Teaching

Next, students were asked whether the extent to which they agree with statements pertaining to the relevance of the game in teaching (10: strong agreement; 1: strong disagreement). The statements are:

- The game is a valuable teaching and learning tool in real estate development and investment.
- The game complements and enhances the typical lecture/tutorial teaching format.
- The game is a better medium in learning about risk than the typical lecture/tutorial format.
- The game should be integrated as part of the real estate course.
- I would like to participate in future games.

Figure 1: Relevance of Game: Mean Rating (10: very relevant; 1: no relevance)

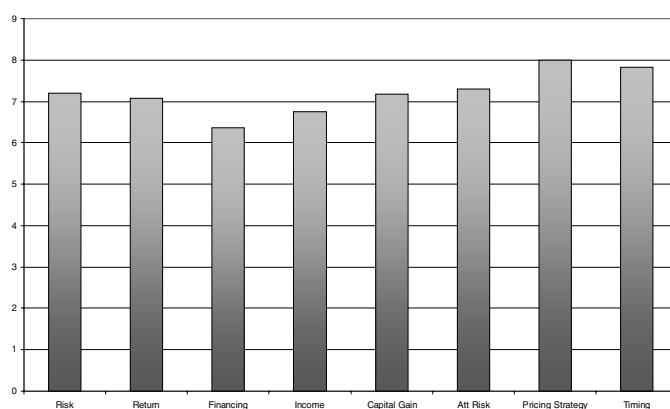


Figure 2: Relevance of Game (Histogram)

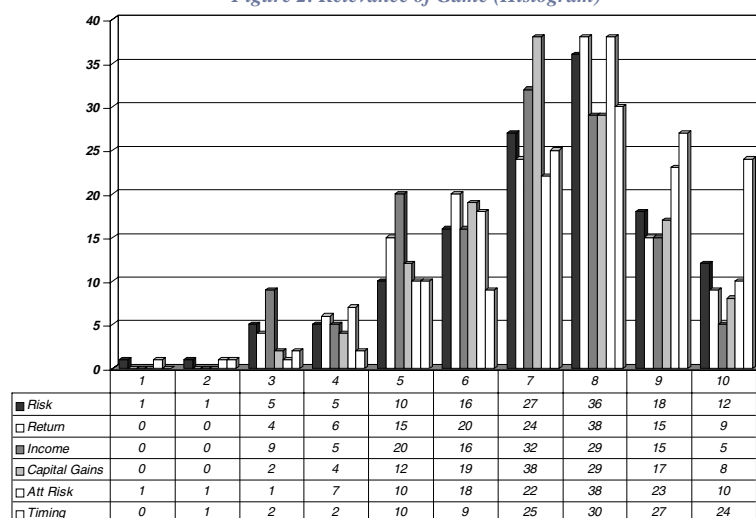


Figure 3: Extent of Agreement: Mean Rating (10: strongly agree; 1: strongly disagree)

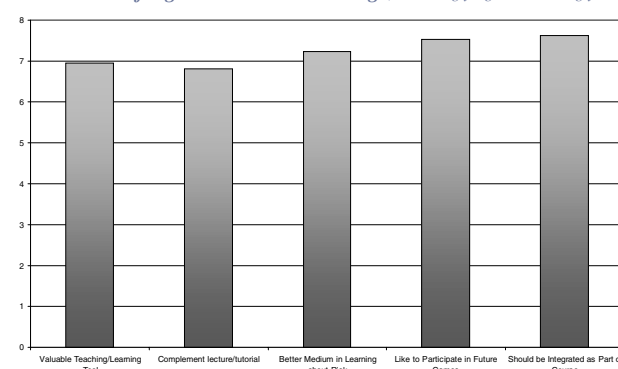
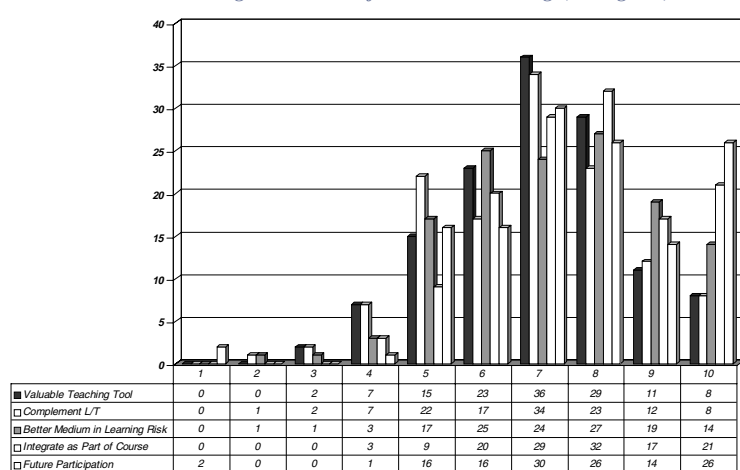


Figure 4: Role of Game in Teaching (Histogram)



Continued next page...

