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In the current push to use new technologies in the area of teaching and learning, perhaps it is time to take a step back and reflect on the pedagogical pros and cons of such efforts. In this issue of *CDTL Brief*, we present several viewpoints on the topic of **Fundamental Teaching Skills in an IT Age**.

Helping Students Learn in the IT Age

Assoc Prof Daphne Pan
Director, CDTL

At NUS, much effort has gone into helping teaching staff to become IT-competent and incorporate IT into their teaching. But as we move away from the traditional, face-to-face classroom scenario, perhaps more needs to be done with empowering students to learn in the new environment.

Since students are often more IT-savvy and better equipped technologically than their teachers, more help is needed in enabling them to know how to learn and to accept learner responsibilities. Although we as teachers may be very clear in what we want to achieve, nothing may materialise if there is a gap in teacher/student expectations.

Awareness

The past decade has introduced major changes in pedagogical assumptions. Most notably, the shift from teacher-centred to student-centred approaches has demanded the re-orientation in curriculum and course design decisions. With the teacher's role becoming a facilitator of learning, not only is expansion/modification of instructional skills needed, but also training students to play a prominent role in the teaching/learning transaction.

Coming to us from the schools, our students should be persuaded that they have to actively participate in and contribute to their own learning. In today's rapidly changing world with its information explosion, they must grasp that real learning is learning how to learn so that they can become life-long learners able to refresh the short shelf-life of knowledge. We should essentially stress that though their formal education may be completed at the university, their informal education will never end and will actually become more significant. 'Spot on' learning – an acronym coined by MINDEF for 'self-paced on time on need' learning – is essential for life-long employability.

Skills

Independent learners need certain skills. Arguably the two most important ones are:

a) *Self-management*: With IT promising any time, any place learning, the potential for becoming independent learners is greatly enhanced. As the teacher lessens his/her control of the learning process, learners need to be more disciplined

and have greater self-management. The abundance and increasing sophistication of IT-enabled resources bring growing distraction: video, audio, interactivity, and dizzying speeds may spoil learners, and what are perceived as boring tasks – e.g. learning the fundamentals – could end up being only a mouse-click away from extinction. Self-discipline and intellectual rigour must thus be inculcated.

b) *Learning management*: Learners must know what to learn, how to learn, and have the ability to evaluate their own learning processes, i.e. cognitive as well as metacognitive skills. Generally, our students are good at learning information, either by rote or with understanding. They have learnt strategies such as identifying key ideas, making notes, organising and integrating new material learnt to facilitate recall, making connections and using images and other mnemonic devices. What is needed is a greater degree of reflexivity, the habit of reflecting upon what they are learning and monitoring how they are learning. Knowing something about intelligence and its management – Robert Sternberg, for instance, posits a theory of triarchic mental functions¹ – would be useful. One could then check to see if one has understood what is being learnt, acquire a repertoire of strategies and understand which strategies work best to facilitate the learning of different materials and for different purposes and contexts. One would also know how to use and manage time to best effect.

Training

a) *Change mindsets*: Take the time to clarify for students the rationale for the paradigm shift and the concomitant expectations. Reinforce through the way you teach and examine.

b) *Build confidence*: As in parenting, if we don't ease up on control and devolve more responsibility to students, they'll never learn. Include them in designing the curriculum and assignments, consult them on the conduct of classes and, perhaps, involve them even in the assessment process. For instance, student-generated examination questions have been experimented with and research suggests that this approach helps to improve learning, with the examination serving to do more than test mastery².

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- c) *Encourage reflectiveness*: Train students to think for themselves by:
- Habituating them to ask questions and engage with what is being learnt;
 - Assessing them in ways that rewards the reflective habit;
 - Setting questions that demand more than recall of information;
 - Helping them to recognise barriers to learning;
 - Providing opportunities for clarification and negotiations;
 - Introducing good practices that will stimulate productive reflection (e.g. the keeping of a learning journal);
 - Ensuring that there is time/opportunity for reflection.
- d) *Develop collaborative skills*: IT provides huge resources as well as the means for learning from and working with others. Our school system tends to encourage competitive rather than co-operative learning, but the workforce we are preparing needs to work as teams. More than ever, knowledge is a social construct, built through collaborative efforts and dialogue among persons with different perspectives. In an IT-connected world, distributed solutions will probably be the norm. To encourage a collaborative mindset, we could, for instance:
- Use team projects with assessment based on team rather than individual performance;
 - Socialise learners into acceptance of and respect for viewpoints other than their own;
 - Be a role model for good interpersonal skills.

Conclusion

“The illiterate of the Year 2000 will not be the individual who cannot read and write, but the one who cannot learn, unlearn and relearn.” (Alvin Toffler)

Even before the Year 2000 it is evident that the IT age makes its own demands: it creates new tools with undoubted potentials as well as problems. We as teachers cannot go on teaching the way we have always done; nor can learners continue with doing more of the same. The paradigm shift requires changes not just of degree but of kind, not just doing things incrementally better but differently, not only thinking critically but also creatively. Meeting these demands will not be easy but it has to be done. And it can be done, with a clear sense of our mission, substantiated by clear precepts and practice, driven by conviction and commitment and with institutional support. ■

References

- ¹ Sternberg, Robert (1988). *The Triarchic Mind: a New Theory of Intelligence*. NY: Viking Press.
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Why IT Can Never Replace The Lecturer

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IT, when used for the purpose of teaching and learning, is able to perform some functions that lecturers are unable to fulfill. For example in engineering, animated examples of certain machinery can be demonstrated to students without having to visit the actual mechanical plant. All kinds of graphics, both in static and dynamic forms, can be displayed, somewhat akin to how Disney cartoons are made. Students can still communicate with lecturers after office hours, as well as with each other, by using IT facilities. Consequently, education is increasingly being freed from the confines of the classroom.

As IT can be used in almost endless ways, does this imply that the role of the lecturer is henceforth diminished? In my opinion, lecturers are still irreplaceable, no matter how advanced and powerful IT may become. Fundamentally, the lecturer is a human being, and only a human being can inspire another human being. As a living, thinking being, the lecturer can be a mentor who gives advice and expert counsel, a friend who communicates on equal terms emotionally and empathises with students in times of difficulty. In contrast, is it possible for students to identify with a robot, computer, or some inanimate system in the same way?

Furthermore, as an invention of human beings, IT programs are limited in scope and content by their respective designers as well as require regular maintenance, updates and revision by man. This is unlike the human brain that can store virtually a limitless amount of information and perform complex functions in an innovative manner. Consequently, there is no teaching program that is so comprehensive or flexible enough to be able to answer all the questions and needs of students.

Therefore, the lecturer is an indispensable commodity that cannot be replaced by IT. Yet, he/she should try to take advantage of IT by investing time and effort to learn as much as possible about its possibilities so that the latter can serve him/her whenever the need arises, in the same way as a servant serves the master. Since a servant should never be greater than the master, so IT should never be superior to those who use it. ■

Computer Technology at NUS: Some Reflections

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Recently, NUS has embarked on a very ambitious project to use computer technology campus-wide. In research, academics have been given generous upgrades of computers. In administration, more and more services are being put on-line to allow for quicker and more efficient turnaround. But it is in the area of teaching and learning that the greatest improvements have been made. Professors can now deliver lectures via the ubiquitous PowerPoint presentations or more esoteric ways like video-on-demand and other special Internet relay methods. In some instances, the introduction of email has facilitated closer communication and better learning between students and professors. The latest project to install hundreds of plug-and-play (P&P) points all over campus and equipping each student with a laptop has made available the World Wide Web to thousands of students.

With all these advancements, many academics are asking the following: Have academics really improved their teaching and research? Has the learning and thinking abilities of students improved?

Have I, as an academic, really improved my teaching and research?

My personal answer to this question is debatable. Granted that I now write faster on a machine, access information more quickly through the Internet, and have speedier answers to my queries with local and foreign colleagues through email, I cannot say I am really more productive. For instance, the ability to access INtv, CNN and BBC World via the computer is a potential distraction from real work. Also, how important is it that BBC or CNN is available to us and do such facilities really add to our knowledge?

With regards to email, it is extremely useful to be able to keep in touch with anyone 24 hours a day anywhere in the world. But junk email often fills our mailboxes. With the ease of bulk sending of email, the tendency for many is to send to everyone with no thought of its value to the receivers. It has placed the decision to act on them on the receivers, resulting in the loss of valuable time for many people.

Email also slowly corrupts our own patterns of writing and thinking. The ease of composing and sending email encourages us not to construct our thoughts succinctly and fully in our minds first before inputting them into the computer. In short, our minds become lazy. We usually are not bothered because the consequences are

so subtle that most are unaware of it; and even if we are, the convenience is so overwhelming that email is still preferable to pen and paper. The long-term consequences of such debilitating effects can only be guessed at.

Has the learning and thinking abilities of students improved?

It is in the area of learning and computer use by students that I fear the assumed benefits have not materialised. Instead, many harmful effects have ensued. Take the case of report writing. The ability to embellish a report with different fonts, pictures and colour tempts students to spend so much time on such activities, that they frequently forget the aim and content of the project. The writing is often bad and the flow of ideas is inconsistent. The output looks beautiful – but it is mostly form and little function. Is this the way we want our students to turn out? I for one have prohibited students from using any forms of embellishment; they are to pass up only neatly typewritten black text on normal white paper. Many students resent this. I agree the process of ornamentation can be fun and exciting, but is it really useful?

The same is also true of presentations. With Microsoft's PowerPoint software, the ability to decorate a presentation is limitless and the time spent boundless. Again, many students often forget the presentation's purpose is to use the force of their personalities and oratory, and not a beautiful slide, to convince their audience. Many lecturers are caught in the same mire too.

The most insidious aspect of computer technology and its use at NUS is the Internet. Everyone is so caught up with its 'advantages' that no one is receptive to the idea that the effects may be harmful. It is assumed that the Internet can improve students' learning because a lot of information is available at one's fingertips. The intent of the P&P campus-wide network is to enable students to learn quicker and cultivate their thinking skills. But is this really true or is the opposite more likely – that students spend time on the net chatting, surfing for triviality or salacious matter, and in general, being entertained rather than informed? I believe the latter is closer to the truth.

The ease of Internet access has made libraries largely redundant for students, with pernicious consequences to students' thinking and independent research skills. A typical student report these days contains a host of Internet references,

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but very few book or journal references obtained from a library. But it is known that the Internet is an anarchic jungle full of material that has not been vetted or edited by anyone, unlike journals and books. For instance, recent incidents in Indonesia have shown that a lot of information published over the net can actually be false. Because it comes from a computer and is attractively packaged, one tends to believe that the facts are accurate and quote verbatim off the net. Students, as observed from their reports, often lacked the necessary sense of discrimination. They cite volumes of information from the net and when asked why certain facts are wrong or inconsistent, they often reply: "But sir, I got it from XXX web site. How can it be wrong?" What has happened to the critical thinking abilities of our students that is so much vaunted on campus nowadays?

The 'cut and paste' practice of students is another disturbing trend. As perceived from many students' reports, large chunks of writing are obviously lifted straight from some web site as the flow of ideas is often inconsistent and the writing style totally different. The ease of copying and pasting makes such plagiarism highly tempting. This is unlike working in a library, where effort is needed to search

for information and one must be discriminate when lifting passages, making the resulting learning stronger and the retention often longer. In contrast by often using the Internet, students may not be exercising their minds as much. The Internet provides an overflow of information that is unnecessary for critical thought and a sharp intellect. Less information but more critical examination of it is more important. But the former tends to be emphasised at the expense of the latter. Is this a healthy trend?

Conclusion

I would like to emphasise that I am not a Luddite extolling the dangers of new technology. I am very comfortable with new technology: I teach such subjects to Business students and am often a leader in its use. What I am cautioning is more discretion and discrimination. The whole country, not just NUS, is pushing technology to such great extents with the notion it will save us from all ills and put us at the pinnacle of development. What is often not discussed or deliberated are the harmful and less useful effects that should be given more attention. ■

IT Showcase

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During the Induction Programme for New Teaching Staff (25 February 1999), an IT showcase was held in the CDTL Computer Workstation where the participants could log on and access the web sites that were being described by the three presenters. A/P Ang Kok Keng (Dept. of Civil Engineering), A/P Edmund Lee (Dept. of Pharmacology) and Mr Aaron Tan Tuck Choy (Dept. of Computer Science) each gave a thirty-minute account of their experience developing their respective web sites. They also discussed issues relating to the use of IT for teaching and learning.

A/P Ang gave a very comprehensive overview of the development process in the design and production of a web site for an educational purpose. He highlighted the need for a multidisciplinary team approach where in real life one individual may need to take on various roles and responsibilities to ensure that all development tasks are addressed. He also touched on the advantages and disadvantages of using IT for teaching and learning before showing his own course web site located at <http://www.eng.nus.edu.sg/civil/Class/EG1101/index.html>.

A/P Lee brought up the issue of designing web sites that could motivate students not only to access a site on a regular basis, but also to promote further inquiry in related topics. While taking the showcase participants on a tour of his web sites, issues such as the use of copyright material and linking to other sites were discussed. To view A/P Lee's web sites, check out his "Cardiovascular Pharmacology" at <http://www.med.nus.edu.sg/phar/medlect/CVPharmacology.htm> and "Pharmacology In The News" at <http://www.med.nus.edu.sg/phar/medlect/PINintro.htm>.

Aaron Tan talked about moving away from the traditional mode of static, one-go, centralized and localized learning environment towards a dynamic, reusable, distributed and portable model. He exuded the passion and pride of creating his all-inclusive and very detailed course web site (CS1101C – Programming Methodology in C). Participants were shown examples of Java and animated algorithms, on-line quizzes and Lecture-On-Demand (a School of Computing initiative). Mr. Tan's course web site can be found at <http://ivle.nus.edu.sg/ivle/search/template.asp?courseid=CS1101C> and the School of Computing – Lecture-On-Demand at <http://www-lod.comp.nus.edu.sg>. ■

Fundamental Teaching Skills in an IT Age

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Under the traditional model, a teacher tasked with undergraduate/postgraduate instruction plays a gamut of roles. This ranges from the designing of a course, delivering of lectures from information gleaned from readings, research and experience and acting as discussion moderator, to acting as an evaluator who prepares and evaluates tests and decides the extent of students' mastery of his subject. How has the advent of the Information Technology age simplified or modified his role?

In this context, 'Information Technology' refers to the use of computers, video and telecommunications technologies. In the area of teaching and learning, the use of IT generally falls into three categories: tools and resources for learning by doing, time-delayed exchange, and real-time conversation. The advent of the IT Age raises several difficult questions for teachers. To what extent should the fulfillment of the above roles and the traditional paradigm of verbal dialogue and contact between teacher and student be replaced? Should newer and more 'hi-tech' methods of instruction (which are frequently more impersonal) which focus on learning rather than teaching become the norm? Will the teacher recede from being 'sage on the stage' to 'guide on the side' and eventually just about disappear from students' view in the face of web sites, on-line lectures, video-on-demand, video-conferencing, CD-ROMs, email, bulletin boards, news groups etc.? While it cannot be gainsaid that new technologies could take over many of a teacher's traditional instructional duties so that his time can be better utilised, is there still a case for developing non-IT related teaching skills?

I firmly believe that there is an indisputable case for the development of non-IT based teaching skills and that some of these teaching skills will remain the core qualities of effective teachers. One of the most important attributes of exemplary teachers is effective communication skills. The importance of the ability to express ideas clearly and in an interesting and stimulating manner (particularly of a difficult topic) in a lecture cannot be understated. This skill still has to be honed. In addition, establishing and maintaining eye contact with students during a lecture often serves as an important (but informal) 'feedback' mechanism to the teacher to assess how his lecture is progressing. Such a lecture may of course, be accessible to students as 'on-line' lectures, or be viewed by a student on video. However, pre-packaged materials, even those with catchy graphics and visuals, lack the spontaneity of live lectures. Further, there are advantages in frequent contact between student and teacher both in and out of class, as these will certainly aid in student motivation, involvement and development.

With regard to tutorials and lab-based teaching, the presence of the teacher to guide, direct and stimulate discussion and learning within a group of students yields benefits which are difficult to attain outside such a 'real' (as opposed to a virtual) setting. For example, collaborative learning increases involvement in the learning process and the sharing of ideas and responses improves thinking and deepens understanding. The tutor will play a pivotal role in the direction a discussion takes by assisting to analyse and synthesise information. It is this very involvement and directive skill of a tutor that must be acquired and developed to yield optimal results in the learning process.

Thus, a consideration of just *one* non-IT based teaching skill, that is, the importance of effective communication, reveals the reasons why there is still a case for the development of non-IT based teaching skills in the face of IT. However it is incontrovertible that one's teaching skills may be enhanced by IT, the extent of the enhancement often depending on the nature of the subject being taught. One of the subjects I teach is the Law of Real Property. Students often email their queries to me and I usually email brief responses to their specific questions arising from case studies posed in tutorial questions. I know that what students *really* want from me are 'model answers' but providing this (if there is such an answer) is undesirable, particularly for a subject like Law. Formulating *one* answer to a case study posed in a tutorial question could never replace the cut and thrust of a 'real' discussion among students in a class, where I would also be able to spontaneously 'twist' or add to facts posed in the case study to test students' levels of understanding. This would also develop students' creative skills, as they would be required to think on their feet and respond immediately. This exercise also serves to enhance *students'* communication skills.

Thus my premise is that doing away with, or even minimising, human contact in teaching (which would be the inevitable effect of inappropriate or excessive reliance on IT) is undesirable – after all, CD-ROMs and web sites could never be as effective as students' contact with academia. Surely, effective teaching cannot be equated (or downgraded) to inserting a disk and downloading information! However, there is no doubt that the full power of new technologies may be effectively harnessed if they are employed in ways which complement non-IT based teaching skills. While integrating IT into teaching, it must be borne in mind that teaching and learning should drive the use of technology, and not vice versa.

The following observation by Robert C. Heterick Jr., in "A Platonic Paradox", *Educom Review*, (1996) Vol. 31 No. 3, articulates this idea well:

"At the heart of the academy lies learning. And, lifelong learning lies increasingly at the heart of our society. We need to begin to redirect our energies from condemning the new and exalting the old to finding how to take the best features of the old, marry them with potential of the new and create new paradigms for a learning society. In doing so, we will take the academy to new heights of service to society..." ■

Is IT It?

**Asst Prof Helmer Aslaksen
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There's currently a lot of talk about the use of Information Technology in teaching at NUS with the assumption that IT is good. I'm a strong advocate of IT in teaching, but I believe we must realise that IT is no panacea, and that not all of its use is effective.

I started using Computer Algebra Systems in my classes in 1993; I put up my first course web page in 1994; and I set up a calculus lab in 1996. I'm also very interested in language learning, and I have been following the development of language learning software closely. I'm very excited about the way computers enable us to do things we couldn't do before. Yet people are using computers to do things there was no reason for them to do in the first place.

First of all, the focus must be on teaching, not IT. A lot of courseware looks incredibly flashy, and is obviously designed by expert graphic designers and programmers. But are there clear pedagogical goals or are they just trying to show off? For example, most language learning software allows you to record your own voice, and look at a graphical representation of the waveform. What exactly is this supposed to teach you? If you are learning Chinese and need help with the tones, you need a program that can analyse the pitch. This is totally different from looking at the waveform and requires powerful specialised programs.

Thanks to the current fascination with the web, some people seem to think that the way to be world-class is to create a course web page. I believe that the web is a great way to make information available to the students, but does any actual learning take place on the web? It's very rare that I see a web site that I believe students would learn much from.

IT shouldn't become an excuse for poor teaching. With the current talk about putting our lectures on-line, I would be praised highly by the administration if I do so. But what if my lectures were not very good in the first place? Are our lecturers so good that they are worth recording?

A sure way of improving your course evaluations is to type out your lecture notes and give them to the students. Instead, I prefer to start the semester by saying that if they want something nice-looking to read, they should buy the textbook. In the past, the university seemed to agree with me, but now the attitude seems to be that I should put the notes on the web.

At the moment, it is possible for technologically savvy people to be rewarded for doing things that the administration supports, even though the pedagogical value might be questionable. Some non-IT inclined people are often afraid of disputing the value of IT in teaching for fear of being seen as 'backward'. Some people who are involved with implementing IT realise that this is good for their career, and are reluctant to rock the boat by questioning what is being done. Another problem at NUS is that most IT projects originate from people high up or the Computer Centre, unlike at American universities where new IT projects are usually implemented by dedicated staff members who want to use it in their classes.

Another rarely mentioned issue is the way IT changes the content of what we teach. In mathematics, computers have had a dramatic impact. Some techniques that used to be crucial are now no longer as important, while several topics that previously were beyond our reach, have now become manageable thanks to computers. Our teaching should reflect this new reality. The increased use of computers in a wide range of fields means that people need more mathematics, presenting a golden opportunity for mathematicians. But we must be open-minded, and teach the mathematics people really need, not just topics that were important when we were students.

Despite the above reservations, there is at least one productive use of IT in teaching. Over the years, I've spent more and more time answering email from my students. I've now started an electronic discussion forum for my class. My answers are now available to all my students, and it's easier for me to justify spending that much time answering questions. The discussion forum is an example of how IT is only useful if it reinforces already good teaching. If you just want to scare the students away so you can spend all your time on research, then there's no point in setting up a discussion forum. It will only be of use if students feel you are approachable and helpful.

The true potential of the forum will only be achieved when it becomes not just a way for me to communicate with the students, but a way for the students to communicate with each other. I personally believe that encouraging active learning is one of the main challenges facing us here at NUS. However, for active learning to flourish at the NUS, we need a totally different attitude among students, staff and administrators. ■



The [Centre for Development of Teaching and Learning \(CDTL\)](#) provides a wide range of services and facilities to support the teaching, learning and research programmes of the [National University of Singapore](#).

These include teaching and learning support, research on educational development issues, as well as instructional design and development.

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