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Integrating Information Technology into Teaching and Learning of City and Regional Planning[1]

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"Malaysia needs to make the critical transition from an industrial economy to a leader in the Information Age. In order to make this vision a reality, Malaysians need to make a fundamental shift towards a more technologically literate, thinking work force, able to perform in a global work environment and use the tools available in the Information Age. To make this shift, the education system must undergo a radical transformation. The schooling culture must be transformed from one that is memory-based to one that is informed, thinking, creative and caring, through leading-edge technology."

*"*Smart Schools in Malaysia : A Quantum Leap*"*
Ministry of Education, Kuala Lumpur, January 1997

Introduction

The Smart Education Project is a Malaysian initiative modelled on International best practices to position our workforce for the Information Age where the workplace has no physical boundaries (global) and where information and communications technology (ICT) is not merely a preferred choice but the indispensable tools and medium for the knowledge worker.

The focus of the Smart School programmes are however on pre-University education. This has two major implications for University educators. Firstly, Universities themselves must prepare for an influx of *smart students* who may have spent their previous 12 years in an IT-based learning environment. This will take at least one generation (most likely several generations) and the process will be gradual but is already evident with current students being more IT-conversant compared to students two years ago. Universities must restructure their curriculum, teaching and learning methods and prepare the infostructure to make itself relevant for its clients. The second major implication is that the majority of students who will continue to be enrolled at the University for the next 10 years (or so) will be neither IT-literate nor equipped to handle a self-driven student-centered learning approach critical towards producing life-long learners for the knowledge economy.

Within this scenario, several initiatives were implemented to integrate IT into the culture of teaching and learning. Two major initiatives are reported in this

[1] We use the term "city and regional planning" to be inclusive of "urban planning", "town and country planning", "urban and regional planning" and the various other directives of similar fields of study.

paper. The first is the *Web-based Learning Project* with more than half of the academic staff of HBP participating. The second initiative involves the integration of IT into studio-based planning projects where various appropriate software are required to be used by the students.

This paper is not about tapping the web for eLearning or distance learning *per se* even though the Web is an integral component for integrating IT in the teaching and learning of city and regional planning. There are three major areas of concern in this paper, namely:

- Using IT by teachers (instructors) for teaching
- Using IT by students for learning
- Using IT for carrying out planning projects

In this effort, our goal is to make IT "a way of life" or "culture" for future planners. To achieve this we have incorporated new approaches to teaching and learning which will sustain a process of continuously upgrading of their skills throughout their career.

A REVIEW TEACHING AND LEARNING METHODS

Currently, no concerted effort has been made to officially review the planning curriculum[2] to make it IT-relevant. The effort so far has concentrated on introducing special IT courses such as "computer applications for planning". These standalone courses are meant to provide specific skills in GIS, databases, electronic spreadsheets, etc. Other courses continued to be conducted in the traditional modes. Whether IT is used to facilitate teaching is entirely the prerogative of the lecturers. Even for techniques and methods courses, IT is not an integral component of the course. The following is a brief review of teaching and learning methods, primarily from more than 15 years of personal experience in academia in Malaysia but many the issues may be relevant for many countries and universities around the world.

Teaching Methods

The most common method for imparting knowledge is the ***informative*** method (or direct-teaching approach) in which the teacher presents information to the students in a one-way flow (from teacher to student). In the extreme, it involves the lecturer/professor standing in front talking to the students for the entire length of the lecture without student participation. The less motivated amongst the lecturers would merely read from their prepared notes or speak off-the-cuff. It is not uncommon for lecturers to shun student "interuption" (students are reprimanded for asking difficult questions or no opportunity is given for the student to ask questions). On the other hand, some lecturers encourage student *participation* in the form of questions-and-answers session to elaborate and explain the subject matter and the lectures are presented with well-prepared teaching aids and graphics (including multimedia

[2] We refer to Malaysia.

presentations). Nevertheless, the informative method of teaching does not promote self-discovery but emphasises absorption and retention of facts and figures (which of course is necessary to provide a sound foundation on theories and concepts which will in turn be used for further exploration and application).

The other two major methods are ***participative*** and ***participative-experiential***. Students may be assigned a term paper in which they have to research a topic and submit a write-up. This approach allows the student to acquire the skills of research, analysis and drawing conclusions. Typically however, students end up copying from "seniors" or extract portions directly from books and journals. It takes a diligent lecturer to critically review and comment on the students' reports and (more importantly) permit the student to improve and resubmit a re-write. Given the opportunity to re-write and re-submit some students would consider it as additional burden. Other students would complain that they learnt "nothing" from an assignment because of the lack of feedback from lecturers. A student could go through an entire university programme submitting numerous assignments but not knowing what mistakes were made or why he/she deserved the A awarded.

Other forms of participation include tutorials, group discussions, seminars, workshops and forums in which students may be required to do background reading and come to class and contribute ideas, insights or challenge entrenched views and values. A major obstacle is the **universal fear** among students (at least, students we currently have in Malaysia) in not wanting to "make a fool of themselves" when they open their mouths to speak in front of their classmates or imminent (fearsome) professors. They fear that their views or opinion may sound stupid or irrelevant or lack sound arguments and facts. Cultural norms (respect for elders and deference to people in authority) as well as prolonged conditioning in primary and secondary schools (pre-university) help to suppress the desire to challenge established "facts" and practice or to innovate and be creative. Students entering universities have no training in critical analysis and independent thinking. Most have not had the opportunity to publicly debate issues or take and sustain positions and point of views. In the past, the Universities and Colleges Act had also been blamed for discouraging students from taking positions and actively articulating those views. However, the authorities have generally relied on this Act to curtail student involvement in politics outside of campus but the fear of putting our the wrong foot may have contributed towards being quiet, preferring to “play safe may be when they are in class”. Students find it difficult to prepare for these form of participation. Even after numerous reminders (and threats), a large majority of the class failed to read the suggested text. Lecturers and professors are not without blame. Many feel threatened or embarrassed if students explore topics and subject matter which the professors are themselves unfamiliar with and are therefore unable to engage in a meaningful open academic discussion. Worst if the student exposes the professor’s mistakes and errors of facts. Then again, many professors are "forced" to teach subjects which are not their areas of expertise due to poor human resource planning and management. Students and lecturers often resort to or refer to the same lecture materials over and over again, for as long as the

same lecturer teaches the course. An even worst situation is when notes and aids from the previous lecturer is passed on and reused by succeeding lecturers with little or no changes. This is sometimes attributed to lack of 'physical' resources in the library or the lack of incentive (otherwise referred to as 'laziness') to seek for new materials.

Experiments in laboratories, fieldwork, projects in design studios and coursework are some of the commonly used methods for students to experience a situation as close-to-life as possible. The aim is for the students to learn or sharpen their skills, to apply theoretical knowledge and concepts learned in lectures when they carry out actual work (life projects).

Many such projects suffer from a lack of expressedly stated objectives in terms of the skills which the students are supposed to acquire or the knowledge which should be applied in carrying out the projects. There is also often a mis-match between when the lecture-based courses are offered and their supposed application in studio projects. For example, students given their first residential layout (planning) project should be required to first understand the planning methodology, process and techniques as well as the theoretical and conceptual ideas of creating a community. They must then apply these knowledge to design the layout. Another example is report-writing, a necessary skill no matter what discipline or medium of communication (hardcopy or electronic). Every such assignment or project involves identification of the topic or subject matter or issues, information or data gathering, analysis, synthesis and drawing conclusions. It also entails organising the materials into acceptable formats or styles with particular attention to issues of copyright, plagiarism and requirements for academic report-writing including the substantiation of findings and conclusions based on data. In other words, to write the report, the student must know how to undertake the task.

It is a constant amazement (and disappointment) to hear students claim that they "learnt nothing" the previous year or semester. Either the professors failed to communicate the objectives of the lessons or the students managed to deliver a product without acquiring the necessary skills and will therefore be at lost on how to proceed when given a similar project in future. Even if the objectives are clearly stated in the project hand-outs, it must be continuous emphasised throughout the duration of the project and form a basis for assessment. The students must constantly focus on what is it that they are supposed to learn and there must be continuous feedback and assessment to ensure that the objectives have been achieved. Delivery of a finished product does not mark the completion of a lesson.

Often, the students claim that the courses did not cover the subject/topics in the classes they had taken. However, on being pressed, we often find that the subject or topic had been covered but at such a superficial level that the students consider it has "not covered". It is a reflection of student's total reliance on lectures for knowledge with very little time and importance placed on further reading and investigation by the students themselves.

Various techniques are available to facilitate teaching including: rehearsal of previously covered points; question-and-answer sessions; demonstration; exposition; allocating task; monitoring work; reviewing lessons; summarising key concepts and facilitating reporting-back.

The question is, how many (non-education) professors/lecturers are motivated to apply the various techniques or methods to facilitate and promote learning? If we rely on informal feedback from students, only a very small percentage of professors/lecturers do. Most lecturers are satisfied if they have overhead transparencies or chalk and white board markers to deliver their lessons.

Delivery of Lessons

In the era of information and communication technology (ICT), we should not view with distain the time-tested medium of delivering lessons - chalk and blackboards, or the more current markers on whiteboard. They provide spontaneity not available in most other medium of delivery.

Another popular medium is the overhead transparency which allows the lecturer to draw attention and focus on key concepts or points. They help to provide the lecturer with a planned flow, covering all the important points and saves time because he/she does not have to copy lengthy quotes on the blackboard. The drawback is that there is a tendency to try to focus on providing sufficient notes for the students to copy which in turn leads the students to focus on copying notes rather than listening to the lecture. At the end of the lecture, students not fast enough in writing down notes will approach the lecturer to "borrow" the transparency to make photocopies. Some lecturers will modify the transparencies and convert them into lecture notes for distribution.

As a result, the objective of most students during a lecture is to copy every single word from the transparency or board rather than to reflect on the subject matter. A primary reason for this is the students' dependence on comprehensive lecture notes to pass examinations. Even when a question requires a critical evaluation or analysis of the subject or topic, it is quite common to see parts of the whole lecture written as answers in exams.

Sophisticated, state-of-the-art information technology such as multimedia slides (the ubiquitous PowerPoint) will not solve this problem (students now ask for the digital version of the "transparencies"). To overcome this problem, we must examine two issues :

- **Are lecturers good teachers?** There are numerous medium to deliver lessons but the professor/lecturer must be able to hold the attention of the students for a sufficient period of time to convey the concepts, ideas or knowledge. This involves not only lesson-planning but communication skills which must be developed and horned.
- **Are students good learners?** Rote learning and memory work is the hallmark of our education system. From primary and secondary school and even until tertiary education, students are not given the opportunity

> to be creative, to explore individual talents or to pursue personal academic goals. There is an over-emphasis on grade as the benchmark of success resulting in students studying to pass exam, not to acquire knowledge.

Academic staff generally do not have formal training as educationist but are nevertheless expected to teach. Presumably, their indepth knowledge of their field of expertise and their record and achievements in research are sufficient credentials.

As we move inevitably closer towards fully assimilating and integrating ICT into teaching and learning, more mediums for delivery become available but they must be accompanied by major shifts in the way we approach teaching and learning. For instance, it is very easy to merely transfer our lecture notes to web-based formats (even with full-multimedia) but it only provides faster, more ready and easier access to a wider audience. It is only a first step. Interactivity can be built-in and students led through alternative routes or scenarios in a self-paced learning mode to acquire basic skills and knowledge which do not require human intervention.

But the new delivery channel (in particular the web and its associated technology) must be exploited and tabbed to produce a new generation of graduates who treat education as a life-long venture and are motivated towards self-discovery guided by personal goals. Future generations must be able to critically evaluate and analyse information and then draw logical conclusions from the analysis.

Apart from disseminating information or knowledge, the web is an excellent medium for teacher-student and student-student interaction and communication. This can take the form of academic discussions through on-line electronic forums, email mailing list or collaborative web-based projects. For instance, students involved in a studio project could be set targets and objectives in terms of the skills and knowledge to be acquired through the project. They will then maintain a web-site as a team effort, with members assigned specific task, each responsible for updating their components on a continuous basis (even daily). The students are challenged to explore integration of new technology into their projects, they are required to plan and schedule their project milestones and work towards attaining them. They can also be party to the assessment process, suggesting the criteria for evaluation which in turn become an objective which they will strive to achieve. On the part of the lecturers, they will continuously monitor their progress through the websites and provide comments, directions and suggestions through the web (or email). The use of the web could be supported by face-to-face interaction through formal presentation by the students (using multimedia slides) and on-the-spot feedback from the lecturers.

The new medium of delivery (web; ICT) not only brings us into the realm of borderless education but provides us with the means to propogate smart learning (alternatively referred to as smart schooling or smart education). The role of professors will shift towards facilitators of learning and creators of

knowledge and content. Their role and time spent in the lecture halls will be diminished. The web will become his "lecture hall". He will no longer have to be physically present at the studio or lecture hall to be able to conduct his lecture. In fact, his lecture will be "conducted" from anyway in the world, on demand, by whosoever wishes to learn (or have paid a fee). Already a major GIS (Geographic Information Systems) vendor in the U.S.A. has provided free training to over 80,000 students world-wide through its virtual campus (campus.esri.com).

And finally, we must ensure that learning be allowed to take place anytime anywhere (continuous 24 hours classroom discussion, including weekends). We should not be constrained by normal office hours where the due date for projects are set at 4.30 pm of the date in question.

However, we must caution against merely direct transfer of textbook materials to the electronic medium (e-book). We must exploit IT to provide better understanding of concepts and theories, integrate IT skills in the teaching of methods, techniques and approaches and provide the students with the opportunity for self-exploration and discovery.

INTEGRATING IT @ HBP

The use of information technology (IT) in the teaching and learning at the School of Housing, Building & Planning (HBP) in University Science Malaysia, Penang goes back a long way to the late 1970s. In the early days, students took a required paper on programming (using Fortran) with options to take up papers on data-processing and computer-aided design. However, the software and hardware was primitive and interest amongst students and faculty members was limited. The general consensus was that computers were better left to the experts.

Web-Based Learning

Since the mid 1990s, however, a major goal at HBP has been to progressively propagate extensive use of IT by each and every student and staff (academic as well as non-academic). In 1998, an aggressive campaign was launched to encourage academic staff to use IT in teaching and learning. The web technology was adopted for its ease of use. It was a grassroot effort spearheaded by the primary author with initial assistance from systems analysts from the University's Computer Centre, IT Centre and School of Computer Science. Currently, the staff at the School of HBP is capable of setting its own local area network as well as setup and maintain Windows NT Servers capable of authenticating users for purposes of web-publishing. Each academic staff creates, publishes and maintains his/her own web sites hosted on the HBP Servers with little or no intervention from either the IT Lab staff or the School's management. Most lecturers work from the comfort of their campus office's networked PCs while a limited number are permitted to publish from outside campus. To encourage and convince the academic staff to adopt

the technology, several group training sessions and clinics on creating webs were conducted, suplemented with personal hand-ons instruction for targetted individuals. Red-tape was abolished and any lecturer who wanted a website was immediately assigned one. Users are also assured that their websites and intellectual property are secure against unauthorised entry or alteration. Within one year more than half of our 50 academic staff had created and maintained individual websites with course schedules, lecture notes, seminar and reference materials, etc for purposes of conducting courses (HBP eLearning Website, 1999). These lecturers now have their teaching notes and resources accessible from the World Wide Web. Typically, their preference is to use a PC or notebook connected to the campus network to project their teaching aids onto a big screen using LCD projectors. In May 2000, the eight members of HBP WebTeam capped their achievements with a series of mini-lectures conducted from an off-campus location (in Kuala Lumpur more than 300 km away) at the eLearning 2000 Exhibition by accessing their lecture materials through the Web.

Students are active partners in the embrace of the web technology. From year one, students are introduced to and required to publish their academic assignments through the Web. They are encouraged to maintain websites for projects, to search and source for reference materials on the web and to submit their assignments electronically to FTP dropboxes or published directly on webservers (anywhere in the world). In addition electronic forums for academic discussion, distribution list (electronic groups), supervision of thesis via email as well as through websites are other innovations which have been adopted. The extent of the acceptance of the web technology amongst students is reflected in students showing a preference to write their studio and industrial training reports using the web. But the web is used not merely as replacement for the printed report. In studio projects, students maintain websites as means of communication between instructors and students. Publishing is on-going and incremental from the start of the project thus facilitating discussion and exchange of views on the subject matter under study. Our emphasis is not only on the final output or product. A great deal of emphasis is placed on the process of learning and methodology for undertaking a project through research, analysis, drawing of conclusions and formulation of proposals and strategies for action. Much like word-processing is taken for granted these days, we have come to the stage where we can de-emphasised the teaching of web-publishing tools (or software) with more effort given to the substance or content of projects or assignments.

The benefits of the Web as a media to facilitate teaching and learning is well-documented (e.g. Rosenberg, 2001; Barnes and Macedo, 2000; Paul). Amongst them are the ability to instantly publish to reach a world-wide audience. It saves on photostating and printing cost though students apparently prefer print the lecture materials of reading off-line. This maybe because students face difficulties getting on-line because of cost (due to longer hours on-line) and accessibility (or rather the lack of it from home or hostel) and general difficulties of reading text on screen. Other benefits of the web are its ability to incorporate interactivity and multimedia which when properly used can enhance the learning experience. It is extremely easy to

setup even for lecturers and staff who not trained in the computer science disciplines. Web-publishing is a breeze for most students (we don't even have to teach them web publishing anymore). We however, encounter difficulties with the "older" lecturers who tend to struggle initially. Some proceed to become versatile web authors while others stagnate. Still others won't give it a second glance with some questioning whether their web efforts will be given sufficient credits for promotion.

Sharing of resources is of course one of the main attractions of the web. Lecture notes and multimedia presentations can be used by lecturers and students from across the world. Out databases, spreadsheets, seminar papers, multimedia presentations and GIS data created by lecturers and students contribute to the world-wide resources for teaching and learning.

In our web-based learning effort, our focus is not on distance learning, one of the much publicised potential for the Web. In fact, web-based learning is often equated with eLearning which in turn is often sold as a web-based version of distance learning. While distance learning through the web may be enticing, we have focussed our effort mainly to harness the web technology to innovate interactivity in the classroom environment and to encourage lecturers to embrace technology in teaching.

While we have been successful in encouraging lecturers and students to embrace the web we are also saddled with various problems. The most serious is that the lecture halls are not Internet-ready hence access to on-line resources are limited. Nevertheless efforts are underway to remedy this problem but it is anticipated that a huge sum of money and time will be required to resolve this problem. We also encounter problems with hardware and software, a critical problem being that the harddisks run out of space very quickly. The processors also tend to become outdated after about two years but replacements are slow. The campus-wide network has been upgraded to 2 Gigabits with no problems in handling even multimedia and video traffic. Wireless access from the hostels is also in the pipeline and will boost student access to lecture materials. However, Internet access from (and to) campus faces a serious bottleneck with some 4000 PCs connected to the campus LAN (with almost all PCs capable of accessing the Internet). Another serious problem is the lack of manpower and budget to keep the computer lab open for longer durations. We have not built a culture of trust with the student population to be able to operate unattended labs or to use students to operate the labs themselves. Hence, the IT Lab usually closes at 7.00 pm during the semester while most students find that lecture commitments requires access to computing facilities later in the night[3].

Regardless of the hurdles, HBP has made a significant contribution in integrating IT into teaching and learning. For this effort, the University awarded the School of HBP the "Quality Award for Excellence in the use of IT for Teaching and Learning" in 1999. This was indeed a great honour since the

[3] We have nevertheless found that many students have nocturnal habits and "late night hours" are by choice rather than enforced.

School of HBP is not associated with or is identified as a centre to propagate IT or technology in teaching (such as the School of Computer Science or Centre for Multimedia and Teaching Technology).

ePlanning Studio

Apart from the web-centred effort discussed above, various other effort to integrate IT into teaching and learning at HBP include the use of databases, GIS, electronic spreadsheets, CAD, graphic and statistical packages, etc for various courses and studio-based projects. One such effort is the second year planning studios conducted by the both authors over the previous 4 years.

Initially, students were given the option to voluntarily adopt and integrate IT into their projects but most opted not to. Progressively, mandatory IT components were introduced starting with students being given layout design projects to be carried out by hand (using pen and paper). These designs were then used as the basis for a continuation project to create an electronic version of the layout using GIS. The project was not ambitious and merely required the the students to scan the layout plans and then use heads-up digitising to create the GIS-version. But even with such a limited scope, the project achieved only limited success (only one GIS plan was handed in for the entire class) due mainly to the short time frame given (2 weeks).

With experience, the authors experimented with a new approach. A separate GIS-based layout design project with a longer duration (6 weeks) was made mandatory. Students were organised into groups and put in charge of the design of specific sections of a town. Each group had to deliberate and agree on a design concept. This design concept became the guide for each individual student to prepare the the layout for subsections of the town for which they have been assigned responsibility. In the process, the students not only learned the principles for layout plan preparation but integrated information technology into their project. In this case, GIS become a tool for colloboration to ensure that the planning of various sections conformed to a guiding design concept such as overall road system, distribution of amenities and relationship between various landuse. The students were required to coordinate and combine the various GIS layouts into a single project which was submitted in digital format only.

Finally, in the second semester of the academic year 2000/2001, we decided to take the big step forward and introduced a totally IT-based planning studio. With a small funding from the Municipal Council of Penang Island, the students were required to carry out several questionnaire surveys and a landuse inventory and limited analysis for the Gelugor Local Plan Area which is adjacent to the campus. This project integrated GIS, a relational database, statistical packages and web publishing tools for various task. For instance, GIS (ArcView) was used to update the landuse as well as to prepare basemaps for sampling. The database (MS Access) was used to store socio-economic and commercial establishment data from the survey. Data entry was facilitated by customised electronic forms (in MS Access) and carried out

in a network environment. The database was also used to generate progress reports as the survey progressed. The formats for tabulations and charts were prepared and tested in advance so the results of the survey could be obtained with the mere click of a button. In addition, a statistical package was employed for selecting the random sample as well as for some simple statistical analysis. The students also explored linking of the survey data to the GIS maps through address matching. Finally, the project report was published under a colloborative website. The project spanned 14 weeks culminating in a highly successful seminar organised entirely by the students employing multimedia presentations. All GIS layers, survey data and reports were compiled into and submitted to the client in a CD-ROM (unfortunately, as has happened frequently, the client has asked for a hardcopy printout, just for record).

In conducting the Studio, we have implemented the ideas of "smart learning" where the students actively seek knowledge which they will apply to specific tasks. For instance, a group of students researched on sampling methods and reported their finds during class discussion and in the process educate their classmates. Others took on the task of designing the questionnaire using principles which they must first acquire through library research; techniques for interviewing, editing and managing a survey including how to handle non-response, rejections, scheduling and callbacks; designing and structuring of the database appropriate for storing socio-economic data; formulate a methodology for landuse inventory; and evaluating and selecting appropriate methods of statistical analysis. Another major focus in this studio was the constant reminder to the students to "think IT". Specifically, they were required to translate the traditional methods into IT-based methods. One example is how they used the list of over 6000 addresses from a database to generate a random sample using SPSS. A more complex problem for them was to coordinate the design of the questionnaires with the design and structure of the database. Equally complex was learning how to store the traditional paper map landuse data in a GIS.

In the initial stages of the project, most of the students could hardly cope with the need to not only quickly absorb and apply new information but had to present their findings to the instructors and classmates and be subjected to intense grilling (mainly by the instructors). One complaint from the students was that even though they had spent several days and the whole the previous night preparing for the presentations, they would painfully find out the next day that they had missed some important aspect or other during the presentation. Usually, the students were told to go back for more research to find the answers (the instructors consciously refraining from providing the answers but pointing to possible resources). This in the long run trains the students to be lifelong learners but creates a lot of tension in class. Instructors are hated for being mean but in the end the students achieve a sense of accomplishment when they succeed and are given due praise verbally not only by the lecturers but also by other HBP lecturers as well as the client for the project. They were also rewarded with excellent grades.

The burden of new knowledge is further compounded in this case by the need to assimilate it with knowledge in IT which is not only new to most students but

perceived to be difficult by many (especially with regards to GIS and databases). A third obstacle for these students is that they are not accustomed to the active learning approach having spent some 12 years of more in a schooling environment where (as discussed above), rote learning is the norm, memory skills are highly valued and passive learning where information flows from teacher to students is the only known method of learning.

Teaching and Learning the Technology

Currently, students at the undergraduate level take a introductory paper on information technology which do not provide planning students with the required skills to under planning projects. There are several techniques and methods courses but these are typically taught the conventional way without a deliberate attempt to make IT integral to the teaching of the methods. At the graduate level, planning students take a special paper on computer applications covering the major technologies including GIS, database, CAD and electronic spreadsheets for modeling all within a short span of 14 weeks. Obviously, we do not have the luxury of rigorously covering all topics and aspects of the full-feldged GIS or database courses where a single GIS or database course takes the entire semester.

Our focus in the second year planning studio had been to integrate basic components or skills for the various technology into projects. For instance, for the GIS component an introductory lecture of the concepts and applications for GIS is given at the beginning of the project. The lecture is presented with a modified version of the powerpoint presentation available from the ESRI website. This is followed by a focus on basic topological editing techniques and emphasis on the proper organisation and storage of spatial and attribute data into layers; map-making techniques; use of legends; generation of reports and charts; and computation of land area using the GIS. The benefit of the electonic map for editing and amendment as well as colloboration is also highlighted. After the introductory sessions, it is all hands-on work by the individual students with the more skillful helping others. Assistance is sometimes rendered by the Lab Technicians but usually, they are asked to read the online resources created by the primary author ("Using ArcView" and "techniques for heads-up digitising"; Lee, 1999a). They are also encouraged to use other web resources.

With these basic skills, it is hoped they will acquire higher skills especially in spatial analysis and modeling in their final year as well as graduate programmes. Amongst students who have gone through this program, we are seeing a preference to integrate IT into their subsequent projects. Unfortunately, due to a combination of lack of official course requirements and the pressures of time, few students progress to more sophisticated applications and skills. Nevertheless, even their basic skills are tremendously better than work carried out by professional consultants undertaking planning projects who employ technicians trained in CAD but have no understanding of

GIS technology thus producing substandard GIS products[4]. We have found that many students entering our graduate planning programme from other disciplines had taken GIS courses but lacked applied knowledge and the skills to use GIS in planning studio projects. Hence, we are convinced that the addition of theory-oriented courses for IT will not only burden the workload of the student but will not produce knowledge workers capable of handling the technology in their professional career. We recognise the need for specialists in IT for planning who will capable of handling complex systems for the planning office. The need for such expertise should be met by IT specialisations in planning (Sieber, 1994) and perhaps only a small number will be sufficient. On the other hand, we want to see each an every future planning graduate equipped with the necessary skills to integrate IT into their daily routine and professional work especially in data-mining, analysis and as a media for communication and participation in the planning process.

Relational database is also perceived by students as another "difficult" technology. Nevertheless, databases are or will be the backbone of any organisation (especially a planning agency). Being about to construct a database to store planning data and the ability retrieve and manipulate for analysis and decision are skills which the planners most possess. Our experience with the Gelugor project shows that with perseverance, the students can acquire the necessary skills even though (from feedback) the journey is extremely difficult. Further, the success was also attributed to two other factors. The first is that one of the students had worked on a project involving database with the authors and thus had a headstart and could support and encourage other members of the group during the learning process. The second factor was that the primary author had previously created a similar database for survey data and this was used as a basis for further development and enhancement by the students. In fact, one of our "sales pitch" for promoting the web and IT is the sharing of resources, including projects carried out by students and professors being made available to serve as models as well as the starting point for further development.

Response from Students

In pursuing the the above approach to teaching and learning, we have always placed communication as a key to successful attainment of the goals. This includes encouraging students to provide feedback and engaging them in an open discussion to resolve issues which are not necessarily academic.

Below are two (of our favourite) unedited feedback provided by two students through our website. They tell not only of the heartaches and fears they encounter but the triumph of success and accomplishment.

[4] For example, topological editing techniques (e.g. append polygon, split lines) are not used resulting in holes and gaps (obvious only when zoomed in). The concept of attributes attached to geographic features are also not understood resulting in each landuse created as separate layers (without attributes) and then annotated with text (as labels).

> *To Studio 200 Planning lecturers, Since the first day I entered the studio, I knew that I was going to face a tough year since both of you are really strict about our work. At the beginning, it was really hard for me to adapt to the situation of being pressured and brain stormed by both of you. I was afraid that I couldn't cope with the pressure. Somehow, as time went by, I became somewhat used to it. Every time there is a presentation, I knew that I had to be mentally prepared to be criticised by the lecturers. I do appreciate your efforts to help us to be more critical even though sometimes the language you use are quite harsh. But that's your style. I don't think I have much problem with that now though sometimes I do 'ambil hati'[5]. But the feeling does not last long. Regarding the exposures to IT world that you're trying to establish in our studio work, I appreciate that. We have just submitted our electronic report and we have learned a lot during the process of preparing and publishing it. But somehow, thinking that GIS is coming…. I'm starting to feel really worried about it. I know nothing about GIS. Please 'counsel' me. (Nikmatul, 1998)*
>
> *This is the first time I read the published comments and the reply, don't know what I'm afraid for? Maybe I am afraid of what reply will be given, of my grade, maybe!? ...although I never checked my grade yet till now! Now, I'm having my practical training in KL: Henry Bucher Lim & Long. I really learn much much more than what I had learn during lectures. Every time when I am given to do something which have to reply to my boss quickly, I alway think of what I been told in the Bilik Mesyuarat[6], then there is the 'woom' for me to do that thing properly, quickly n correctly! Just 1 sentence I would like to say: "thank you very much, sir!" (Duen Yong, 1999)*

We encourage feedback throughout the duration of the course and urge students to be open and frank in their assessment of not only the content and approach in teaching and learning but also the "performance" of the instructors. Initially, students are always reluctant to open for fear of being penalised but our record over the years have sustained our reputation as being open and not vindictive and this has encourage the students be critical in their assessment.

Due to long exposure of being "spoon-fed", most of the students in the studio felt intense pressure and needed quick adjustments to the approach we introduced in the studio. They soon realized that they had to come prepared for every studio session where they will face constant grillings by the studio instructors. *"Who wants to challenge me?"* was a favorite question used to instigate the class. Soon, students learnt to be prepared to start challenging lecturers, armed with facts in hand. The positive attitude change was sensed even among the less aggressive students.

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[5] Literally, this means "take heart"; it means to win the heart of someone or get into their good books. In this case, she is probably saying that she might occasionally feel offended.

[6] This is the Meeting Room where the Studio was conducted every Monday and Friday.

One of them commented : "*After a while, a challenge is no longer a challenge anymore. We are used to it. We are prepared!*" [Yoke Fum, 2001][7]. In the end, they valued the approach as declared by one student, *"I admit that I could not accept this education approach at the beginning. Now, I realize that it helps students learn critically, learning from our own mistakes and seeking your own materials are more meaningful than fully receiving all from the lecturers. Furthermore, I was given freedom to think, plan, and manage"* [Tzu Cherng, 2001].

Another student added, "*the approach teaches us to learn the way of learning not just learning to just pass exams like before. Learning should be a life-long process. Besides, students are taught the 'power' of learning through experience or practical"* [Shariman, 2001].

The whole approach, including e-learning really depends very much on the students' own initiave and drive, as commented by one of them, *"It (the learning process) is based on student's own initiative. I joined, therefore I learned*" [Sok Fern, 2001].

The long hours of searching for knowledge and even longer hours discussing it among studiomates had affected their concentration on other subject but it is a sacrifice they found fulfilling and worthwhile (but which the instructors must take note to balance the students commitments to all courses). One student response typifies the majority of the students' reaction on this issue :

> *"The whole semester was quite challenging and a long one, because this project needed full attention, full commitment, working long hours (until I had been scolded by my Arabic teacher for not concentrating in class because I was too exhausted), the skills of managing (I really learnt a lot), physically and emotionally balance (I had an accident at a big road during using bicycle), critical thinking, searching the right information at the right place, obtaining the right communication skills, working under pressure and the most important of all - working as one big team. The learning approaches were very challenging and lots of studio member's cried because of it (to find answers for questions). The lecturers communicated clearly to the students even though sometimes, it took a longer time to fulfill the requirements that had been made by the lecturers."* [Alia, 2001]

THE IT AGENDA

In pursuing the above objectives, we are constantly reminded that computers and computing will be (more) pervasive. Computers will not only be used by planners and stakeholders to gain better understanding of the world they plan

[7] This citation in square brackets provides the student's name and year comments given.

but computers themselves will become part of the city (Batty). Virtual cities will coexist with the real (physical) cities. Planners must not only possess the skills handle computers and computing as though it was second nature but most acquire new knowledge and theories concerning cities of the future.

The Curriculum

One of the first tasks must be to review the curriculum to identify relevant IT skills, which all planners must possess. Rather teaching them specific software or technology in specialised courses, we suggest that a more effective approach is to progressive introduce the technology and the methods into planning studio and courses. There are three major areas of skills that will require IT integration:

Skills	The Technology	Basic Skills Introduced in Year
Report Writing	Wordprocessor Web Authoring and Publishing Multimedia and Graphics	1
Data Processing and Analysis	Statistical Packages *(Data input; creating data sets; tables of frequency; simple and advance statistics; charts)*	1
	Electronic Spreadsheets *(Similar to statistical packages; "what-if" analysis and modeling)*	1
	Relational Database *(Data structure; data input; generating reports; queries; publising on the web)*	2
Plan-Making *(Layout Plan; Structure and Local Plan)*	GIS *(Concepts of spatial information system; mapping and visualisation; topological editing; land use change analysis; site analysis and selection; suitability analysis; modeling)*	2

These essential skills must be made mandatory components into studio-based projects at all levels from year one through year three and continue into the graduate planning programme. It should be made mandatory for professional accredition of planning programmes. Right now, at the School of HBP (as is also the case elsewhere) the inclusion of IT is the prerogative of the instructor or up to the initiative of the student. The major problem in its implementation is that the very large majority of lecturers (old and young) are not themselves familiar with the technology and will there be contented to leave it to the experts amongst their colleague to pursue this agenda. Our effort at HBP has been focused on pushing every lecturer to embrace the technology, starting with the simplest (i.e. web) but even then we encounter many roadblocks (resistance and apathy). To aim to convert every lecturer techno-centric would have to be a very long-term goal but in the mean time a critical mass must be

created to spur the information drive. The university (as the employer) can play a role by giving due recognition to acquisition and enhancement of such skills (e.g. given sufficient credit during promotions) while the professional bodies should identify the faculty's IT agenda as relevant and mandatory criteria for programme recognition.

In addition to the information technology identified above, there would be packages such CAD, animation, remote sensing, virtual reality, 3-D modeling, demographic models, economic models, transportation models, urban models, planning support systems, electronic plan approval systems and others which will be adopted based on the students' specialisation and interest either through projects and assignments or integrated into taught courses on the subject matter (e.g. urban and regional economics, transportation planning or methods of planning analysis). However, the cost to acquire all the necessary software would be astronomical even with educational pricing. As such, the decision to acquire these software should be the prerogative of schools of planning with identified goals to be centres of excellence in particular fields.

The state-of-the-art and trends in information and communication technology (ICT) and its impact for planning should also have to be given prominent emphasis given that cities of the future will be molded by telecommunications affecting spatial location and distribution and hence commuting patterns and options. These are however concerns for another paper.

Infostructure

The provision of basic infostructure for teaching and learning is often not given proper consideration. At USM each of its 1000 academic staff is provided with a Pentium III PC with 64 MB RAM connected to a highspeed LAN (2 gigabit). Hardware provisions are therefore adequate for most academic staff. However, the only legalised software provided is for productivity (MS Office). For a design school with multi-disciplines[8] we need numerous software ranging from web authoring, CAD, GIS, 3-D, animation, structural engineering, landscape design, graphics, project management, quantity survey, remote sensing, etc. Laboratories in the non-computer science faculties are usually under-equipped and usually cannot afford to acquire sophisticated software for modeling. The bureaucrats who approve budgets will not permit software to be acquired through annual operational budgets. They will only approve funding for software and hardware if it is included into new programmes (academic courses or new buildings). But even when the University itself approves special allocations from its reserves to spur IT acquisition, the amount is comparatively small due to demands from various disciplines resulting in many software beyond the reach of the faculty especially when the pricing mechanism demands yearly maintenance contracts. While academic pricing of software is very affordable in the United States of America, those outside of the U.S. suffer from unfavourable foreign exchange rates since most

[8] We offer planning, engineering, quantity surveying, architecture, interior design, construction management, housing and building technology courses at both undergraduate and graduate levels by coursework or by research.

of the prices are directly converted to local currencies at prevailing rates. A single key for a popular GIS (ArcView) is about RM1,700[9] compared to the market price of RM8,000. A web-based map server cost almost RM8,000 for academic institutions compared to about RM40,000 for others. The discount is substantial but if we factor in the number students (and hence number of keys) needed, the amount would be astronomical[10]. In our recent budget proposal for the next 5-year plan (2000 – 2005), we estimated a conservative RM1.6 million would be required for hardware and software acquisition for the School of which almost RM 1 million will be required for software. This was to sustain us for a 5-year period but with no provisions for upgrades. After review at the University level, we were asked to slash the proposed budget to only RM250,000. We anticipate that when the budget if it is finally approved at the Ministry level will be only a minute fraction of our original estimate.

When software companies offer so-called "select" or "academic" programmes to academic institutions, they quite often impose conditions such as minimum seat requirements over a specified period[11]. Failure to meet the target result in the programme being terminated. Another cause for worry is that some companies are now penalising customers who do not faithfully subscribe to the continous stream of updates. International software companies have also to comply with a "blacklist"[12] of developing countries, refusing to sell floating licenses but insist on installation of a hardware key which are difficult to manage when we have multiple users spread over the faculty.

There are of course software companies taking the lead in distributing "free" software[13] but these are hardly making any impact for teaching and learning. A major shift in the mindset amongst university administrators and those who approve budgets for public universities as well as amongst software vendors is needed to propel us into the information age. The current bias in favour of hardware acquisition must be addressed with a substantial proportion of university budget for IT (or for new construction for that matter) allocated for software. The acquisition of software must however be based on identified needs for each of the courses or programmes (as discussed above) and not based on vendors' marketing pitch resulting in software hardly anybody wants to use. Vendors on their part must come up with creative schemes to offer state-of-the-art software which is focussed on propelling the future knowledge economy in terms of production of knowledge works rather than on the company bottomline. In particular, educational pricing for students should be

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[9] Currently, the Malaysian Ringgit is pegged at RM3.80 to USD1.00.

[10] We now have only 6 keys acquired through consultancy funds. A typical planning studio has 20 – 30 students. There are four planning studio each semester with a total of more than 100 students. That's not including research students and students in other discipline who might be interested in GIS.

[11] There are some vendors who may even ask you to drop all other competing software.

[12] Allegedly because of poor enforcement of intellectual and copyright protections by these countries.

[13] Sun Microsystems is making a statement with StarOffice while ESRI considers ArcExplorer as a social obligation to the community. Occasionally, software companies have donated copies of software to institutions of higher learning (e.g. Microstation and Autodesk).

made attractive[14] to reduce the burden on the University as well as to encourage students to use licensed software on their personal computers.

eLearning

So, far our efforts at HBP had been undertaken witouth the benefit of specialised eLearning software. Various systems are available on the market and USM recently, after several false starts, decided to subscribe to a commercial eLearning product. A Pilot involving only one thousand five hundred students (out of a total 15,000) would have cost more than RM1 million in the first year alone[15]. But the effort failed due to internal lobbying to channel the funds for in-house development. HBP is now taking tentative steps forward with the cooperation of the Information Technology Centre at USM to use Lotus LearningSpace as the vehicle to provide functionalities such as management of student list, chat, scheduling, online quizzes and various other features to enhance the eLearning experience.

We anticipate that a lot of "hand-holding" and conjoling with be necessary to convince the staff to adopt the technology. On the other hand, the University does not appear to have committed itself to pour in adequate funding for this effort until they see some promising results. It is a classic "chicken-and-egg" dilemma.

Our focus have also not exploited the potential for distance learning but with the increasing interest of private institutions of learning to undertake franchise programmes with HBP, this is an area which holds some promise for revenue generation which should in turn help to fund the IT Agenda.

ePublications

One major hurdle in pursuing eLearning is availability of online resources and literature. The University spends several hundred thousand annually subscribing to online databases with access to full-text articles. However, within the campus the move towards electronic publishing (eJournals and eBooks) is sluggish and even resisted by some. The feel of a hardcopy seems to carry greater satisfaction. Others are concerned that once a book or article is published electronically, a source of revenue will be depleted.

For countries where the medium of instruction is not English, we face the additional problem of the language barrier since most of the resources online are in English. It is a deterrent to the students as they can bearly understand what is written in this foreign language. While encouraging students to study English with serve them well in the long run, local academics must also aggressive contribute to the online resources in their native languages.

[14] Microstation offers a RM500 educational package for its CAD software for students but this is still pricey considering that CAD is not the only software the student requires. Other companies may not even sell their products to students at educational pricing. On the other hand, your could walk into any University Bookstore in the U.S. and buy MS Word and other software for less than a 100 bucks each (with valid student ID).

[15] The cost would eventually have been borne by the students.

Leadership

It is a well-known fact that the IT push requires enlightened leadership and champions of the technology. At HBP we are fortunate to have had both (though not on a continuous and consistent basis). But reliance on these champions is not a foolproof approach since the absence of these leaders for extended periods of time will create a vacuum when everything either stagnates or reverts back to the gool old ways of pre-IT era. The push for integrating IT must involve the "masses" (all academics and students) as a grassroot effort that will be perpetuated regardless of who assumes the leaderships in the faculty.

CONCLUSIONS

This paper is concerned with two major issues:

- The approach to use of IT, especially web-based methods, for teaching and learning
- Use of information technology in carrying out planning projects.

This is a pro-active "grassroot" initiative in the absence of official effort to restructure the curriculum to make it IT-relevant (in this case the city and regional planning programme) and despite the fact that the necessary infostructure is severely lacking. But in the long run, structural changes must be made, especially in terms of integration of IT into the curriculum and enlightened policies on funding and prospects for academic advance.

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For further details refer to the following article : eLearning @ HBP – A Success Story or http://www.hbp.usm.my/itsupport/eLearning@HBP.htm

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