Future of western China hinges on communication and education

With a plan to "go west" high on the agenda of the administration in China, the President, Prof. Poon Chung-kwong, was invited by the Provincial Government of Shaanxi to deliver a speech at a seminar on the "Full-scale Development of Western China" held in Xian in April.

In his presentation, Prof. Poon urged that firstly the West could be linked up with other cities and countries through an effective communication network. Such a network should be built with the aid of advanced telecommunications technologies and in tune with the transportation infrastructure in other parts of China.

Secondly, the grooming of talent must be intensified, Prof. Poon elaborated. By exploiting the latest Internet technologies, knowledge can be brought to more people sporadically distributed over vast areas. In this respect, PolyU has recently launched some online postgraduate programmes which can well be adapted to mainland learners. Over the years, PolyU has also built a strong network of research co-operation and academic exchange with many reputed mainland universities. Looking ahead, Prof. Poon said PolyU looks forward to contributing to western China's development through further collaboration in these areas.

The President exchanges views with the governor of Shaanxi Province Mr Cheng Andong.

The seminar was one of the highlights of the Year 2000 Investment and Trade Forum for Co-operation between East and West China. Prof. Poon was recently appointed as a Member of the Policy Consultative Committee of Shaanxi Province.

Forum on venture capital in China

(From left) Mr John Wall, Mr Cheng Siwei and Mr Jiang Zhenghua and Prof. Poon.

As hi-tech industries are attracting investors' increasing attention worldwide, the University joined hands with China Venture Capital Inc. and NASDAQ International Corporation in co-organising the Symposium on Venture Capital Operations in China 2000.

The two-day symposium, which opened in Beijing's Great Hall of the People on April 19, brought together academics and

PolyU leads inter-institutional materials research project

Backed by $3.5 million of funding from the Research Grants Council (RGC), top-notch researchers at PolyU are leading a large-scale inter-institutional collaborative research project in computer-aided materials engineering. This initiative is one of the five projects approved for funding in the competitive bids for RGC's Central Allocation – Group Research Scheme in 1999/2000.

The research team is led by Associate Professor Dr. Hanchen Huang and Prof. Woo Chung-Ho of the Department of Mechanical Engineering. The other team members are Prof. Ian Wilson of The Chinese University of Hong Kong, Prof. Tongxi Yu and Dr. Qing-Ping Sun of The Hong Kong University of Science and Technology, and Dr. Alfonso H.W. Ngan of The University of Hong Kong.

Dr. Huang said: "Our study in computer-aided materials engineering will complement the strong experimental component of materials R&D in Hong Kong. It is vital to the long-term development of innovation and technology."

He added that this group research project on computer-aided materials engineering will focus on the three areas of thin film growth, ion implantation and mechanical deformation. In view of the importance of this project, PolyU has also allocated $500,000 from its internal funding to support the initiative.

Apart from contributing to R&D in the field, the research team seeks to provide a platform for a postgraduate course on the relevant technologies. Leading experts from local and overseas institutions will be invited to support the programme by giving short courses and seminars.

Leading the research project are Dr. Huang (right) and Prof. Woo.

Prof. Sidney Yip of Massachusetts Institute of Technology (MIT), for instance, has recently been invited to present a short course on the latest developments in the field.

Furthermore, the team members have established close working relationships with scientists in many prestigious R&D institutions in the US, Canada, Germany and Japan. Through these collaborations, Prof. Woo and Dr. Huang have not only won financial support from overseas funding agencies but also helped establish the reputation of Hong Kong's expertise in this area.

Looking ahead, Dr. Huang is optimistic about the further development of computer-aided materials engineering in Hong Kong. "With the strong support from RGC and the concerted efforts of our team members, we can capitalize on our strength and break new grounds in this fast-developing field," he said.

professionals from the securities and industrial sectors from home and abroad.

The event featured keynote speakers including Mr John Wall, President of NASDAQ International Corporation; Mr Cheng Siwei and Mr Jiang Zhenghua, both Vice Chairman of the Standing Committee of National People's Congress; Ms Zhu Lilang, Minister of Science and Technology; Mr Zhou Xiaochuan, Chairman of China Securities Regulatory Commission; and Mr Yan Yixuen, Vice President of Chinese Academy of Sciences.

Besides delivering a welcome speech at the opening ceremony, the President, Prof. Poon Chung-kwong, gave a presentation on "The Role and Status of Universities in Promoting Hi-tech Industries". The three special sessions throughout the symposium were chaired by Prof. Poon, Prof. Raymond Chiang, Chair of Professor of Financial Management, and Dr Chen Gongmeng, Director of PolyU's China Accounting and Finance Research Centre.

Cities and towers at your fingertips:

Teaching construction technology with visual simulation

The use of visual simulation is opening up a new world in construction education. But exactly how and why and its benefits to students remain a relatively new issue for educators to explore.* Dr Heng Li, *Associate Professor in the Department of Building and Real Estate, shares his insight in this area in the following article. For an outstanding paper which he co-authored on the impact of information technology on construction management education, Dr Li was awarded the Fred Wilson Memorial Prize by the Australian Institute of Building in 1997.

Education in construction technology aims to provide students with the essential knowledge needed to understand how plant and equipment, materials and procedures can be utilized to erect a building. In comparison with other subjects, such as cost planning and project management, construction technology does not have a clear theoretical thread to link together discrete topics. As a result, there are often difficulties in presenting the dynamic and temporal features of construction technology using traditional teaching materials and methods. Audio and video materials can help eliminate some of the difficulties, but they can only repeat a single operational process of a project. Site visits are also useful, but students can only get a snapshot of a whole temporal construction process. Moreover, the arrangement of site visits can be arduous and can present various practical limitations and problems.

In some cases, particularly when a new technology and/or procedure is applied in construction, there may be no equipment or information available to train students. In particular, as new technologies and procedures are designed to fulfill specific construction tasks, they are often not quite transparent to students. These problems thus give rise to the need for alternative ways for delivering construction technology education.

Recently, educational models have been developed from an explorative/ constructivist perspective (Steffe and Gale 1995), which propose a new direction for implementing teaching and learning as an exploratory process. Supported by advanced information technologies, numerous learning environments have been developed for facilitating explorative learning models (Rossman, 1992; Bos et al., 1996). Visual simulation is a useful information technology to education in that it can provide a condensed or vicarious experience, basing on the belief that students learn better when they receive better visual stimulation and when they can 'experience' the subject or topic. The following captures actual first-hand experience in using Virtual Reality (VR) and other visual simulation techniques as demonstrative and explorative tools in teaching construction technology related topics.

VR as a tool in education

By nature, VR is a computer-based visual simulation technology. It enables users to build an artificial model of construction with a rich assortment of colors, shapes and sounds. The model allows users to view aspects of construction in a convenient manner. Such capacities transform a viewer into a participant through engaging him/her in a dynamic and energized virtual construction environment.

Two learning models are commonly applied in construction technology education: learning through instruction, or the objectivist model of learning (Jonassen 1993), and learning through exploration (Papert 1980). In the objectivist model, learning is the uncritical absorption of objective knowledge, and the role of visual simulation is to assist the instructor to better represent the objective knowledge so as to stimulate and enhance the transfer of knowledge from the instructor to students. In the explorative model, however, learning is considered as a process of constructing knowledge through exploration in a controlled environment. The use of visual simulation to provide powerful exploratory learning environments is articulated by Papert (1980) who describes that simulated objects can be manipulated by learners in instructionally meaningful ways.

VR as a demonstration vehicle

In the objectivist model of learning, the goal of teaching is to efficiently transmit knowledge from the instructor to the learner. In this learning model, the presentation of information is critical, and it is assumed that the instructor, as the source of knowledge, will use appropriate symbolic and graphical representations in order to communicate efficiently. For factual or procedural-based learning, it is believed that the objectivist model is appropriate and the lecture is the most frequently used instructional method in objective learning (McKeachie, 1990).

Figure 1: Process of using a slipform to construct a column

In order to enhance the presentation of information related to construction technology, VR has been used as a demonstration vehicle. A number of VR models have been developed to simulate plant movements, building erection procedures and processes.

Figure 1 illustrates the use of slipform in constructing a column. Slipform is a type of formwork used commonly in Hong Kong for house construction. However, the process of slipform construction is often difficult for students to observe in operation, because of the slow progress of the construction process and its bulky size, which in parts is not open for scrutiny. By developing a VR model of the slipform construction process, the dynamic nature of the use of this technique can be demonstrated. The detailed structure of a slipform, which is not easily observable in reality, is shown in Figure 2.

These examples of using VR as a demonstration vehicle illustrate that VR is a convenient tool for enhancing information transfer in an objectivist learning environment.

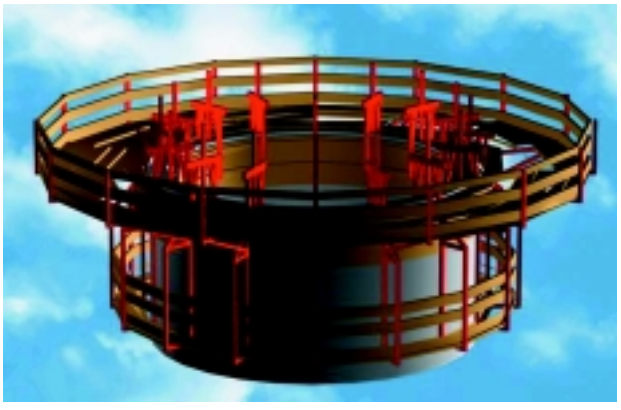

Figure 2: Detailed structure of a slipform

VR as a tool for exploration

As another learning model, the constructivist approach places emphasis on the learner's ability to explore and construct knowledge. Rather than transmitting knowledge, it is explored and constructed by the learner themselves (Jonassen, 1993). Considerable research work has been undertaken in the design and delivery of constructive learning environments. For example, Hamburger and Lodgher (1992) investigated two approaches: semantically constrained exploration and heuristically guided exploration. Semantically constrained exploration refers to an explorative learning environment in which a learning problem is managed, so that meaningless options are avoided and that the learner's search will more likely arrive at correct conclusions. The heuristically guided exploration provides the learner with useful hints and warnings that are responsive to the learner's actions. Both types of explorations are used in delivering construction technology material. As an example of semantically constrained exploration, assignments have been set which require students to discover an appropriate installation plan for 'assembling' prefabricated components for a room, as shown in Figure 3.

In the assignment description a list of equipment and methods of construction are presented. Students are free to choose the appropriate combination of equipment and methods to construct the room. They are required to conduct simulation on the constructability of their conceived construction plans. Furthermore they are required to answer specific questions relating to the relationships of the time and cost for the facility constructed.

To prepare a plan for constructing the room, students need to produce a schedule for the construction sequence. However, the current practice, which relies on the use of the critical path method (CPM) or bar charts, does not show whether prefabricated components can be assembled by the activities scheduled in the construction sequence. Thus, by using visual simulation, students can readily identify any mistakes in the programme and make the necessary modifications to the programme.

Figure 3: An assignment for students to conduct exploration-based learning

Essentially, the assignment enables students to understand that there are many ways of constructing a building. Also, the simulation of the construction process and sequencing enables students to gain useful experience in scheduling and coordinating various stages of construction.

Unlike many other fields of VR applications, such as entertainment, where requirement in accuracy is only needed to orient a user in positioning, construction professionals need to track the precise position of all components in a building as well as the use of equipment. VR appears to be an ideal tool for determining how different construction sequences and equipment can be used throughout the construction process. It also appears that real-time 3D positioning is a critical technology essential for the practical application in construction.

What are the benefits?

The use of VR as a tool for teaching construction technology are beneficial to students as it enables users to present a specific and individualized construction process in the classroom. This tool also allows students to explore complex construction situations without harzard to anyone. However, as a new teaching and learning tool, its strengths and weaknesses have yet to be further scrutinised if its potential in construction education is to be fully realized.

The following lists some major benefits of using visual simulation in construction technology education:

- visual simulation can serve as a powerful tool to demonstrate important construction equipment, processes and components;
- students can practice at their own pace, in their own time;
- students can 'experiment' different construction processes and methods without physical danger or harm; and
- students can experience realistic responses from their actions on the simulation models.

Visual simulation has tremendous potential in construction technology education, as it is a powerful tool for illustrating spatial relationships of construction components and situations that are otherwise inaccessible. Many students of PolyU have already shown strong interest in and enthusiasm for visual simulation. As a continuing exploration into this area, a series of VR-based educational modules are currently being developed in the Department of Building and Real Estate at the University. The educational modules will be incorporated into a Virtual Campus system that is also currently under development. A VR research laboratory will also be established on campus.