



Organising APPRENTICESHIP Programmes: Methods, Pitfalls and Optimisation

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As organisations become more complex with the onslaught of information technology and dynamic work processes, more premium is placed on mimicking these trends in student curricula. Consequently, the role of apprenticeship is increasingly regarded as being central to the students' learning process. How exactly does this process work and what are some of the pitfalls in organising, managing, and evaluating such programmes? This essay examines these issues.

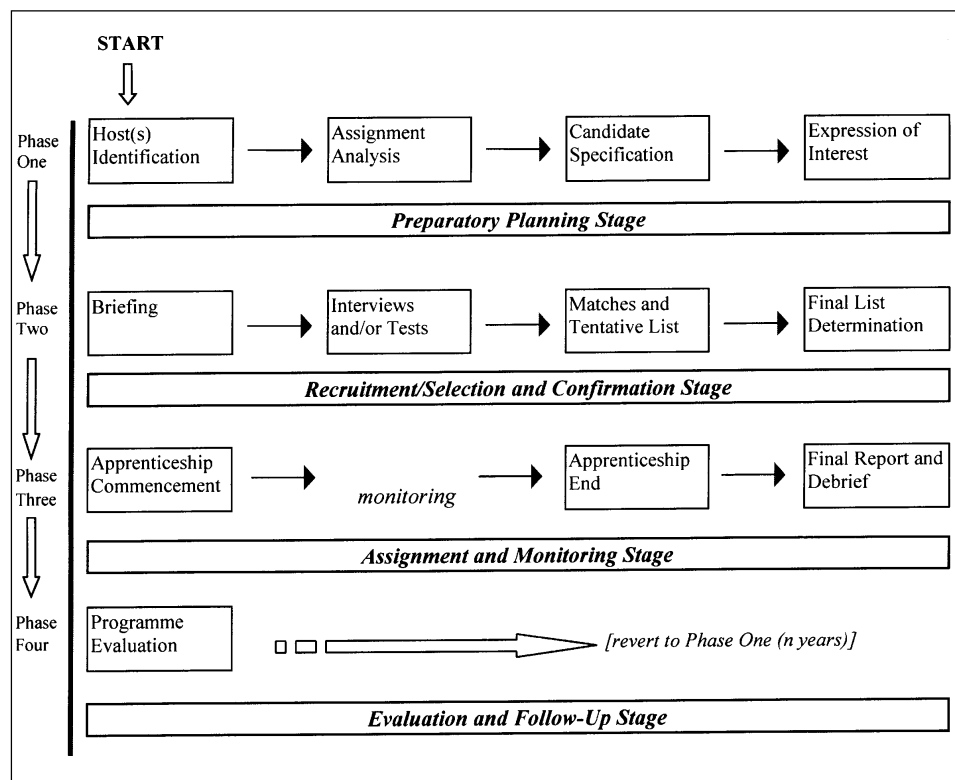
RATIONALE

The rationale for organising an apprenticeship programme is self-evident. It provides a real-life platform for students to experience first-hand what is happening in the world outside and an opportunity for organisations to assess potential labour entrants. It also enables the educational institution to develop a core group of students who will bring into the classroom a newfound awareness of the practical world outside that hopefully can be transmitted in due time to other students.

METHODOLOGY

The development of an Apprenticeship Programme can be contained in four phases, each phase with considerably varying timelines (see Figure 1).

Figure 1: Various Stages of Organising an Apprenticeship Programme



The process begins when an organisation (e.g. an NUS Department) decides to make an Apprenticeship Programme the centrepiece of a learning process that focuses on hands-on and practical training for students. Subsequently, host agencies are identified; this can be either simple (if a history of such collaboration has existed) or complex (if a potential host agency is recent to the scene and is thus understandably hesitant to commit to a novel programme). Next, an analysis of the jobs/assignments to be done is prepared which provides a benchmark to the students and the organisers to work on. This includes specifications of tasks to be completed, learning objectives to be operationally specified, and work processes detailed. Candidate specification then follows since different assignments require different attributes (e.g. for tasks that require front-end contact with the public, a separate candidate profile emerges from that requiring considerable back-end roles and responsibilities). Phase One (Preparatory Planning Stage) is complete with the expression of interest not only by the Department to prospective students, but vice versa as well.

Phase Two (Recruitment and Selection Stage) is critical as much of the Programme's success rests on identifying suitable candidates for specific assignments. First, the prospective candidates are briefed; then, a round of interviews follows. Normally, the interviews will suffice since the candidates will already have been screened for aptitude, intellectual ability, and seriousness of purpose prior to this stage. A list of selected candidates is then paired against the host institutions' specifications and a tentative list circulated for analysis and debate. The list is usually accepted as is, although there could be instances of host agencies (or even some candidates) withdrawing from the Programme at the last moment. The final list is determined only after both Department and host institutions have looked at the matches.

Phase Three (Assignment and Monitoring Stage) concerns the duration of the assignment and involves a fair degree of monitoring by the supervisors designated for individual candidates in each agency. The Department generally only enters into the picture if there are extenuating circumstances. This is usually left to the particular agencies concerned. Once the apprenticeship ends, a debriefing session is held to collate experiences (both positive and negative) about the assignments. A final report is then prepared encapsulating the lessons of the entire exercise.

The final phase (Programme Evaluation and Follow-Up Stage) concerns specific actions taken by both Department and host institutions to cement the relationship, substantially alter the nature of the candidates' participation, or terminate altogether the relationship depending upon the learning experiences of the year's Programme. The process is complete when these lessons are applied to the host identification stage of the subsequent year.

OPTIMISATION PARAMETERS

Experience has shown that while all steps are taken to ensure the smooth implementation of the Programme, there will always be specific concerns that will hinder the optimisation of the Programme itself. Optimisation parameters include concerns related to candidates, nature and scope of work, inflated expectations and/or egos, and un-oriented supervisors.

Despite a fair amount of control being exercised in the pre-selection stage as to who will be invited to apply for the Programme, there are no safeguards yet to prevent the selection of individuals who clearly are not up to the mark for whatever reason. In such a case, the host institution can do little to optimise the situation but terminate the assignment. This is a serious step that sends a strong signal to both students and other participating host institutions. The problem could be that the nature and scope of work is clearly inimical to the interests of the selected candidates. Top-notch candidates these students might be, but the work available must be tuned to their levels of intellectual ability.

The corollary to this problem obviously is that the candidates themselves come to the Programme with inflated expectations and/or egos of what they are to be doing. More often than not, public sector apprenticeships can be more mundane and rote than they imagine. Hence very early in the Programme, a sense of detachment may set in which, if not addressed promptly, can easily derail the Programme's success.

Finally, the supervisors of the candidates may also have undue expectations. It is not inconceivable to assume that the supervisors will not discriminate between candidates and regular employees, in which case the candidates necessarily suffer if the pressures are harsh.

As the optimisation parameters of apprenticeship programmes are quite severe, Departments wishing to embark on this venture in the future may do well to keep this in the back of their minds.

CONCLUSION

However, notwithstanding all the concerns with the optimisation parameters, experience has shown that apprenticeship programmes are very worthwhile for candidates. There have been very few candidates that have come out of programmes unsatisfied at being given an opportunity to learn how things are done in the real world. Host institutions, in turn, have expressed strong support for such programmes and it is clear that such relationships can only strengthen. ■

In the first semester of the 1998/1999 academic year, the Department of Biological Sciences set up its Professional Placement Programme (PPP). This article summarises our experiences in organising this nascent programme of industrial attachment for our students.

LOGISTICS

To allow us to marshal and focus our limited resources, it was decided early on that industrial placement would be offered once a year and only in the first semester of the students' third year. Student selection was done early and was entirely meritocratic, i.e. based on the Cumulative Average Points (CAPs) of essential modules over the first three semesters. This allowed us a grace period of six months to find the required number of placements. A reserve list was maintained to cater to students below a certain CAP but who would have had difficulty in switching majors without doing extra semesters. An initial figure of 46 students (and 3 reserves) was arrived at. Consequently, numerous forms and records of students (and organisations) had to be generated and kept.

DEFINING THE BIOTECHNOLOGY INDUSTRY

A true biotechnology industry currently doesn't exist in Singapore. As most of the attachments had to be local, we defined the industry as one involving all organisations dealing with life science products. This created quite a substantial listing of potential placement organisations that we divided into two broad categories: Agrobiolgy and Biotechnology. (It was not feasible to over-categorise as we would be creating pedantic details that would not match with student expectations.) Agrobiolgy covered fieldwork and included fish breeding farms, greenhouses, research stations, etc. Biotechnology covered lab-based operations and included breweries, lab-based operations, hospitals, etc. The organisations were contacted via direct mailing, email, and telephone. We followed through on all contacts with personal visits to explain about the scope of the PPP, its objectives and their organisation's potential involvement.

MATCHING STUDENTS TO INDUSTRY

A simple curriculum vitae (CV) form was created for each student covering their background, research interests, and preference for attachment in Agrobiolgy or Biotechnology. The perception among the students was that an attachment to research institutes was a prime posting. Hence, only students with a CAP above 4 were pre-selected and their CVs were sent to the research institutes. The students were arranged in alphabetical order and usually several candidates for one placement were sent to each organisation listed under Agrobiolgy or Biotechnology. This manner of selection minimised any partiality on our

Setting Up the Department of Biological Sciences' Professional Placement Programme

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part as the organisations themselves did the final selection of students. All returned student names were sent out to other organisations on our list.

Students were expected to accept the industrial placement offered. Any unreasonable reshuffling among the students would have created problems between the Department and respective organisations. However, there were exceptions. One student was emphatic about not working with insects. As this was a reasonable rejection, the student was placed elsewhere. Another case involved an Indonesian student who was accepted but was expected possibly to travel to Batam for fieldwork. As the Indonesian student would have to pay considerable exit/entry fees to Indonesia, a replacement candidate was found for the posting.

EXPANDING THE PPP BEYOND SINGAPORE

During the first PPP exercise, one student, through her own initiative, obtained an overseas placement. We assisted her by checking that the position offered was with a bona fide organisation dealing with life sciences and then sending this organisation a copy of our PPP objectives. Once the link was verified, the student arranged for her own visa application.

However, for us to expand the PPP beyond Singapore, we need to improve our administrative capability and seek additional support. For instance, we have to ensure that this programme does not clash with the Student Exchange Programme over regional exchanges or the Undergraduate Research Opportunities Programme over research projects.

Although we have approached numerous regional organisations about becoming involved with the PPP, their awareness of industrial attachment is generally limited and patience is required to generate a change in mindset. So, we are now exploring exchange programmes with other overseas institutions with similar industrial attachment programmes and hope to formalise overseas postings in the PPP by next year.

In addition, we would like to propose that the University consider offering scholarship awards for short overseas industrial attachment, apart from the existing subsidies for travel and warm clothing expenses. Such a measure would definitely enhance the distinction of being selected for the PPP. ■

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Practical Training Scheme at the Departments of Building and Real Estate

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Under the provisions of the course curriculum, students at the Departments of Building and Real Estate in the School of Design & Environment are required to undergo 9 weeks of approved practical training in each of the second and third years of the course. The Departments view the Practical Training Scheme as a tripartite responsibility involving the outside host organisation, the student, and the University.

OBJECTIVES

The objectives of the Scheme are:

1. to enable the student to apply the knowledge gained from academic studies to practical situations;
2. to enhance the student's understanding of the relevance of the theoretical studies to the construction and real estate industries in its practical perspective; and
3. to afford the student the chance to experience at first hand, a working situation in the construction and real estate industries, local or overseas.

NATURE

Practical training gives students the opportunity to participate in, supervise, monitor, or at least, watch and understand how construction-related operations and management processes are carried out. Building students are attached to well-known quantity surveying firms (doing measurement work and assisting in projects), contracting and consultancy organisations, statutory boards, Town Councils, government departments, and research projects in the Departments. Most of the Real Estate students are attached to established property consultancy companies involved in management, leasing, valuation, and research.

MANAGEMENT

The Departments assist in finding Practical Training placements for the students. Each student has two supervisors during the period of practical training, one being provided by the employer and the other by the School. The supervisors are responsible for ensuring that the training meets the requirements of the course. They jointly develop and agree on a training programme for the student prior to the commencement of the student's attachment and monitor the student's progress. The School's supervisor visits the student at least twice during the period to liaise with the student and the other supervisor and to discuss the student's work, progress, and any problems encountered.

During the period, each student is required to keep a Log Book and to record his/her work in sufficient detail to provide evidence of satisfaction of the curriculum requirements and the agreed training programme. The Log Book is endorsed by the external supervisor week by week and by the internal supervisor during liaison visits. On completion for the period, the responsible staff member certifies satisfaction of the overall requirements. Each student is further required to prepare, and submit for the approval of the staff supervisor, a 1000- to 2000-word report on two out of a given range of relevant aspects of the industrial situation.

VENUES

In recent years, students have been encouraged to undertake their Practical Training overseas. Undergraduate students from the Departments have been attached to organisations in China, Hong Kong, Indonesia, Malaysia, Mauritius, New Zealand, and the United Kingdom for the industrial orientation. Despite initial adjustment problems to climate, people and culture, all the students have found their overseas training very educational, horizon-expanding, and enriching.

Says one student who was on a 9-week attachment in an international property company (providing property-related services including property management, valuation, mortgage, and building consultancy) about her experience:

"Having a chance to work overseas not only allowed me to acquire new knowledge from work, but also enabled me to improve myself in handling human relations in terms of meeting and mingling well with different people. It is an unforgettable experience and has given me a chance to really understand and experience life in another country..."

This is the general consensus of students attached overseas: they learnt to be more independent and gained a broader outlook of professional practice in their respective disciplines. More students have since indicated keen interest to do their practical training overseas. With the increasing drive to globalise the Singaporean worker, this trend will help to better prepare Building and Real Estate graduates for the international challenges ahead. ■

The Applied Chemistry Professional Placement Programme

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Department of Chemistry

apprenticeship: training in an art, trade, or craft, under a legal agreement defining the relationship between master and learner and the duration and conditions of their relationship.

—Encyclopedia Britannica

The Applied Chemistry Programme in the Chemistry Department was implemented during the 1997/98 academic year. Then, 8 students were allowed to enter the programme at Level 2, and a larger cohort entered regularly at Level 1. The first students graduated with their B.Sc in 1999, and the first B.Sc (Hons.) class completed the course earlier this year. Presently, we do not possess statistically significant data analysing the effectiveness of the course. Hence, this essay is based on my subjective observations.

THE PROFESSIONAL PLACEMENT PROGRAMME (PPP)

A full-time Professional Placement period in the third year was provided to give the Applied Chemistry course the desired practical and industry-oriented component. The PPP aims to:

1. encourage self-study and independent learning before the attachment by making the students aware that their skills and knowledge will eventually be put to use;
2. provide industry with the opportunity to give feedback on the adequacy and relevance of the university curriculum; and
3. allow students to experience an actual industrial work environment, and through it, see the need for gaining higher-level skills and possibly a higher degree¹.

Discussions with representatives of the local chemical industry indicated that companies preferred at least a 6-month internship. This would leave enough time for appropriate training, and the company would obtain some return in the form of useful work done by the trainee. The current 3-year structure of the Chemistry (B.Sc) course dictated that this professional placement had to be in the first semester of the final year. Any earlier, the students would have too little professional training. The last semester of the final year

was excluded because: (1) university regulations stipulate that the final semester before graduation should be spent at NUS, and (2) an internship period after completion of all academic degree requirements would put the students at a disadvantage (it would amount to an additional 6 months of probation time at grossly reduced pay for students who actually qualified for the B.Sc).

The companies that participated in the PPP (*see Table 1 on page 6*) constitute a mix of large multinational corporations and local firms as well as non-profit organisations or government-affiliated bodies. Most students worked in applications and customer support laboratories or in quality assurance. Some were involved in new product development and formulation.

FEEDBACK ON THE PPP

What are the benefits of an internship programme to the students, companies, and teaching staff concerned? Professor Anthony Kelly, Lee Kuan Yew Fellow and former President of the Institute of Materials (UK), commented in a conversation on the effectiveness of industrial attachment programmes: Such programmes are very personnel intensive for the academic institution if they are to be well managed. Students who graduate from a cooperative course (with industrial attachment period) seem to have less difficulty in finding their first employment. However, a clear career advantage is not identifiable. After 3 or 4 years on the job, there is little difference between graduates who had experienced an industrial trainee period and those who graduated from a conventional academic course. However, he observed that a significantly larger number of female students from these programmes pursued careers in industry.

For the Applied Chemistry PPP, most students indicated that the attachment was an enriching experience. One enthusiastic student highlighted an exciting opportunity during which her site supervisor allowed her to accompany her on 12-hour shifts during a plant start-up. Others were more reserved, but conceded that they had learnt a lot, realising that a chemist's job required considerable stamina besides a knowledge in chemistry. Students on overseas attachments gained an insight into the reality of corporate

1. We hope that the attachment will indicate to the students the importance of further education, and thereby lead to an increase in the number of students who seek M.Sc's or PhD's before leaving for an industrial career. For this, it was considered necessary that the section heads and group leaders in the divisions to which each student is attached should themselves have higher degrees. Fortunately, the number of managerial personnel in Singaporean enterprises who hold higher academic qualifications has increased over the last few years, and most of the group leaders, particularly in multinational corporations, have MBA's, M.Sc's, PhD's, or comparable qualifications.

research and the experience of living for 6 months in a different cultural setting.

The companies' evaluation of the students was overwhelmingly positive. Although some organisations pointed out deficiencies in the classical curriculum, we received no complaints about lack in specialised skills (e.g. management, use of statistical tools, safety, engineering). The most important characteristics required by the companies appeared to be an outgoing character, willingness to integrate into a team, and a constructive attitude. The number of companies who supported the programme more than once (*see Table 1*) suggested their general satisfaction with our students. Several companies that had accepted interns in 1999 offered placements for 2000, but could not be considered because the students had already secured positions elsewhere. In other cases, companies disappeared due to mergers and acquisitions, but continued to support the programme under another name.

The (admittedly small) database of students who graduated from the Applied Chemistry course indicates that the goal of preparing students for an industrial career seems to have been met: out of 5 who graduated in 1999, 4 (80%) found employment in the chemical and related industries. This of course does not prove that the industrial attachment increased the likeliness of a student to choose an industrial career: the students who opted for the Applied Chemistry course might have always wanted to go into industry. However, discussions with the students before their attachment revealed that they had only a very vague perception of the chemical industry, its products, and the job opportunities offered there. Thus, we are justified to assume that the professional placement did play a decisive role in their ultimate decision to look for employment in the manufacturing sector. In due course, it is expected that the other goal of retaining a considerable fraction of each cohort for an advanced degree will also materialise. ■

Table 1:
List of Companies Participating in the Applied Chemistry Professional Placement Programme

	<u>1998</u>	<u>1999</u>	<u>2000</u>
Overseas:			
Imperial Chemical Industries (GB)	•	•	•
Mitsubishi Chemical Corporation (Japan)		•	•
Materials Performance Technologies (NZ)		•	•
DEGUSSA-HÜLS AG (Germany)			•
Dupont (USA)		•	
Locally:			
3M Corporation		•	•
Agilent Technologies			•
Albright & Wilson	•		
Exxon Chemicals			•
GE (Airplane Services)		•	
Glaxo Wellcome	•	•	•
Honeywell			•
Johnson Matthey	•	•	
Merck Sharp & Dohme			•
Milliken Chemicals		•	
Philips			•
Polymer Coating Industries of Singapore			•
Rhodia		•	•
Shell Research Eastern			•
Shell Seraya Research		•	•
Schering Plough		•	
Seraya Chemical	•		
Union Carbide			•
Wacker Siltronics		•	
ECO		•	•
SGS Testing	•		
Singapore Catalyst Testing Laboratory		•	
IMRE			•
Centre for Natural Products Research		•	

The Virtual Laboratory Platform as a Form of Internet-based Apprenticeship

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Rapid changes in technology have led to the recent development of internet-based virtual laboratories. In this article, we would like to examine the impact and potential of virtual laboratories in the area of engineering education as a useful tool for learning curricula and experiencing real-life work situations.

TRADITIONAL VS. VIRTUAL LABORATORIES

Traditionally, the laboratory has been an integral component of engineering education for relating fundamental concepts to basic real-world phenomena. Conducted largely within the confines of the lecture-classroom format, the laboratory involves the use of largely pre-determined or recipe-like experiments that simulate basic phenomena found in real-world situations. Unfortunately, the lecture-classroom-laboratory system has its flaws or demanding requirements: time-space dislocations of what is taught, what is explained and learned, and what is practised and internalised, as well as the need for large amounts of space and complicated logistics to create and maintain an appropriate learning environment.

However, the role of conventional laboratories for training and understanding engineering problems is presently being challenged. The advances made by Information Technology has led to some learning processes being replicated to varying degrees in the form of courseware available through the Internet, thereby overcoming some limitations of the traditional lecture-classroom-laboratory system. As web-based learning systems improve over time, the concept of an e-Learning community that embraces a Learning-on-Demand culture is likely to be eventually realised.

THE ROLES OF VIRTUAL LABORATORIES

Through a collaboration between the Department of Mechanical & Production Engineering and SGI, Inc, we have devised a three-dimensional virtual experiment structure of a simple beam-cantilever case study. The virtual beam-cantilever experiment can be carried out anytime, anywhere over the Internet using web browsers and other Java programming technologies.

To improve upon the design of this virtual experiment structure, we are in the process of developing a facility to support the direct manipulation of objects in the setting up of virtual experiments. Such a capability is vital to avoid running virtual experiments in a recipe-like manner. For example, beam-cantilever parameters (e.g. shapes, dimensions, loads, properties) can be adjusted freely to allow for an analysis programme to calculate results (e.g. stress, deflection) in such a way that is easy for students to visualise mechanical phenomena. Because such experiments are virtual, they can be safely conducted when certain extreme parameters are used, unlike in the real

world where such experiments could be dangerous and life-threatening.

In addition, the virtual laboratory has the potential to be an e-Learning and e-Training hosting infrastructure that can align with the needs and practice of curricula programmes and industrial attachment scenarios. Hence, we are currently identifying the necessary architecture and key details that will allow us to develop the virtual laboratory as a computer environment that can support different kinds of experiments and analytical requirements over the Internet. The aim is to make the virtual laboratory a reasonably extensible and reusable platform that can be used collaboratively by large groups of students through a distance-learning format, thereby overcoming more weaknesses of the conventional laboratory-based educational system.

If real-world experiments, via equipment, sensors, video streaming, etc. can be integrated into the virtual laboratory, there will then exist an excellent means to compare and evaluate real-world property behaviour with the virtual form. Technological advancements (such as web-server-on-a-chip and the embedded Java) will allow this scenario to soon become a reality and will transform the way real-world objects are accessed and managed. Experiment farms may be possible. Conceptually speaking, this can be described as a kind of convergence between what is taught and what can be simulated together with what can be practised and observed.

As the infrastructure for setting up virtual laboratories improves, the inherent capability within virtual laboratories to allow links between experiments and real-life phenomena (and thereby compare and reinforce learning) can enhance operator training. Like flight simulators and game playing environments, virtual laboratories can provide opportunities for trainees to learn skills and be assessed in real time over the Internet. Consequently, training apprenticeships in the future could be conducted through internet-based learning platforms.

CONCLUSION

There is still much to be done and explored if a flexible and reusable infrastructure for virtual laboratories, integrating experiments and courseware-like materials with communication support, is to be realised. Although we realise that virtual laboratories may not necessarily have universal applications and can never totally replace real-world processes, we believe that when students can interactively learn, play, and make mistakes in an integrated and rich setting that combines 'textbook' knowledge acquisition, evaluations as tutorial questions, and hands-on interactivity, we will have a useful tool at hand. This will overcome some of the constraints of traditional engineering education. ■

CIVIL SERVICE internship programme for POLITICAL SCIENCE students

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INTRODUCTION

Since 1993, the Department of Political Science has participated in the Civil Service Student Internship Programme, under which students are attached to a Ministry for six weeks during the long May/June vacation. So far, 93 Political Science students have participated in the Programme, including 13 students selected for the Programme in May/June 2000. The Ministries to which they have been attached include Communications & Information Technology, Community Development & Sports, Defence, Education, Environment, Finance, Health, Home Affairs, Information & the Arts, Law, Manpower, National Development, and the Prime Minister's Office.

THE TYPE OF WORK UNDERTAKEN

The students perform professional duties within Government administration. These may involve doing research projects, designing and carrying out surveys, writing papers, reviewing plans, preparing exhibitions, analysing media reports, or developing websites.

For example, during May and June 2000, two students were assigned a joint project to study service delivery standards at the Singapore Land Registry (including a survey of customer satisfaction levels and measures to improve them). Part of the project was also the design of an interactive website to facilitate electronic conveyancing. Another two students were attached to the International Talent Division at the Ministry of Manpower. One designed a Chinese contact website, whilst the other undertook an assessment of

overseas tertiary qualifications to facilitate the programme of attracting suitable foreign talent to Singapore.

During the Internship Programme, the students visit other Ministries and organisations in the public sector. In the course of these visits, they are briefed on the work of the organisation. In addition, the students are given an overview of the Singapore Civil Service when they attend a briefing session at the Public Service Division at the beginning of the Internship Programme.

SELECTION OF STUDENTS

The Department adopts strict criteria in selecting students for the Internship Programme. Second and third year students, who have received a B+ grade or above for most of their courses, are invited to fill up an application form. As part of their application, they write a short essay on why they wish to undertake the Internship. Senior members of the Department then interview the applicants. On the basis of their interview performance, information provided in their applications, the grades received for their courses, and feedback from tutors, the final list of applicants is selected.

BENEFITS OF THE INTERNSHIP PROGRAMME

The Internship Programme gives students a greater knowledge of Government administration in Singapore. They gain first-hand experience of the way Civil Service Departments operate, how policies are formulated and implemented and the way services are delivered. In so doing, they acquire an understanding of decision-making and administrative procedures on a day-to-day basis.

Most of the work given to the students involves research either through surveys and interviews or by consulting documents, from which relevant information is gathered, analysed, and summarised. Thus, they gain valuable exposure in undertaking practical research in the context of public administration. In many cases, the students are called upon to write reports and papers as part of their research projects. This gives them experience in how to compile reports, and enables them to appreciate the need for clear and concise writing for this purpose. In addition, the students are usually given a degree of autonomy in doing their work. They enjoy plenty of scope to use their initiative in planning their work, gathering and analysing information, writing reports, solving problems that crop up, and finding new tasks to be done.

The Internship students find that they learn a lot from interacting with others in the job situation, especially in meetings and dialogue sessions with senior officers. In addition, they are often engaged in joint projects with other Internship students, through which they learn the importance of team work and cooperation. Some of the Political Science students work with students from other disciplines also involved in the Civil Service Internship Programme, which allows them to share perspectives derived from their different disciplines.

A further benefit is that the Internship Programme gives the students an opportunity to consider the Civil Service as a possible career option and assess their suitability for such a career. Over the years, quite a number of Political Science Internship students have joined the Civil Service or a Statutory Board after their graduation.

CONCLUSION

The Internship Programme has given Political Science students valuable experience in a professional working environment, enabled them to see how the theories and concepts of Political Science apply in practice in Government administration, and opened up for them possible career options within the public sector. In their feedback, the students have regularly reported that they learnt a lot from the Internship Programme, and found the experience challenging and enriching. The Department of Political Science is indebted to the Public Service Division, and those officers in the different Ministries who supervised the Interns, for all their efforts in organising and implementing the Programme since 1993. ■

Under the Talent Development Programme (TDP) specially tailored for the top performing students in the Faculty of Arts & Social Sciences, an internship programme was set up in 1998 whereby students are attached to a public or business organisation for a period of six to eight weeks during their May/June vacation. The objective is to provide TDP students with professional work experience in such fields as policy-making, administration, financial management, and personnel management, so that they can be better equipped to perform leadership and management roles in their future careers.

To date, various organisations have participated in the programme such as Ministry of Foreign Affairs, Housing & Development Board, Singapore Tourism Board, Singapore Press Holdings, Development Bank of Singapore, and Shell Eastern Petroleum (Pte) Ltd. When placing TDP students for their internships, the type of organisation and the nature of work involved are matched as closely as possible to the students' academic backgrounds and interests.

The work performed by the students entail assisting organisations in major projects or a series of small assignments. These include information and data gathering;

sorting and analysis; planning and designing projects; drafting reports and papers; helping in the preparation of publications and organisation of exhibitions; being involved in committees; and communicating with the public.

The Faculty emphasises the necessity for the students to be assigned a supervisor in the organisation to which they are attached. The supervisor will allocate projects and assignments to the student, provide necessary advice on how the work is to be carried out, monitor the student's progress, and submit a report on his/her performance at the end of the internship. It is important that the supervisor meets the student

on a regular basis, such as once per week, and be on hand to give advice if any difficulties arise. At the end of the internship programme, the students will write a report describing the work they have done as well as indicating what they have gained from the programme and what improvements could be made.

Thus far, feedback from TDP students who have undergone the internship programme has been optimistic. Some felt it had been an insightful and refreshing experience. Others were grateful for being given the opportunity to have a feel of working life while still a student. ■

Internship for Arts Students in the Talent Development Programme

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Apprenticeship in Postgraduate Orthodontic Training

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As a teacher at the Faculty of Dentistry, I am faced each academic year with the utmost responsibility of grooming new postgraduate students and developing in them a love for learning. In the paragraphs that follow, I wish to share with fellow teachers my philosophy of training postgraduates for successful careers in Orthodontics.

I will always remember with fondness the two years that I spent at the University of Adelaide for my specialist dental training in Orthodontics under dedicated teachers. It was their love for learning and how they communicated this passion that have been instrumental in shaping my thoughts and beliefs on teaching. While at the University of Adelaide, I was an eager and enthusiastic novice learning from a well-known master of dental research in the true definition of apprenticeship. During the first eight weeks of the course, I spent much time and lost much sleep learning how to bend wires to match complicated printed patterns for seemingly inexplicable reasons. My former teachers were neither sadistic, nor did they demand unquestioning loyalty to their personality and/or work methods. Instead, they probed and pushed my young mind to the limits, and sharpened it in the process. They were more than teachers to me; they were mentors and facilitators of learning. I can now say with a great measure of thankfulness that those eight weeks of painful and bruised thumbs and finger tips have instilled in me a sense of precision and efficiency in wire work to move patients' teeth into their desired positions.

The teaching and learning of Orthodontics, as in other clinical disciplines in Dentistry, are well suited for apprenticeship training for they take place in real life environments such as in the presence of patients or simulated through the use of clinical records. Apprenticeship in Orthodontics requires an expert, not just to transmit knowledge and foster understanding of key concepts, but to also build into the very character and soul of each student the ability and will to make the correct clinical and honest intellectual decisions in the provision of orthodontic care.

At NUS, postgraduate Orthodontic students undergo an intensive 3-year clinical training programme treating dental malalignment problems in children and adults. Students develop: (a) diagnostic skills, (b) the ability to provide treatment options and decide on optimal treatment plans, and (c) manual dexterity skills for moving teeth. Lest clinical findings and treatment plans become of little use, students also need to learn to communicate effectively with patients and/or their parents, recognising patients' eccentricities and what motivates them to seek treatment.

Consequently in Orthodontic training, teacher-student interaction is extremely vital. The skills of diagnosis and

treatment planning are honed through Socratic-style tutorial sessions during which students discuss their cases with the teacher. Questions are structured to help the students analyse dental problems comprehensively and explore all treatment possibilities. To sharpen their clinical decision-making skills, further questions are posed to make them think about possible outcomes with different scenarios. As students respond to these questions, they are challenged to evaluate their own answers. Teachers, as mentors, in turn share their experiences on how similar cases have been managed. Students are also encouraged to question the validity of the teacher's treatment decision. Teachers handle students' queries with deftness and conviction. Through this lively interaction, active learning takes place for both students and teachers as critical and analytical thinking are stimulated. Slowly but surely, students learn the finer points of Orthodontics over time.

Clinical apprenticeship is also vital for the student in learning how to work with patients who have different temperaments. As a novice postgraduate, I had the privilege of witnessing one of my former teachers handle a difficult parent of one of my patients who was demanding and extremely critical of my treatment. The composure and firmness with which he handled the recalcitrant parent not only reassured me, but also led subsequently to the parent relenting and apologising. I learnt several important lessons from this incident:

1. Students, no matter how bright and capable they are, need affirmation, especially during the developmental years of their clinical careers. My teacher's ability to communicate and reason with the difficult parent, and yet support the correctness of my treatment decision, boosted my confidence to continue working with the patient.
2. The key to successful patient management lies in the need to communicate with patients and parents at all stages of treatment.

Despite the growing ease and spread of online learning in recent years, no computer can and should duplicate the personal involvement a teacher has in helping students learn. In fact, there is now a greater need than ever before for the human touch in students' learning such that apprenticeship should play a bigger role in the 21st century. In my view, postgraduate Orthodontic students learn best higher order problem-solving skills, manual dexterity, and effective communication under the guidance of a teacher who instils confidence and gives direction. Thus, the true measure of a successful Orthodontic apprenticeship is when one observes in the life of our charges the expression of the skills and values gleaned from having been with a teacher who is both a mentor and facilitator of learning. ■

Student Responses

to the Pharmacy Practice Preceptorship Programme

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The Pharmacy Practice Preceptorship Programme is made up of two 6-week student attachments to preceptors who are practising pharmacists after their second and third year final examinations. It also fulfils in part the statutory pre-registration training requirement for admittance to the Pharmacists' Register in Singapore.

The programme provides an opportunity for experiential learning in work environments of different pharmacy practice sectors in order to partially fulfil the following objectives:

1. Gain an understanding of the practice of pharmacy and to learn more about career opportunities available to pharmacy practitioners.
2. Acquire and apply some knowledge, experience, and skills to achieve professional competency in pharmacy.
3. Begin to develop high standards of ethical, legal, and professional conduct.
4. Begin to develop the commitment to keep abreast with developments and maintain professional competency.

The programme comprises the Core and Sectoral components of the Pre-registration Competency-Based Training Programme developed by the Pharmaceutical Society of Singapore. The Core component addresses the generic and critical aspects of pharmacy practice, i.e. the professional (behavioural-based) elements and the technical (task-based) elements. The assessment of the student for the professional elements is 70% and 20% for the technical elements. The minor Sectoral Component provides a set of sector-specific experience in community pharmacy, polyclinic pharmacy, hospital pharmacy, industrial pharmacy, the National Pharmaceutical Administration, or the pharmaceutical industry. This amounts to only 10% of the overall assessment. A set of guidelines for the students and preceptors was

formulated and revised after discussion with senior pharmacists. The students and preceptors were briefed on the programme.

63 pharmacy students participated in the programme under the wings of 34 community pharmacists for the first time in May 1999. Each student furnished a log book and a 2000-word report after the programme. The preceptors submitted evaluation reports on each student to the NUS coordinator. The overall impact of the programme was further observed when the students returned to the classroom with exuberance and enthusiasm. The following extracts from students' reports offer candid feedback on four important aspects of the programme.

A. THE PROGRAMME

1. ...good timing for programme to start during the May/July holidays, after studying core subjects e.g. pharmacology, pathology, physiology, and pharmacy law. I am able to apply whatever I have learnt and to correlate experience with examples cited in class.
2. Favourable aspects of the programme:
 - choice of location
 - flexible working hours
 - choice of period of attachment during vacation, any 6 weeks
 - possibility of mutual exchange of preceptor before programme commenced

B. THE EXPERIENCE

Positive

1. After receiving an education, which is heavy in spoon-feeding for 1½ decades, I am starting to learn about how to learn. I hope I have not started too late.
2. This programme has honed my interpersonal skills through daily interaction with my colleagues, preceptor, and the regular flow of

customers. Every customer provides a new case for study as every individual has dissimilar needs and reacts in a different way.

3. Greatest challenge was to communicate with customers in dialects and languages one is not fluent in.
4. We not only learnt from observation, but also put skills into practice after gaining sufficient confidence via role-playing.
5. I felt the full impact of a pharmacist's frontline influence on a customer when I realised the vast amount of options that are available for just cold remedies. Good pharmacy service ensures that the customer gets the right medication and hence a speedier recovery.
6. I realised that in order to provide good patient counselling, the pharmacist needs to know the physiology and pathology of the human body and the pharmacology of different medications. This made me appreciate the rigorous programme that pharmacy students have to undergo at NUS.
7. I learnt how to solve problems and handle situations the correct and professional way by observing how my preceptor dealt with these problems, by listening to experiences of my preceptor and pupil pharmacists and by reflecting on my own experiences while working at the pharmacy.

Negative

1. ...doing things totally unrelated to pharmacy e.g. price-tagging & cashiering.
2. I thought work would be more relaxing and less stressful than being a student—sad to say I was very very wrong—as a practising pharmacist—it is even more stressful and you get to be assessed by a greater number of people.

C. THE LENGTH OF THE PROGRAMME

1. I reached a 'plateau' after a steep learning curve in the first 3 weeks—my preceptor pointed out that the plateau is an illusion as my knowledge was still very superficial.
2. Duration is just right, not too long to drive us up the wall...not too stifling. Everyday is like a small discovery trip because there is so much to learn.

D. THE PRECEPTOR

1. When it is not too hectic, my preceptor would take time to go through the medication profile of certain interesting cases... She would provoke me to think and encourage independence and initiative in learning with the aid of available resources.
2. Getting the right preceptor during this attachment is very very important. It is the factor that either makes it or breaks it.
3. Preceptor allowed me to adopt a pro-active attitude towards learning and she did this by giving me surprise quizzes for which I had to find the answer on my own and by letting me handle a variety of tasks, even if it meant learning through mistakes. In fact, how much a student would gain from the programme would depend on how much initiative he has in the first place.
4. We had discussions on health topics, covering the medical, ethical and financial issues. This was enlightening, as my preceptor recounted real-life examples.
5. She showed us the ropes of the trade without any reservations and with an openness of her knowledge for which I am extremely grateful... She exuded enthusiasm and dedication in the process. ■



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

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