FLEXIBLE LEARNING PROGRAMME IN VOCATIONAL EDUCATION: A CASE STUDY

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Abstract The Vocational Training Council (VTC) is undergoing a transformation that has reshaped many aspects of its organization; in particular, the course design and the way these courses are delivered. This paper presents a case study of the planning and design of a typical part-time vocational course curriculum at the Hong Kong Institute of Vocation Education (HKIVE). It outlines the considerations that the course team has to face. First, the aims of the Higher Certificate and Higher Diploma courses are highlighted. The major influence on the course aims for the curriculum, the social and economic efficiency factor, is discussed. A further aim, the learner-centered consideration, is identified. Given clear aims, goals and objectives, the design of the course structure proceeds. Subsequently, a suite of curriculum is proposed.

1. INTRODUCTION

The VTC is now undergoing a transformation that has reshaped many aspects of its operation, ranging from management structure to the design of the courses and the way they are delivered.

This transformation focusses on a new mission statement:

> *"To provide high quality, cost-effective, internationally acceptable vocational education, training and qualifications for student of all ages, directly applicable to the requirements of Hong Kong's employers"*

To implement this mission, seven objectives have been identified [1]. These objectives include the creation of an environment in which the various major components associated with the VTC, such as the employer, students and employees can play an effective and collaborative part in realizing the mission. This requires a radical change in the organisation's structure and culture.

Among the many reforms and restructuring, the radical change in the design of its courses has the most far ranging effect. This requires the VTC to have a shift of paradigm in course design and the way these courses are delivered. This paper presents a case study of the planning and design of a typical part-time vocational course curriculum at the Hong Kong Institute of Vocational Education (HKIVE). It outlines the considerations that the course team has to face.

Section 2 outlines the current practice in the operation of part-time courses in HKIVE. Together with an overview of the needs for a flexible learning program, it gives some background on the various considerations needed for the new courses.

In section 3, the aims of the Higher Certificate and Higher Diploma courses are highlighted. The major influence on the course aims for the curriculum, the *social and economic efficiency* factor, is discussed. The focus of intentions, contents, learning and assessment are also discussed.

Given the clear aims, goals and its various focus, section 4 details the design of the course structure. Subsequently, a suite of curriculum is proposed based on the new design paradigm. The course

planning team focus on an approach based on flexible learning in which the learning program of the curriculum places emphasis on flexible learning and transferable skills. A Module Accumulation (MAC) course structure is proposed so that the learning program has a framework of flexibility. Finally, the overall design of these two courses is presented in Section 5 together with some practical considerations.

2. COMPARISON OF CONVENTIONAL COURSE AND FLEXIBLE LEARNING PROGRAM

Traditionally, the HKIVE courses have a rigid curriculum and timetable based on the academic year. Enrolling on courses begins in September and the academic year ends in the summer term. The learning is arranged in a fixed sequence, with assessment occurring at a fixed point for the whole group of students. Courses have an integrated curriculum designed by a course planning team and accredited by awarding and professional bodies[3].

More recently in vocational education, there has been a trend to provide a coherent curricula within a diversified course structure[4]. In contrast to the conventional course, a learning program provides an initial guideline, counseling and assessment to establish individual starting point. Flexible learning program is a major innovation in curriculum to address the requirement of flexibility and diversity, particularly appropriate to students already in the workforce. It challenges the conventions of the traditional taught course structure. Entry and exit points for the learner depend on achievements both prior to and during the study. There are no assumptions about the pace of the learning. The delivery of the learning program is not constrained by the conventional academic year. Programs are constructed using the building block of a module (or credits). The differences between the conventional taught course and a flexible learning program are highlight and shown in Table 1.

Flexible learning program is the key to this proposal in which a Module Accumulation Course (MAC) structure is the major vehicle to implement a viable and cost effective vocational training program.

Stage	Conventional Course	Flexible Learning Program
Before entry	• Students choose a specific course to study • Each course contains a pre-determined group of subjects, related to a particular profession.	• Students choose a discipline of study with the specific curriculum being selected later • Different modules can lead to a range of different qualifications • Students can join the program at different points (recognize prior learning) • Select initial rate of study
At entry	• Based on previous qualifications • Require subject-based induction	• Based on the principle of open access • Need guidance on module choice • Require induction into the structure of the program
During Program	• Curriculum is compulsory and delivered over a set period of time and in a set sequence • Learning style is based on pedagogy[1]	• Student can maximized the effectiveness of the modules to achieve different qualification outcomes and match their vocational needs • Learning style is based on Andragogy[2]
At exit	• Student will attain the qualification	• Student will have choice over the qualification outcome at exit which depend on the module combinations

***Table 1** : Comparison of Conventional course and Flexible learning program*

2.1 Flexible learning program in IVE

A review was conducted into the operation of Higher Certificate courses within the former Technical Colleges of the VTC and it recommended the adoption of a more flexible approach to course delivery. This was in response to the acknowledged high attrition rates on the courses, with an overall cohort completion rate of 53%. Subsequently, the General Academic Regulations were amended to support the Module Accumulation (MAC) model and a working party established in March 1999 to formulate guidelines for their operation.

The Department of Electrical & Communications Eng. conducted a pilot course design exercise for two PTE courses (HC and HD in Telecommunications Engineering) which will start their MAC mode of operation in Sept. 2001. To establish a flexible learning program, the following provisions are necessary :

- a mission and set of policies

[1] The art and science of teaching children, it is more commonly associated with teacher-dominated approaches to learning

[2] The theory of adult learning, which stresses the value of approaches which build upon the exiting experience of the learner.

- the provision of resources for student guidance
- a unit-base program designed to accommodate the different needs of individual learners
- procedures for recognizing prior experience
- MIS capable of tracking individual learners

This gives course planners some parameters for its course design process.

3. AIMS, GOALS AND OBJECTIVES OF THE LEARNING PROGRAMME

As far as curriculum design is concerned, there are two main aims of the part-time Higher Certificate (HC) and Higher Diploma (HD) in Telecommunication Engineering. The prime aim is to produce Associate Engineers in the field of Telecommunications Engineering who will be capable of satisfying the needs of industry and commerce in Hong Kong. It achieves this by providing persons with a suitable technical education that will enable them to take up careers where they can make a valuable contribution to the design, operation and maintenance of telecommunications systems. This type of particular aim is viable for adult education. The second aim is to satisfy the needs of the individual learner to obtain a vocational education that can provide them with a career path so that they can integrate into the society.

In vocational education, a strong element of the *social and economic efficiency* factor is embedded in the course aims. As far as curriculum design is concern, four components encompass this approach, namely: *intentions*; *contents; teaching/learning methods*; and *assessment*[2]. The focus of each component is:

1. *Intentions* : to provide for the current and future manpower needs of society
2. *Contents* : to focus on knowledge and skills which are useful and relevant to future employment
3. *Teaching/learning methods* : to emphasize application and skill mastery
4. *Assessment* : to emphasize assessing students' ability to apply knowledge and skills

3.1 Intentions

For part-time courses, there is a lesser requirement to accomplish its main *intentions*. Most of the learners already have a job in the related field and they possess some of the skills and knowledge before enrolling on the course. However, in a fast moving industry such as telecommunications, skills and knowledge can become obsolete in just a few years. There is a strong intention and incentive for these learners to engage in life long learning. Thus, the intention of the course is to produce graduates who are capable of self-learning and provide a framework for on-going self learning. Life-long learning is an increasingly important skill for learners to meet the changing needs of the society and industry.

3.2 Contents

The focus of the *contents* of the course is to provide career-oriented training for part-time HC and HD students. Often, the learner is the best person to plan his/her learning to best match his/her career planning. Thus, flexible learning is essential to contemporary vocation education to allow the learner to decide which relevant knowledge and skills to acquire and the best mode of studying. It also reinforces training to plan their own career and professional development.

Using this approach, the learner can decide which knowledge and skills will be most useful in the fast moving telecommunications industry. In addition, they can decide the pace of learning. Study becomes a partnership between the teacher as facilitator and the students as client.

3.3 Teaching and Learning Methods

The learning program was designed to include a range of attainments, including development of inter-personal skills, practical skills and technical skills. The five themes of the learning program identified are:

1. Practical and Professional Skills - economic considerations and management
2. Embedded Systems and Instrumentation - role of computing and experimental techniques
3. Electronic Principles and System Design - principles of electronic engineering and communications theory
4. Communications Theory - fundamentals of telecommunications engineering
5. Applications to Communications Systems - application of principles to real systems and networks

The five themes identified are practical in nature and designed to meet the needs of local industry and commerce. As a whole, they also satisfy the personal growth of the individual.

In the planning of the course, these themes are identified in three aspects*: knowledge, skill* and *attitudes*. *Knowledge* corresponds to the cognitive domain in six categories: *recall, comprehension, application, analysis, synthesis* and *evaluation*. Each category involves a higher degree of complexity than the one preceding it. The coverage of knowledge is addressed in the themes of the learning program. In particular, higher levels of cognitive skill, such as the ability to apply principles, the power of analysis and evaluation, are encouraged in the senior level of the course.

Skill involves the ability to perform a task (either physical or mental). This corresponds to the psychomotor domain. Practical skills are identified and integrated into the Course so that physical skills are the attainments. Likewise, communications skills and the ability for critical observation are considered to be mental skills which they are promoted in the learning themes of the Course.

Attitudes deal with the way of thinking about something and can be described in the affective domain (concerned with feelings). It can refer to a student's attitude to himself/herself, his/her family and friends, his/her job or society in general. Professional ethics, cooperation and tolerance are examples of values which this course tries to encourage. It is more difficult to describe and measure this learning outcome from the learning themes of the Course, but these elements of learning (i.e. attitudes) are considered throughout the design of the Course. For example, the study units of Project, QA and Project Management encourage the learning outcomes that students can work both in a team and perform tasks independently.

With these design parameters in mind, the overall learning outcome should ensure the students can:

1. understand the basic underlying theory of telecommunications systems;
2. utilise computers and embedded systems in the design, evaluation, control and instrumentation of communications systems;
3. apply basic electronic circuit design techniques in telecommunications systems;
4. appreciate the characteristics of the various types of telecommunications system encountered in Hong Kong; and

5. make a contribution to the overall design, implementation and operation of a communications system.

3.4 Balance of Assessments and Assessment Framework

Creating a comprehensive assessment framework is one of the most important tasks for a curriculum designer. From the viewpoint of the learners and instructor, assessment fulfils two main functions. First, it has an element of *formative* assessment. It offers feedback to the learner about his or her strengths and weaknesses and identifies measures needed to improve performance, for both learner and instructor. Second, it provides evidence for a grading decision. This is known as s*ummative* assessment.

In many vocational courses, it is desirable that the assessment of the learning program is based upon the assessment of performance in the workplace or an environment similar to the workplace. This can be broken into units of competence which are assessed through performance criteria related to each competence. When candidates are judged to have achieved all the elements of competence necessary for competent performance of the particular occupational role, they become eligible for the aware of HC or HD. Table 2 outlines the essential assessment tools when assessing learners in their affective, psychomotor and cognitive domains. These are also based on holistic assessment in which different elements and evidences are collected as part of the assessment. The evidence may take many forms. Although it is desirable to collect different evidence to give an accurate representation of the students' level of competence, it is understood the tasks could become very tedious and expensive to operate. For each module, there are many specific learning outcomes in which evidence can be collected. In vocational education, many of these should rely on competence based assessment. Nevertheless, the following factors need to be considered when the assessment framework is planned:

- Accessibility : A good assessment should aim to be transparent. This means that the learner has the right of access to all information on how he or she is to be assessed. The use of a computer-based MIS allows students to query their own academic standing. It also facilitates the tutor entering state marks effectively.
- Consistency : The course team agree on a consistent approach to issues such as grading and the timing and nature of individual assessments. This forms part of the teaching and learning package that is commonly shared by teaching teams.

Affective domain

1. testimony of others e.g. supervisors, clients
2. simulations/role plays
3. projects

Psychomotor domain

1. observation of workplace activity (or activity related to workplace such as trouble-shooting, installation)
2. candidates portfolios with extensive record of work
3. observation of workplace products e.g. records, reports, schematic diagram, program, etc

Cognitive domain

1. examination of knowledge context
2. assessment of prior achievement
3. oral questioning
4. project work

***Table 2** : Essential Tools for Competence Based Assessment*

The method of assessment is another important aspect that the course team needs to consider. Efforts were made to ensure the *validity* and *reliability* of the assessments. Assessment plays a major role in a course with Module Accumulation. A pragmatic approach was adopted where existing practice in assessment can fit in with the new course design. In particular, the year-end examination is replaced with an end-of-module assessment. An assessment framework is proposed to allow flexibility and practicality. In particular, competence based assessment is advocated where learners are being assessed in all aspects of knowledge, skills and attitudes.

4. OVERALL DESIGN OF THE COURSES

The learning themes are divided into 3 areas or grouping which are based on the full-time D/HD in Telecommunications of the IVE Electrical & Telecommunications Course Board. Table 3 shows the learning program consisting of modules from *support*, *core* and *elective* groups. There are 16 credits, 20 credits and 16 credits in each group respectively. Students are free to choose from these modules, but to be eligible for award of HC in Telecommunications, he/she is required to have a total of 36 credits. In particular, a minimum of 8 credits is chosen from the support group. Likewise, he/she needs to have a minimum of 20 credits from core group and a minimum of 8 credits from elective group respectively. A total of 36 credits is required which is equivalent to 540 hours of class contact.

Group	No. of Credit	Lecture/tutorials : lab (contact hours)	pre-requisite
Support			
Engineering Maths II	4	60 : 0	Engineering Maths I or equivalent
Supervisory practice	2	30 : 0	NIL
Putonghua	2	0 : 30	NIL
English & Communication 2	4	60 : 0	English & Comm I or equivalent
QA & Project Management	4	45 : 15	NIL
Core			
Communication Electronics	4	45 : 15	COI, Introduction to Computer,
Telecom Principle 1	4	45 : 15	Electrical Material, Circuit Theory (Fundamental Knowledge in Electrical Principle)
Telecom Principle 2	4	45 : 15	TP1
Data Comm	4	45 : 15	COI, Introduction to Computer, uP Systems
uP systems	4	45 : 15	COI, Introduction to Computer,
Elective			
Enterprise Network	4	45 : 15	Data Comm, TP1, TP2, Comm Electronics
Mobile Communications	4	45 : 15	Data Comm, TP1, TP2, Comm Electronics
Comm Electronics	4	45 : 15	COI, Introduction to Computer,
EMI/EMC	4	45 : 15	Instrumentation

***Table** 3 : Modules available in HC in Telecommunications Engineering*

Similarly, in the program of HD in Telecommunications Engineering shown in Table 4, students are required to take appropriate modules from different groups. Again, there are 8 credits, 8 credits and 36 credits in each group respectively and students are free to choose from these modules. For a student to be eligible for HD in Telecommunications, he/she is required to have a total of 36 credits in which a minimum of 8 credits is selected from the support group. Likewise, he/she needs to have a minimum of 8 credits from core group and a minimum of 20 credits from the elective group respectively. Again, a total of 36 credits is required which is equivalent to 540 hours of class contact.

Group	No. of Credit	Lecture/tutorials : lab (contact hours)	pre-requisite
Support			
Putonghua	2	0 : 30	NIL
Supervisory practice	2	30 : 0	NIL
QA & Project Management	4	45 : 15	NIL
Core			
Project	8	120: 0	at 4 elective taken form the HD courses
Elective			
LAN & WAN	4	45 : 15	Data Comm, TP1, TP2,
Broadcast & Multmedia systems	4	45 : 15	Data Comm, TP1, TP2,
Telephony	4	45 : 15	Data Comm, TP1, TP2
Broadband & Optical Communications	4	45 : 15	Data Comm, TP1, TP2, Comm. Electronics
Wireless Information Network	4	45 : 15	Data Comm, TP1, TP2,
Radar & Electronic Navigation System	4	45 : 15	TP1, TP2, Comm Electronics
Satellite Communications	4	45 : 15	TP1, TP2,
RF and Radio Comms	4	45 : 15	TP1, TP2,
Mobile Communications	4	45 : 15	Data Comm, TP1, TP2,

***Table 4** : Modules available in HD in Telecommunications Engineering*

5. STUDENT PROFILE - SCENARIOS OF 5 PTE STUDENTS

To show the planning of these modules, Table 5 presents scenarios of five students with different background representing the market segments addressed by the course. As shown in Table 6 and 7, these hypothetical cases are to illustrate some preference of the students in choosing the modules that suit their career planning.

1. Technical officer, Technician, Ass Engineer of a Fixed Network Providers - HKT, NT&T, CATV
2. Service Technician, Ass Engineer, Engineer of Mobile Operator - Hutchinson, SmartTone
3. Service support - ISP - IMS, PSInet, Linkage
4. Technician, Service Engineer of Cable and Satellite TV broadcast - CATV, IMS, AsiaSat, C&W
5. Technician, Ass Engineer of Radio/Satellite - RTHK, Department Civil Aviation, Airport Authority, Marine Department, Royal Police

Table 5*: Scenarios of 5 Students with background following the Course Target Segments*

	Student 1	**Student 2**	**Student 3**	**Student 4**	**Student 5**
Support					
• Maths II	✓	✓	✓	✓	✓
• English & Comm	×	✓	✓	✓	✓
• Supervisor Practice	✓	×	×	✓	✓
• QA & Project Management	✓	✓	✓	×	×
Core					
• uP	✓	✓	✓	✓	✓
• TP1	✓	✓	✓	✓	✓
• TP2	✓	✓	✓	✓	✓
• DataCom	✓	✓	✓	✓	✓
Elective					
• Mobile Comm	✓	✓	✓	×	×
• EMI/EMC	×	✓	×	✓	✓
• Comm Electronics	✓	×	×	×	✓
• Enterprise Network	✓	×	✓	✓	×
	40 credits	**36 credits**	**36 credits**	**36 credits**	**36 credits**

Table 6*: Modules taken required in Higher Certificate in Telecommunications Engineering*

	Student 1	Student 2	Student 3	Student 4	Student 5
Support					
• QA & Project Management	×	×	×	✓	✓
• Supervisor Practice	×	✓	✓	×	×
Core					
• project	✓	✓	✓	✓	✓
Elective					
• LAN & WAN	×	✓	×	×	✓
• Mobile Comm	×	✓	✓	✓	✓
• RF and Radio Comm	×	✓	✓	✓	✓
• Broadband Comm & Optics	✓	✓	✓	×	×
• PSTN		✓	✓	×	✓
• Broadcast & Multimedia System	✓	✓	✓	✓	×
• Satellite Comm	✓	×	×	✓	✓
• Radar & Navigation	✓	×	×	✓	✓
• Wireless Information Network	✓	✓	✓	✓	×
	40 credits	**36 credits**	**36 credits**	**36 credits**	**36 credits**

Table 7*: Modules taken required in Higher Diploma in Telecommunications Engineering*

6. PRACTICAL CONSIDERATION

In the traditional course structure, subjects are taught over the full academic year. To give greater flexibility to the learner, the module accumulation program is based on shorter semesters. A 15-week semester is proposed for each module. At the end of each module, a form of assessment such as written examination is used to measure students' attainment. Having a shorter duration, students can more quickly gain skills relevant to their jobs and have greater flexibility to vary their study load to match work commitments. Once a student has gained a sufficient number of credits, he/she is granted the appropriate award (HC/HD). Note that there is not rigid timetable to acquire the credits, rather, students have between two and five years to complete their studies. A typical academic calendar is shown in Table 8.

These proposed courses are yet to undergo validation and detailed operation still requires planning and implementation. The course team will continue to review the learning program and the balance of assessment within the rules and procedures of the IVE General Academic Regulations. The department is also making transitional arrangements to cater for students already enrolled on an existing course.

One concern for the MAC structure is the administrative workload related to the registration of students on the various modules. This can be addressed with suitable support of a MIS together with administrative staff.

Time	Events	Reference
Wk 0	Registration	
Wk 1-7	Lecture/tutorial	Mid of September
Wk 7-8	test and other module assessment	
Wk 8 - 14	Lecture/tutorial	
Wk 15	Revision	
Wk 16	**Exam**	**early of Jan**
Wk 17	Marking	
Wk 18	Module BoE	
Wk 19	Registration of next semester	Chinese New Year
Wk 20 - Wk 26	Lecture/tutorial	
Wk 26 - Wk 27	test and other module assessment	
Wk 27 - Wk 33	Lecture/tutorial	
Wk 34	**Exam**	**end of May**
Wk 35	Marking	
Wk 36	Module BoE	
Wk 37	Course BoE and IVE APC approval	end of June

***Table 8**: A typical academic calendar*

CONCLUSIONS

The implementation of a flexible learning program is new to vocational education in Hong Kong. It allows the learners to choose their pace of study and select modules that are relevant to their own needs. This paper shows how it can be applied to evening courses. The model is well suited to part-time students who are mature and in a good position to decide their own learning program within the course framework. The learners also have a stronger incentive as the learning program has greater impact on their career planning.

Criteria for selecting the study program are also outlined and hypothetical cases presented to show how learners from different telecommunication disciplines can select their own learning program to best match their requirement.

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