KEY SKILLS AND PERSONAL ATTRIBUTES IN THE ENGINEERING TECHNICIANS' CURRICULUM: A STUDY OF TWO FURTHER EDUCATION INSTITUTIONS IN HONG KONG AND ENGLAND

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Abstract

Vocational course providers are aware of increasing demands from influential curriculum stakeholders to produce 'work-ready' students. There is no consensus in the literature about which skills and attributes are most important for engineering technicians. In England FE staff deliver narrow, generic national key skills qualifications. In Hong Kong, in the absence of a national skills framework, Vocational Education and Training staff work with one that is institutionally-developed. This small scale qualitative study contributes to a better understanding of key skills and personal attributes in these two different cultural contexts.

The conceptual framework comprised a 'cubic' vocational curriculum (knowledge and understanding, key skills and personal attributes) based upon the perceived needs of curriculum stakeholders. A skills and attributes list developed from the UK-SPEC Engineering Technician Standard supplemented by items from international taxonomies and engineering literature was used with staff and student groups. Data collection involved semi-structured interviewing and systematic elicitation based on bi-lingual card-sorting activities to address the issue of equivalence (particularly important in cross-cultural research). Data analysis was based on the principles of Interpretive Phenomenological Analysis, a categorising strategy developed from the conceptual model, and contextualising information from secondary sources. Following within-case and across-case analysis, material for thick description was chosen to produce two descriptive case studies.

The most important skills for engineering technicians in Hong Kong are framed within a broad definition of key skills for 'lifelong learning'. In England key skills are primarily for 'vocational preparation'. Respondents in both cases hold realistic views of what skills industry requires. A common secondary definition of skills indicates a 'softening of skill' to include 'workplace attitudes'. Key personal attributes are less clearly articulated than skills and fall into two categories, those for student life and those for employability. Recommendations include aligning the intended and received curriculum for engineering technicians: a checklist to help achieve this is provided.

Key Words

Key skills, personal attributes, engineering curriculum, Further Education.

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Abbreviations and Acronyms

BTEC/Edexcel	Qualifications and Examination Board
CAB	Course Advisory Board (Hong Kong)
CoVE	Centre of Vocational Excellence
DfES	Department for Education and Skills
FE	Further Education
GNVQ	General National Vocational Qualification
HD	Higher Diploma (Hong Kong)
HE	Higher Education
HEFCE	Higher Education Funding Council for England
HND	Higher National Diploma
HKCAA	Hong Kong Council for Academic Accreditation
HKIE	Hong Kong Institute of Engineering
IE	Institute of Engineering
LSC	Learning and Skills Council
LSN	Learning and Skills Network
NCVER	National Centre for Vocational Education Research (Australia)
NVQ	National Vocational Qualification
Ofsted	The Office for Standards in Education, Children's Services and Skills
PDP	Personal Development Planning
QAA	Quality Assurance Agency
QCA	Qualifications and Curriculum Authority
SAO	Student Affairs Office (Hong Kong)
SEMTA	Sector Skills Council for Science, Engineering and Manufacturing Technologies
TLC	Teaching and Learning Centre (Hong Kong)
UK-SPEC	UK Specification (Engineering)
VET	Vocational Education and Training
VTC	Vocational Training Council (Hong Kong)

provision in subsequent academic years. This will require staff at both colleges to review their existing curricula, think hard about how best to implement the changes and if they can also better address those key skills and personal attributes that they have identified as crucial to students' college life and subsequent employability.

It is clear from this small scale piece of research that although there are some uncertainties about the future, key skills and personal attributes are valued by respondents and external stakeholders; those that are seen as relevant to industry needs are particularly highly valued. Staff in England have to reconcile the generic key skills qualifications with calls to develop vocationally relevant skills and attributes in their students. Staff in both contexts also have to continue working to convince students of the value of improving their employability by signposting skills and attributes for teaching and assessment purposes as well as providing practical and work-based opportunities for students to practise and develop their skills.

However it is noted that staff are less confident in their ability to significantly influence students' personal attributes than in their ability to develop students' skills. Although staff generally feel comfortable acting as role models to their students, they also identify a role for external people, particularly local employers and alumni, who can reinforce messages about behaviour and professionalism in engineering. It may also be that increasing students' exposure to the workplace (during project work, work placements and even paid work such as holiday jobs) has beneficial effects in developing those personal attributes that are highly valued in engineering technicians. It appears that paying attention to all three elements of the cubic curriculum requires those managing the curriculum to agree a broad definition of curriculum such as that proposed by Marsh (1992) and combine formal and informal learning experiences that occur not only within the department but also outside its boundaries.

Furthermore, and following from the research done by Bloomer and Hodkinson (2000), it is certainly worthwhile for those working in the case study departments to think about how FE students' dispositions towards learning are intricately linked to their wider social network, both inside and outside the college setting and

1. Introduction

Institutions of Further Education (FE) and Higher Education (HE) worldwide play an important role in the education and training of young people to work in the Engineering Industry. Students taking engineering qualifications are expected to leave equipped with the necessary knowledge and skills to enable them to participate actively in the workplace (Brady and Kennedy, 2003). Engineering traditionally comprises four broad disciplines of chemical, civil, electrical and mechanical engineering. Within each discipline there are branches covering many fields including aerospace, ocean, nuclear, biomedical and environmental engineering, so job opportunities are wide-ranging. According to the Sector Skills Council for Science, Engineering and Manufacturing Technologies (SEMTA, 2005) there is an ongoing need to recruit and retain well-qualified staff in all fields and at all levels; operators, craft-workers, technicians, professionals and managers. Consequently it is important for engineering curricula to match industry needs and expectations (Back and Saunders, 1998).

There are many routes into an engineering career, depending on what qualifications are held on entry. For many students, especially those in the UK aiming to become Chartered Engineers or Incorporated Engineers, A-Levels and HE is the preferred route. Universities worldwide run engineering courses at higher diploma, undergraduate and post-graduate levels. Engineering technicians (the group that are the main focus of this research) typically enter the industry after a period of education and training in FE colleges, taking certificates, diplomas and higher diplomas in varied engineering subjects on either a full-time or part-time basis. Less academically able school leavers or those preferring a combination of practical training and experience can take up apprenticeships, working as operators or craftspeople while studying part-time at FE colleges. After completing apprenticeships people may subsequently take further qualifications and appropriate professional development to become engineering technicians.

UK students who obtain an appropriate Level 3 National Vocational Qualification (NVQ) can work as engineering technicians (ETB, 2006). A recent report (SEMTA, 2005) indicates that the most significant area of future skills shortage in engineering in the UK is at Level 3 which suggests that the effective education and training of engineering technicians is crucial. The role of an Engineering Technician is certainly wide ranging:

> Professional Engineering Technicians are involved in applying proven techniques and procedures to the solution of practical engineering problems. They carry supervisory or technical responsibility, and are competent to exercise creative aptitudes and skills within defined fields of technology. Professional Engineering Technicians contribute to the design, development, manufacture, commissioning, operation or maintenance of products, equipment, processes or services. Professional Engineering Technicians are required to apply safe systems of work (Engineering Council UK, 2005).

It follows that engineering technicians need to acquire technical knowledge as well as to develop a range of skills and personal attributes in order to demonstrate professional competence. Employers worldwide require flexible, multi-skilled employees who are willing and able to continue learning (De la Harpe et al., 2000). Engineering education is subject to a range of demands including:

- **globalisation** – causing changing labour markets and working conditions and raising the importance of certain attitudes and transferable skills as well as social competencies of graduates;
- **rapid pace of change** – requiring an explicit focus on life-long learning and the education of an 'adult learner' who has learned how to learn and is able to organise his or her personal development;
- **additional societal demands regarding engineering education** – from understanding environmental and sustainability issues through to requests for contributions to regional economic developments as well as calls for entrepreneurship education and also greater appreciation of ethics;
- **decreasing figures of student enrolment in engineering in many countries** – requiring appropriate measures including the development of attractive programs of study and challenging learning environments;

- **new ICT-based teaching and learning technologies** – to be applied and integrated.

(Heitmann, 2005, p447-8)

To ensure that graduating students are employable, course providers at all levels need to be aware of, and respond to, these demands. New programs are being developed and existing curricula improved as engineering practice changes, new technologies emerge and new areas of specialisation develop. However there is a danger that this pressure to expand and alter content may cause a loss of coherence in engineering curricula (Pearce, 2001). Coherence requires that the aims of the curriculum are clearly identified and agreed upon and also that a strategy to achieve them is established.

Curriculum managers are subject to a range of pressures and constraints as they approach curriculum design and course management issues. Curricula take different shapes as a result of separate sets of negotiations between contending forces such as the state, the labour market, students, knowledge fields and institutions (Barnett, 2000). Curriculum managers should both understand these stakeholder requirements and respond to them. It is consequently important that they ensure their students develop an understanding of professional and technical knowledge as well as demonstrate a range of vocationally relevant skills whilst in education and training.

Unfortunately despite calls worldwide for key, core, transferable and employability skills to be central to students' learning experience (Atkins, 1999) this does not appear to have been achieved to any great extent. Atkins (1999) attributes this to confusion over two issues; what to call skills (their nomenclature) and how to classify them. It is certainly true that how key skills are defined and the way the key skills curriculum is organised and managed varies from country to country, between educational sectors and from institution to institution (Drummond, Alderson, Nixon and Wiltshire, 1999). Some of the confusion perhaps results from trying to work from a generic conceptual basis for skills rather than an occupationally specific one. In addition Bennett (2002) claims there is no consensus in the academic literature regarding which transferable personal skills are most and least important, either generically or for particular occupation types and levels. There is clearly a need for further research in this emerging field of study to understand better how FE organisations view skills and personal attributes in vocational curricula, and how they attempt to maintain curriculum coherence.

1.1 Study purpose and focus

There are three different kinds of purpose for doing a study: personal purposes, practical purposes and research purposes (Maxwell, 1996). Research purposes are focussed on *understanding* something, gaining some insight into what is going on and why this is happening. Practical purposes are focussed on *accomplishing* something, which might be meeting a need or changing some situation. Personal purposes are those things that *motivate* an individual to do a study.

In the study presented here there is an obvious practical and personal purpose: to successfully fulfil the requirements of the University of Leicester's Ed.D degree programme by presenting an original research thesis that is of publishable quality. Another personal purpose is to build on the experience of living in Hong Kong for seven years, working in the vocational education sector (in both HE and in FE) and to explore aspects of curriculum design and management in more depth. In other words this study will further personal and professional development. However, clearly the most important purpose for undertaking the study presented here is the research purpose. This serves to guide other design decisions (to ensure that the study is worth doing) and is crucial in justifying the study.

The context of the study is based on the following line of reasoning. Vocational students, particularly at sub-degree level, are expected to leave college and to be employable. This places pressure on those who manage, design and deliver the curriculum to equip their students with the knowledge, skills and attitudes they will need. Curriculum managers often focus primarily on knowledge (curriculum content) although they usually also consider skills development (key skills or generic skills or vocationally specific skills). They may give some thought to what attitudes or personal attributes students need to develop in order to become acceptable and successful in a professional work environment (although this may be part of the 'hidden' curriculum). In the UK 'skill talk' of one kind or another still dominates the discourse about the curriculum, qualifications and assessment in post-compulsory education and training (Bolton and Hyland, 2003; Hayward and Fernandez, 2004). The existing key skills qualifications framework in the UK is generic and quite narrow comprising three key skills plus three wider key skills (Green, 1998). It is unlikely to meet all needs of vocational students, who are increasingly required to demonstrate 'desirable' personal attributes as well as appropriate skills. Curriculum managers (those running sub-degree diploma and certificate level courses and also those running degree courses) are likely to take a broader view of what industry requires of students in terms of skills and personal attributes. Hong Kong lacks a key skills qualifications framework although matching student learning outcomes with employer requirements is clearly a major element of vocational education and training (Hung, 1998).

This leads to a number of broad and difficult questions: Which skills and attributes are valuable in a particular vocational context? Is there any consensus among stakeholders about which skills are 'key' for a profession or vocational area? How does this vary according to the level people work at? Do students, lecturers and curriculum managers hold a common view about which skills and personal attributes are important for success on a course that is preparing students for a particular job or profession? Are these different in different countries, cultures and contexts? What factors and issues underpin successful key skills curriculum design and management? Although these are all interesting, they are too numerous and too broad to be adequately covered in a single piece of research tackled by a lone, part-time researcher. As a consequence more tightly focussed research questions are needed.

Research aims and objectives

After careful consideration the following research aims and objectives were developed to guide the research. The major aim of the research is to investigate (compare and contrast) how the key skills curriculum operates, and how key skills and personal attributes for engineering technicians are perceived and valued, in the engineering department of 'Asian College', Hong Kong and the engineering department of 'Northern College', UK. The research develops a conceptual model before exploring internal stakeholders' perceptions about which skills and attributes are particularly important for success as an engineering technician.

Key research questions

1. How are key skills viewed and valued in the engineering technician curriculum in two further education colleges in two countries (England and Hong Kong)?
2. How are personal attributes viewed and valued in the engineering technician curriculum in these two colleges?
3. What are the main issues that those responsible for the curriculum in the two departments should consider if they wish to improve the effective development of their engineering technician students' key skills and personal attributes?

1.2 Overview

Further Education colleges have long been an important but neglected part of a broader, evolving system of education for young people and adults (Frankel and Reeves, 1996). In many ways FE can be viewed as the "disadvantaged 'middle child' between schools and Higher Education" (Foster, 2005, p. viii). This may be (as Foster suggests) in terms of how government sees this sector, but there is a strong case to be made that it is also true of research activity; indeed it has been suggested that FE is "chronically under-researched" as a sector (Hodkinson and James, 2003, p. 390). The volume of research into all aspects of the FE sector, strategic and operational, is much less than that done in schools or universities (AfC, 1995). Such research as does exist is often poor, largely anecdotal or conjectural (McCollum and Calder, 1995).

Huddleston and Unwin (2002) claim the diversity of the student body is a distinguishing feature of the FE sector. In filling the gap of provision between school and university, FE "takes most of its clients from the 'failures' and low achievers of the academic system and low status occupations" in the UK (Cripps, 2002, p46) and 'less able' in Hong Kong (Morris, 1996) which places particular demands on the teaching and learning methods used. Curriculum planners must understand the profile of incoming students (the numbers, qualification levels and attributes of those coming into the college), existing students (retention and progression, satisfaction with the course, their teachers and facilities, aspirations and needs) and leavers (their progression patterns, destination statistics, course improvement suggestions). And there are other issues curriculum managers have to take into account, such as complying with national standards and educational policies. These issues impact on curriculum decisions including which courses to run, at what level, and what knowledge and skill sets to include within them. Given that FE colleges have a unique and distinctive cultural pattern comprising a heterogeneous curriculum (Frankel and Reeves, 1996) it makes research into curriculum management in this sector particularly worthwhile.

Many sections of the education system in Hong Kong are under-researched (Morris, 1996). A sustained literature review found few research studies in either Further Education (FE) or the Vocational Education and Training (VET) sector of Hong Kong (see section 2.6) with none addressing key skills. Furthermore no cross-cultural work has compared how key skills are viewed, managed, taught, assessed or accredited in England and Hong Kong. Attempting a cross-cultural study is risky as many issues could be interpreted, or misinterpreted according to perceived national differences, cultural differences or personal differences (Dimmock, 2002). However, despite the difficulties, the potential to contribute to the international body of knowledge about the key skills curriculum is significant.

Preedy (2002) suggests that in any school, college or university much staff time and attention is given to curriculum design and management. Deciding what students should be taught, what teaching and learning methods are most appropriate and how best to monitor the success, or otherwise, of student learning outcomes (Briggs, 2002) are major tasks within any educational establishment. A study, however small, that contributes to a further understanding of curriculum is likely to be welcomed. However, curriculum design and curriculum management are complex topics, predicated on views of what education/training is for and what it should achieve. This study articulates a view of the vocational curriculum as cubic, a development of Wragg's (1997) approach, with the three facets being knowledge and understanding, key skills and personal attributes. This approach offers a holistic way of considering the constituent parts of the vocational curriculum. It should be noted that there was never an intention in this study to explore all three dimensions of the cubic engineering curriculum. Knowledge and understanding is very specific to a course, module or unit of study. It is difficult to avoid micro analysis, which will be of interest to those actively involved with teaching the subject but may be of limited interest to those outside the immediate field. An investigation of key skills and personal attributes is anticipated to be of more general interest to those involved with vocational curricula.

There are a number of 'players and pressure groups' active in the curriculum field, who establish the framework within which curriculum debates are resolved (Lofthouse, 1994); in other words they are curriculum stakeholders. Curriculum planning in an FE college typically involves a range of people, some involved directly (the head of department, course leaders and lecturers), others indirectly (the college directorate, local employers, national and regional funding bodies). It is likely that personal values and ideological judgements will strongly influence both the curriculum and teaching and learning processes (Law and Glover, 2000). A study needs to carefully consider all those stakeholders who might influence the curriculum for a particular group of students in a specific educational setting. This makes a case study approach, which investigates their views and values in context, particularly appropriate.

Science, engineering and technology are projected to be strategically important to the future development of the economies of the United Kingdom (Engineering Technology Board, 2006) and Hong Kong (Hong Kong Trade Development Council, 2006). This study is based upon two cases: 'Asian College' which is a Vocational Education college in Hong Kong and 'Northern College' which is a Further Education college in England. Within these institutions the departments that train students to be subsequently employed as engineering technicians are the research focus. Chapter 2 reviews the literature and other material about key skills and the engineering curriculum and includes two items developed for this study, a conceptual framework and a comprehensive list of skills and attributes. Information about the methodology used is presented in Chapter 3. Chapter 4 contains an overview of the case study departments, identifies influential curriculum stakeholders and provides information about how key skills curricula operate. The first two research questions, how key skills and personal attributes are viewed and valued in each of the colleges, are addressed in Chapters 5 and 6 and discussed further in 7.2 and 7.3. The third research question, the main issues that those responsible for curriculum management in the two departments might consider if they wish to improve the effective development of their students' key skills and personal attributes, is addressed 7.4 where a checklist containing questions for curriculum managers to consider with their course teams is presented.

This study aims to contribute to a better understanding of key skills in two different cultural contexts. It is anticipated that uncovering these views could lead to more productive key skills curriculum development for departments involved in the research. However, it will also be of interest to others who run courses for engineering technician students and who wish to compare their own experience with those of the case study departments. The findings may be particularly useful to department heads who are planning to integrate a broad approach to skills development into their academic programmes. It will also be of interest to employers seeking to develop training programmes aimed at compensating for a lack of specific attributes and skills in the ex-student population that they employ as engineering technicians.

1.3 Conclusions

Engineering is a strategically important economic area. Most engineering technician students attend FE colleges, either full-time or part-time while working, to obtain relevant qualifications before entering the profession. Course providers are required to respond appropriately to the demands of stakeholders, especially those of employers. In exploring how the key skills curriculum operates in two FE organisations and in identifying which skills and personal attributes major internal stakeholders see as 'key' for engineering technicians, this present study is both relevant and timely.

Having set the scene with a brief overview of the research project and justification for it, the next chapter provides a review of key skills and the engineering curriculum drawn from a literature review and online information search. The purpose of this is to build a conceptual framework for the research and produce a list of skills and attributes that appear relevant for engineering technicians that can be explored in the case study contexts.

2. Key Skills and Personal Attributes in the Engineering Curriculum

This chapter lays a foundation for the research that follows in three ways; it builds a conceptual model for examining elements of the engineering curriculum; it explores the major issues surrounding employability, competencies, skills and attributes; and it provides a literature review of existing research into key skills in Further Education in the UK and in Hong Kong.

Although many definitions of curriculum exist, it is necessary to work with one that fits with a vocational orientation. It is also important to establish whose views and interests dominate when curriculum content is decided or amended. Section 2.1 defines the vocational curriculum in terms of three major elements: knowledge and understanding, key skills and personal attributes. Section 2.2 examines the concept of curriculum stakeholders and lists those relevant to a vocational course. Section 2.3 takes an international look at employability, competencies, skills and attributes in an attempt to make sense of a very confusing and contested field.

The chapter then focuses more closely on engineering with Section 2.4 examining literature and other material to gain insight into what industry expects of engineering students in general and technicians in particular. Sections 2.5 and 2.6 respectively contain overviews of research into key skills in FE in the UK and in Hong Kong, which are the case study contexts.

2.1 The cubic vocational curriculum

In order to understand how key skills fit into a vocational curriculum it is necessary to first define curriculum. Unfortunately curriculum is "a slippery word" (Richmond, 1971, p2). One perfect composite definition of curriculum is unlikely to be found (Lofthouse, 1994) and it is a contested term (Kelly, 2004) used with many meanings. Cheng (1994) suggests that if asked to define curriculum, many people would describe a series of lessons and activities shown on a student's timetable. FE students might refer to their Course Handbooks and the units of study they need to complete as comprising their curriculum. Teachers might see curriculum as a specific set of knowledge, skills and activities to be delivered to their students. These legitimate views reflect a narrow definition whereby curriculum is more or less synonymous with the syllabus, a scheme of work or simply subjects. They accord with Young's concept (1998) of *curriculum as fact* where curriculum is a product that can be clearly delineated, organised (and reorganised), studied and analysed.

However many educationalists see curriculum as having a richer meaning than that described above. Cheng (1994) sees curriculum as a set of planned activities to foster students' learning. Marsh (1992) takes an even broader approach, defining curriculum as a particular combination of formal and informal learning experiences that occur within an educational context. So at its extreme, curriculum can mean the educative process as a whole. It can also be seen in terms of *curriculum as practice* (Young, 1998), a model first proposed by radical educational theorists in the 1970s, which takes as a starting point how knowledge is produced by people acting collectively and where knowledge, learning and teaching are embedded in the practices and assumptions of teachers and students.

In thinking about how to manage, change and improve curricula it is pertinent to keep both approaches in mind; the tidy formal view of curricula as products and the messy but pragmatic view of curricula as resulting from many complex interactions. These views are not completely incompatible if a multi-layered model is envisaged such as that proposed by Lofthouse (1994) in which there are:

1. The *intended* curriculum or the *rhetorical* curriculum (evidenced by policy statements and curriculum documentation, published schemes of work and assessment packages).
2. The *offered* curriculum or the *delivered* or the *taught* curriculum (evidenced by teaching practices and the interpersonal behaviour of teachers).
3. The *curriculum in action* or the *received* curriculum (evidenced by the students learning outcomes).

(Lofthouse, 1994)

This approach recognises that valid, but potentially disparate, views of curriculum can be obtained from students, lecturers and curriculum managers. It also suggests that effective curriculum management requires that attention be paid to both curriculum policy and classroom practice. It follows that a major curriculum management task is to ensure that these dimensions are integrated (Preedy, 2002).

Another significant issue relates to curriculum content. Cohen, Manion, and Morrison (2000) state that curriculum comprises a selection of what is deemed to be worthwhile knowledge. Academic and vocational subjects tend to develop year-on-year (frequently expanding) whilst curriculum constraints (such as how many hours students are expected to spend on a topic or subject area) tend to persist. There is a general expectation that students will learn up-to-date material but this logically requires some previously included material to be deleted from the curriculum. When studying curriculum content, particularly in relation to elements that may be seen as peripheral to the main course of study as key skills might be to engineering, it is important to recognise what Morris (1996b) calls the 'nul curriculum' that suggests decisions are made about what to *exclude* from curricula as well as what to include. What is included (and its justification) reveals the dominant ideologies operating in that educational context: the stakeholder priorities. It follows that if key skills are really significant they must be designed into the curriculum, taught and assessed. They must also contribute to curriculum coherence (Pearce, 2001) or they may be marginalised by lecturers and students.

It is important to understand what functions the curriculum has in relation to the orientations that underpin it. Brady and Kennedy (2003) suggest that multiple orientations of curriculum exist: cultural, personal, vocational, social and economic. A vocational orientation equips students with the necessary knowledge and skills to enable them to participate actively in the world of work. Consequently it is relevant to consider what 'the world of work' requires and for curriculum managers and lecturers to engage with employers, either through direct local contact or associated professional bodies. In his recent review of FE colleges for the UK government, Foster (2005) explicitly endorses a vocational orientation by calling for a "core focus on skills and employability" (Foster, 2005, p. vii). In Hong Kong Post-Secondary and Higher Education is separated from Vocational Training and Continuing Education. The latter encompasses FE colleges in which there is a clear vocational orientation for learners to acquire skills and knowledge for lifelong learning and enhanced employability (Vocational Training Council, 2006).

The concept of a 'cubic curriculum' (Wragg, 1997) further extends the view that curriculum is more than merely a collection of subjects and syllabuses by suggesting that there are three different dimensions to curriculum which co-exist and influence each other. The dimensions Wragg (1997) offers are subjects, themes, and teaching and learning strategies. Together these provide a structure for learning and teaching, effective when all three aspects are acknowledged and approached in a balanced way. Although this model is useful in identifying a position to evaluate and describe the curriculum (Burton, Middlewood, and Blatchford, 2001), it is perhaps less helpful in providing a way to view specific curriculum outcomes. In thinking specifically about curricula offered in the context of professional vocational education (such as engineering), it is perhaps important to think more broadly about how to develop professional knowledge and competence (Eraut, 1994) and what professional education involves. Increasingly the concepts of skills and attributes feature in definitions of vocational and professional competence.

Carter (1985) provides a useful taxonomy of objectives for professional education in which knowledge (both experiential and factual), skill (information, mental, action and social) and personal qualities (mental characteristics, attitudes and values, personality characteristics and spiritual qualities) are combined. This can be incorporated into the cubic curriculum. Figure 2.1 is therefore a variation of Wragg's (1997) three-dimensional model which focuses on three elements that appear particularly relevant to vocational education:

- **Knowledge and understanding** – the development of a personal and professional knowledge base derived from discipline-based theories and concepts.
- **Key skills** – the development of generic skills and practical skills considered essential for learning and employment in a specific vocational area.

- **Personal attributes** – the development of those characteristics identified as important elements of professional competence.

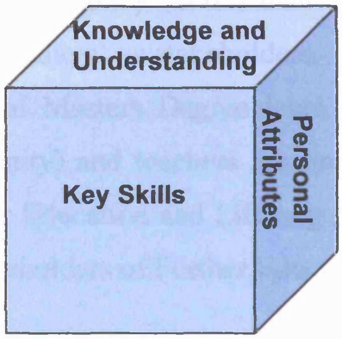

Figure 2.1: The cubic vocational curriculum (Adapted from Wragg, 1997 and Carter, 1985)

The cubic approach appears to give the three dimensions equal weighting, although for many lecturers and education managers may give the element of knowledge and understanding a higher priority when making curriculum decisions. Barnett, Parry, and Coate (2001) claim that knowledge fields dominate HE as they provide a means of structuring curricula and a source of academic identities. This is likely to also be true in FE. Curriculum decisions are based, whether explicitly or not, on underlying assumptions and values (Law and Glover, 2000). However it can be difficult to uncover and express precisely those assumptions and values, especially as they move from subject knowledge, which may be quite detailed and specific, to the inclusion of more abstract qualities, skills and attitudinal characteristics.

2.2 Curriculum stakeholders

The principal objective of engineering education is to prepare students to practise engineering in industry. A range of individuals or groups have an interest in the learning outcomes; these 'curriculum players and pressure groups' (Lofthouse, 1994, p. 145) are commonly called stakeholders. Lindell (2004) identifies internal stakeholders as those single individuals, groups or organisations who affect and impact change within the VET system from the inside (students, lecturers, curriculum writers, single education organisation and training providers). Examples of external stakeholders are trade union confederations, national authorities, trade associations, large companies and lobbyists who exert influence and impact change on VET from the outside.

Stakeholders in the education of engineering technicians do not appear to be identified explicitly in the literature. However in the context of degree level engineering courses Todd and Magleby (2005) name industry, students, faculty, academic administrators, and 'others' as stakeholders. Boehm et al., (1998) claim that the industry recipients of Masters Degree level graduates (specifically the software engineering community) and teachers are important stakeholders. Bill Rammell, Minister for Higher Education and Lifelong Learning identified learners and employers as the key stakeholders of Further Education (Rammell, 2006).

Stakeholders who might be significant in understanding the role of key skills within the curriculum of a vocational course therefore fall into two categories; those essentially external to the educational institution, and those internal to it.

External stakeholders are:

- **The government** – particularly their education policies and manpower strategies.
- **Accreditation and qualification bodies** – particularly influential in FE where the institutions generally cannot self-validate courses and programmes.
- **Professional bodies** – who tend to be powerful lobbyists in terms of their required student learning outcomes and projected manpower needs.
- **Employers** – especially local employers who send workers on part-time or day release courses and who may also commission tailor-made short courses (training courses) at a college, providing an income stream for the department.

Internal stakeholders are:

- **Senior managers** within the institution (and the strategies and policies they produce) in turn influence departmental priorities as determined by the head of department and senior colleagues.
- **Curriculum managers** – typically course leaders who try to produce courses that are relevant to stakeholders, and work with their course teams on course structure, course content, assessment and other curriculum issues.

They are often involved in student recruitment and ensuring student retention and progression.

- **Lecturers** – at a micro level influence what is actually taught and how it is taught and assessed, as well as having a personal relationship with students.
- **Technical, educational and administrative support staff** – many institutions have staff involved in teacher training and development and/or specialist support units (for particular learner groups or specialist subject areas) who service departments. Their role may form part of the curriculum or may influence how the curriculum functions. For example, there may be key skills specialists and support units.
- **Students** – the capabilities of existing (and potential) students affects course and curriculum design, and they will certainly have views about what they are learning, how it is taught and assessed, and its relevance to their intended future path (which may be further study, work in the industry for which they are being prepared, work in other occupations, or other things entirely).

The stakeholder approach acknowledges that curriculum development and management is shaped by the contextual factor of stakeholder influence (MacPherson and Brooker, 2000). Lumby (1999) claims that understanding the expectations and needs of those external to the organisation and the relationship of these to the process of internal curriculum development is particularly crucial. Stakeholder pressure provides a parameter within which curriculum design and change take place (Walkington, 2002).

Curriculum choices reflect where decision-making power lies (Finlay, 1998). Power may lie with individuals and groups (students, lecturers, curriculum managers) but also, and perhaps more importantly, in social organisations, institutions and systems. This can operate through formal and authoritative roles and relationships (for example the Education Department and the college principal) and through historically shaped conceptions and understandings. Thus the education and training of engineering technicians in different countries will reflect both cultural contexts and economic environments. The knowledge, skills and attitude requirements of engineering technicians may be broadly similar, but are unlikely to be identical. Power is likely to be unevenly distributed among stakeholders, and over time some stakeholders will increase in power or influence whilst others will see their position decline (Finlay, 1998).

It has been shown that stakeholders hold different perceptions and expectations of key skills and technical skills (Saunders, Skinner and Beresford, 2004). Furthermore differences are likely between stakeholders' perceptions of key skills and personal attributes. Within any institution departmental heads and curriculum managers have to consider stakeholder interests and influences and may feel pressurised by them or find them conflicting. However, if the views of external stakeholders are recognised, they may positively influence curriculum and thereby ensure that graduating students are well prepared to enter the world of work.

2.3 Employability, competencies, skills and attributes

Competencies, skills and attributes are part of the larger construct of employability, an area in which international interest has grown over many years. The majority of the published work focuses on Europe, North America and Australia, regions which broadly share a cultural heritage. There is far less published (in English) with an Asian focus and very little cross-cultural work.

Employability is a complex construct (Knight and Yorke, 2002). Employers, academics and policy makers all claim an interest in employability but often hold different views on how it is defined and how best to develop it. Little (2003) defines employability as a set of achievements, understandings and personal attributes that makes individuals more likely to gain employment and be successful in their chosen occupations. This requires individuals to actively blend understanding, skilful practices, efficacy beliefs and reflectiveness (Knight and Yorke, 2003). Kamsah (2004) states that fostering generic employability skills development is particularly challenging because these are hard to define explicitly, to develop and to assess. Thus employability is a broad and complex concept, which perhaps explains why it is so difficult for educationalists to agree over what is actually required of students and translate these requirements into appropriate curricula.

Despite the conceptual and operational difficulties involved, Brady and Kennedy (2003) claim that it is widely agreed that vocational curricula *should* equip students with knowledge and skills that will enable them to participate actively in the world of work. Employability skills are seen as providing the 'career capital' (Bloom and Kitagawa, 2000) that people need in an era of globalization and rapid structural, economic and technological change (Green, 1999). Governments in many countries are pursuing this market-led approach to construct and implement training policy: it has become the dominant paradigm (Jordon and Strathdee, 2001).

Although many countries have developed national frameworks encompassing a range of competencies and generic skills (some of which are discussed below) only work done by the Organisation for Economic Co-operation and Development (OECD) attempts to establish a theoretical and conceptual basis for 'key competencies' internationally. Academics and experts, including policy makers, trade unions, statisticians and philosophers, met with employers to specify the objectives of education and the desired outputs of educational processes (Rychen and Salganik, 2005). The project outlined four conceptual elements of key competencies, that: key competencies are multi-functional; relevant across many social fields; refer to a high order of mental complexity, and that they are multi-dimensional. The key competencies were classified in three broad categories: to be able to use tools interactively, to interact in heterogeneous groups, and to be able to act autonomously.

Rychen and Salganik (2005) explicitly reject the idea that competencies are innate, inborn characteristics. This view is shared by Williams (2005) who argues that competencies are learned and it is therefore appropriate to include them as education and training objectives. Operationalising the OECD approach and translating it into educational policy and practice is, however, quite complex (defining, teaching and assessing what students are expected to know and do) because the key competencies are abstract and context-free. It appears that despite the OECD's attempt to classify competencies, many countries are developing more practical frameworks containing a wide range of skills and personal attributes that are held up as relevant to employability (Scottish Qualifications Authority, 2003; DfES, 2006; NCVER, 2003; Bloom and Kitagawa, 2000; Cotton, 1993).

Approaches developed in Europe, North America and the Asia-Pacific region are discussed below. They are being diffused into higher secondary, FE, HE and VET education curricula in the expectation that people will be able to transfer them into different contexts.

Europe

According to Tucker (2000), in the European Union there is a shared interest in mutually beneficial economic development occurring in the context of an increasingly global business environment and a more mobile labour market. This has resulted in a range of policies and initiatives designed to improve young people's employability being developed and implemented. Europe-wide initiatives, such as the Luxembourg Process of Employment Guidelines and National Action Plans provide a framework for fighting unemployment and promoting employability which requires European governments to implement structural reforms and educational initiatives (Tucker, 2000). Individual European countries such as Germany and Sweden have attempted to develop core skills and competencies among trainees (specifically young trainees) through different vocational training schemes, particularly using combined approaches that link on-the-job training with school-based and college-based education (Gibbons-Wood and Lange, 2000).

The idea that young people should develop generic skills has been debated by educationalists, employers and policy makers in the UK for over 40 years (Huddleston and Unwin, 2002; Payne, 2000). Such skills have variously been labelled 'core', 'interpersonal', 'transferable', and 'life skills'. Key skills evolved in England, Wales and Northern Ireland through a series of initiatives in the 1980s which sought to develop a range of generic competencies. In the early1990s key skills were formally introduced, by the National Council for Vocational Qualifications and were later extended into a broader range of qualifications, partly as a result of the recommendations of the Dearing Report (1996). In 2000 key skills were included as a component of 16-18 courses of study at schools and colleges (Powell, Smith and Reakes, 2003). In the UK, the term 'key skills' refers to a set of transferable skills central to academic, vocational and personal development. They:

- are an identified set of skills which are common to all learning activity, and underpin effective performance in a wide range of settings;
- should enable individuals to perform more effectively in new, unfamiliar settings or contexts;
- are essential to personal development and therefore to the individual's capacity to manage his or her own learning now and in the future.

(Centre for Developing and Evaluating Lifelong Learning, University of Nottingham, 2002)

Up to September 2007, the Department for Education and Skills (DfES[1]) oversaw six key skills qualifications at Levels 1 to 5 of the National Qualifications Framework. Key skills qualifications can be obtained in Communication, Application of Number, Information Communication Technology, Working with Others, Improving Own Learning and Performance and Problem Solving (QCA, 2004). This qualification-based approach evidences a highly codified system of measuring competence and skills (Foley, 1999) with clear 'units' to be covered and 'assessment criteria' specifications to be fulfilled. Underpinning the UK's approach is a belief that unless skills are explicitly defined and assessed for certification purposes they become marginalised (Ecclestone, 1997). The 'skills gap' (between what employers need and what universities and colleges are producing) is certainly a recurring theme of recent UK reports (DfES 2003; DfES 2005; Foster 2005; DfES 2006; Leitch 2006). However it is clear that there is no agreement about what the gap is, how 'big' it is, or where it is at its most damaging (Atkins, 1999).

North America

In North America both Canada and the United States of America appear to have ongoing concerns about 'employability' and 'workplace know-how' respectively (Bloom and Kitagawa, 2000; United States Department of Labor, 2000). In the USA a 'competencies framework' has been heavily promoted by the Secretary of Labor and the Secretary's Commission on Achieving Necessary Skills (SCANS) since the early 1990s. The 'know-how' identified by SCANS is made up of five competencies and a three-part foundation of skills and personal qualities (see Table 2.1).

COMPETENCIES – effective workers can productively use:

- **Resources** – allocating time, money, materials, space and staff;
- **Interpersonal Skills** – working on teams, teaching others, serving customers, leading, negotiating, and working well with people from culturally diverse backgrounds;
- **Information** – acquiring and evaluating data, organizing and maintaining files, interpreting and communicating, and using computers to process information;
- **Systems** – understanding social, organizational, and technological systems, monitoring and correcting performance, and designing or improving systems;
- **Technology** – selecting equipment and tools, applying technology to specific tasks, and maintaining and troubleshooting technologies.

THE FOUNDATION – competence requires:

- **Basic Skills** – reading, writing, arithmetic and mathematics, speaking and listening;
- **Thinking Skills** – thinking creatively, making decisions, solving problems, seeing things in the mind's eye, knowing how to learn, and reasoning;
- **Personal Qualities** – individual responsibility, self-esteem, sociability, self-management and integrity.

Table 2.1: SCANS workplace know-how (United States Department of Labor, 2000)

It should be noted that the American term 'competency' has a different meaning from the English 'competence' (Bolton, 2000). Competence means the aptitude to demonstrate ability (to show what skills and knowledge have been previously acquired in doing a job). Competency relates to aspects of the person (certain behaviours) which enable him or her to be competent. Van Loo and Toolsema (2005) suggest that in the North American context, the skills and competencies that are identified refer to the most *important* or *desired* skills. They claim that these are different from the core skills and key skills found in the United Kingdom which are of a *generic* and *transferable* nature (Van Loo and Toolsema, 2005). However this distinction is perhaps unhelpful as it is likely that the North Americans would claim that the skills in their frameworks are generic and transferable. Equally the British might well claim that their key skills are important and desired by many employers.

Canada has had generic skills programs since the 1970s, starting with a set of 'essential skills' before greater employer involvement developed a more extensive scheme and introduced the term 'employability skills' (NCVER 2003). In Canada the development of employability skills has long been an important implicit component of school, college and university education (Bloom and Kitagawa, 2000). Within the learning hierarchy employability skills comprise one element of generic skills which stand alongside specific skills and knowledge (see figure 2.2).

<table>
<tr><th colspan="8">Learning</th></tr>
<tr><td colspan="7">Skills</td><td>Knowledge</td></tr>
<tr><td colspan="4">Generic</td><td colspan="3">Specific</td><td rowspan="2"></td></tr>
<tr><td colspan="3">Employability</td><td>Life/other</td><td>Job-specific</td><td>Technical</td><td>Technological</td></tr>
<tr><td>Academic</td><td>Personal Management</td><td>Teamwork</td><td colspan="4"></td><td></td></tr>
</table>

Figure 2.2: The Conference Board of Canada's typology of learning (Bloom and Kitagawa, 2000)

In the Canadian typology of learning, employability includes three generic skill sets. Academic skills require people to communicate, think and learn. Personal management skills call on people to demonstrate positive attitudes and behaviours, responsibility and accountability. Teamwork skills are based around working with others to achieve good results. Eleven skills are linked to each of the three skill sets in the Employability Skills 2000+ framework (The Conference Board of Canada, 2000). Academic skills (also called fundamental skills) are communication, managing information, using numbers, thinking and solving problems. Personal management skills are demonstrating positive attitudes and behaviours, being responsible, being adaptable, learning continuously, working safely. Teamwork skills are working with others, participating in projects and tasks.

In April 2003, the Essential Skills and Workplace Literacy Initiative launched with the aim of equipping Canadians with the skills for changing work and life demands. Full details are available on the Human Resources and Skills Development Canada website, http://srv108.services.gc.ca/english/general/home_e.shtml. 'Essential skills' are defined as the skills needed for work, learning and life. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change. Nine essential skills are identified, used in nearly every occupation and throughout daily life in different ways and at different levels of complexity. The list comprises reading text, document use, numeracy, writing, oral communication, working with others, continuous learning, thinking skills and computer use. The essential skills are enabling skills that serve three functions: they help people perform the tasks required by their occupation and other activities of daily life, provide a foundation to learn other skills, and enhance people's ability to adapt to change.

In both Canada and North America, skills development and knowledge development are embedded in an ongoing process of education that begins at school. This reflects the ethos that an educated person is both skilled and knowledgeable, someone who recognises how and when to transfer their generic skills. The ultimate aim is to encourage students to be independent lifelong learners.

Australia, New Zealand and Asia

In Australia there has been a focus on generic skills since the 1980s. The term 'general competencies' (Karmel, 1985) was originally used but was changed when the idea of employment-related 'key competencies' became prominent (Finn, 1991). The drivers for generic skills and attributes development in Australia were identified by Gow and McDonald (2000) as global, economic, technological and social trends that changed the way business is conducted and the skills required to gain entrance into, and maintain a place in the workforce. The debate about employability was re-invigorated in the late 1990s by a series of industry-led initiatives. The Mayer Committee Report (Mayer, 1992) established a set of seven generic skills or key competencies, defined as the basic transferable competencies that underpin employability and the capacity to adapt to different types of whole work roles, as well as personal and community activities throughout an individual's life (NCVER, 2003). These were collecting, analysing and organising information, communicating ideas and information, planning and organising activities, working with others and in teams, using mathematical ideas and techniques, solving problems and using technology. Moy (1999) reports that an eighth key competency, cultural understanding, was also piloted, but work on this competency ceased in 1996.

Gow and McDonald (2000) suggest that the employability skills in the Australian framework were not sufficiently future-oriented and that the skills required by the Australian workplace in the future include cross-cultural competence, entrepreneurial ability, adaptability to changing work environments, business management skills, accountability (self management) and lifelong learning. It is noted that this element of forward thinking is not obvious in any of the skills taxonomies, although it may have been considered when they were being formulated.

During 2001 the Australian Chamber of Commerce and Industry and other industry groups undertook another major research exercise. The resulting report proposed an Employability Skills Framework comprising eight major skill groups and a set of thirteen personal attributes (see Table 2.2).

Employability Skills for the Future	
Employability skills	**that contribute to ...**
Communication skills	productive and harmonious relations between employees and customers
Teamwork skills	productive working relationships and outcomes
Problem-solving skills	productive outcomes
Initiative and enterprise skills	innovative outcomes
Planning and organising skills	long term and short term strategic planning
Self management skills	employee satisfaction and growth
Learning skills	ongoing improvement and expansion in employee and company operations and outcomes
Technology skills	effective execution of tasks
Personal attributes	
Loyalty Commitment Honesty and integrity Enthusiasm Reliability Balanced attitude to work and home life Motivation Personal presentation Common sense Positive self-esteem Sense of humour Ability to deal with pressure Adaptability	

Table 2.2: Australian employability skills (Australian Chamber of Commerce and Industry/Business Council of Australia, 2002)

In New Zealand the most recent statement of Tertiary Priorities (2005-7) calls for a stronger focus on skills for work and life in the tertiary education curriculum. The terminology used is of 'competencies' which are the skills, knowledge, attitudes and values that are needed by New Zealanders to be successful life-long learners operating in a knowledge-based society. No formal taxonomy is presented although it might be at a preliminary stage of development.

Turning to Asia, there appears to be very little material published in English about skills development and training for young people. However, in some parts of Asia there is evidence of a broad concern about life-long learning as an education policy priority. In Korea, Taiwan, Japan, Singapore, Hong Kong and Thailand people are encouraged to develop their creative and analytical abilities as well as increasing their flexibility and collaborative learning skills (Kennedy, 2005). There appears to be an expanded and ambitious agenda for educational systems throughout the Asia-Pacific region where regional policy makers and parents view a quality education as preparing students to be:

- lifelong learners;
- able communicators in both a native and international language (i.e. Mandarin, English);
- technologically skilled for the workplace and daily living;
- cognitively prepared for complex tasks, problem-solving and the creation of knowledge; and
- socially, politically and culturally responsible citizens.

(Hallinger, 1998, p494)

In Singapore the Critical Enabling Skills Training (CREST) initiative aims to develop in the people an ability to learn continuously, think and apply the knowledge and skills acquired to innovate and enhance the competitiveness of their place of work. This links with Singapore's National Skills Recognition System (NCRS) that was launched in September 2002 and which concerns workforce development and training. There does not appear to be any explicit policy or strategy for bringing employability into Singapore's education system at present.

The Universiti Teknologi Malaysia launched a list of seven graduate attributes in 2004 (communication skills, team working, problem solving, adaptability, lifelong learning, self-esteem and ethics and integrity) to be developed by embedding them in the contexts of the students' discipline or professional field (Kamsah, undated). These generic skills are seen to cut horizontally across all industries and vertically across all jobs. There is no evidence of a national taxonomy in use in Malaysia.

In Hong Kong the Education Bureau mentions 'employability skills' on its website http://www.edb.gov.hk in advice given to students about career planning. In doing so it draws on information sourced to the American Society for Training and Development. However this particular set of skills does not feature in Hong Kong's education policies or strategy documents. The Hong Kong Education Commission (2002) promotes improving the curriculum and teaching methods to achieve lifelong learning and all-round development for its schoolchildren. Three elements are highlighted to help achieve this: knowledge (Key Learning Areas), generic skills, and values and attitudes. In subsequent reform progress documents (Hong Kong Education Commission 2002, 2003, 2004) there is scant mention of generic skills. However the most recent document (Hong Kong Education Commission, 2006) does indicate progress in a number of skill areas at primary and secondary school levels.

Nomenclature and other issues

It is obvious from the international skills taxonomies presented above that the naming of skills is diverse and the conceptualisation of them problematic. Bennett, Dunne and Carré (2000) suggest that the term core skills has several synonyms including personal transferable, key, generic, process, common, work- or employment-related and soft skills. Furthermore these skills are also referred to as competences, capabilities, elements or attributes. A simple cross-country comparison shows a wide range terms being used (see Table 2.3) although the extent to which these have evolved and been redefined in each country is not clear either from this table or the report it is adapted from.

Terms used to describe skills	
Australia	Key competencies, employability skills, generic skills
Canada	Employability skills
Denmark	Process independent qualifications
France	Transferable skills
Germany	Key Qualifications
Hong Kong	Generic skills, key skills
New Zealand	Essential skills
Singapore	Critical enabling skills
Switzerland	Trans-disciplinary goals
United Kingdom	Core skills, common skills, basic skills, key skills, wider key skills
United States of America	Basic skills, necessary skills, workplace know-how

Table 2.3: Terms used to describe skills (Adapted from NCVER, 2003, p2)

It should be noted that despite the overwhelming interest in competencies, skills and attributes fostered by employers and governments, some academics appear less than enthusiastic. Bennett, Dunne and Carré, (2000) claim that lists of skills are theoretically threadbare. Hyland and Johnson (1998) argue that free-standing, context-independent abilities (generic skills or key skills) are without philosophical or empirical support. Despite the attraction of key skills to educators, politicians and industrialists and their "ubiquitous presence in contemporary educational discourse" Hyland and Johnson (1998, p170) argue that transferable skills education and training has proved futile in producing a flexible and adaptable workforce in any discipline in the UK. Their criticism centres on the generic nature of much skills provision. This reinforces the need for studies of key skills that are contextualised, such as the one presented here, to see if there is a more effective way to prepare vocational students for the world of work. It suggests that the integration of key skills into the curriculum is a particularly important curriculum management issue, a point made by McNeil (2006).

The process commonly used to develop skills taxonomies is to consult with stakeholders (particularly with employers' organisations) in order to produce a list of skills and then to exhort (or compel) educational institutions to include them in curricula. At this strategic level the identified skills tend to be generic foundational skills rather than skills specific to certain occupations or levels of responsibility (McLaughlin, 1995). Kennedy's description (2005) of 'broad brush' Asian approaches to education reform are similarly generic but aspirational. In several countries (for example, in Canada, America, Australia and the UK) there has been an evolutionary approach to skills education and training with skills taxonomies expanding to become ever more comprehensive 'wish lists'. Unfortunately, as Bennett (2002) asserts, there is little consensus about which skills are 'key'. This becomes of more concern the longer the lists become as curriculum designers are unlikely to be able to include every skill.

Even those who subscribe to skills development raise some difficult issues. Payne (2000) draws on work by Keep and Mayhew (1999) to argue that the VET system must come to terms with the fact that both the *categories* and *levels* of skill being demanded of it are widely divergent; this confuses policy makers as to the precise targets and delivery models being required – should they aim at developing those skills that 'lead-edge' organisations require, or skills for the 'mass'? Even here it is implied that what is required are generic skills, and there is no link made between professional areas and specific skill sets. It can be argued that curriculum managers should engage closely with their external stakeholders to establish what specific educational and practical objectives are appropriate for the students they work with, both now and in the future.

There have been several attempts to clarify the 'fuzziness' of skills and competencies (Bennett, Dunne and Carré, 2000). Bethell-Fox (1982) identified 20 managerial competencies arranged in four broad bands of generic competencies (cognitive, managing, influencing and personal). These are a mixture of knowledge, skills, understanding and personal qualities that might be used at work and in life. However, these competencies are abstract and poorly defined and the model is untested. Cotton (1993) examined 41 studies, reviews and evaluations drawn from the employability skills literature available at that time in the USA. She concludes that there is research evidence that employers want entry-level employees to possess a range of 'critical employability skills' but that these vary considerably in the way they are organised. By examining those attributes cited most frequently, Cotton organises them into three categories, namely basic, higher order and affective skills. However, this categorisation does not appear to have been subsequently tested. Cheetham and Chivers (1996) and Anderson and Marshall (1996) have somewhat similar hierarchical models of professional competence but unfortunately both models suffer from similar problems, namely that their models are untested and do little to clarify the conceptual confusion surrounding the definition and status of the skills and competences identified.

Tait and Godfrey (1999) draw on work done by Birenbaum (1996) who suggests that students require four different types of competencies: cognitive competencies (such as problem solving, critical thinking, information literacy, inventing and creating new things, oral and written presentation), meta-cognitive competencies (such as self-reflection or self-evaluation), social competencies (such as leading discussions, persuading, co-operating, working in groups) and affective dispositions (such as responsibility, flexibility, motivation, initiative). Using this approach, Tait and Godfrey (1999) report some preliminary success in their efforts to operationalise these competencies in an 'effective learning' module for their undergraduate students, but claim they are unable to fully evaluate it until more cohorts of students have completed the module. It is therefore difficult to know how useful this approach to categorising competencies is.

There is also a trend worldwide towards recognising that there are attitudinal characteristics that should be developed alongside skills. Both skills and personal attributes appear in several taxonomies that relate to employability, most overtly in those in use in Australia (NCVER, 2003) and the USA (United States Department of Labour, 2000). Keep and Mayhew (1999) argue that this 'softening' of skill to include personality traits and characteristics raises questions of whether desirable employee attributes such as 'motivation', 'persistence' or 'co-operation' are, in fact, trainable through the VET system. Unfortunately there does not appear to be research evidence to answer this important question. It is clearly relevant to include personal attributes in this present study that aims to explore key skills in context.

2.4 Engineering industry requirements

Concern about skills development in engineering is not new. In the literature there appears to be more interest in graduate engineers who may ultimately become senior engineers (Chartered or Incorporated Engineers) than with more junior engineers, engineering technicians or craft-level workers. Most research relates to HE curricula and industry expectations for graduate level engineers. There is surprisingly little information concerning engineering technicians.

In the UK, a major upturn in interest in skills in the context of the engineering profession can be traced to the Finniston Report of 1980. 'Engineering Our Future' (Finniston, 1980) explored the need for engineers, the type of engineering expertise required and a framework for the formation of engineers. It was recommended that engineers develop a range of skills including the ability to express themselves and communicate both verbally and in writing, to manage and participate in meetings and to master cost and budgeting information. Unfortunately the outcome of the report was "disappointing to say the least" being formally accepted by the Government but "pigeonholed by everyone else" (Hills and Tedford, 2003, p. 18). They suggest that the engineering profession failed to endorse the Finniston Report and that there was also stiff opposition from engineering professors within HE, whose interest lay in pursuing higher-level theoretical research and more academic teaching and learning objectives. How FE colleges were affected by this is not reported.

Because the job market is rapidly changing and characterised by new types of employment, increased globalisation and new technologies, many engineering employers are looking for flexible, multi-skilled employees who are willing and able to continue learning (De La Harpe, Radloff, and Wyber, 2000; Back and Saunders, 1998). It appears that professional engineering bodies worldwide are demanding curriculum changes. Although they want traditional technical content to be taught, they also expect more generic skills to be incorporated in an integrated approach to teaching so that more effective outcomes can be achieved (Walkington, 2002). Back and Saunders' (1998) research concludes that the skills graduate engineering students need if they are to achieve career success in the USA fall into three categories: personal skills (communication skills, interpersonal relationship skills, team skills, organisational skills and management skills), business skills and technical skills. Engineering students should receive a good theoretical and technical education but they should also be required to tackle 'real-world' or ill defined problems, in an attempt to boost their creativity and flexibility, and also have more industry exposure.

Expansion of the engineering curriculum and the problem of making good deficiencies is recognised by other authors. Felder et al., (2000) state that engineering schools in the USA have been told that they must strengthen their coverage of fundamentals, teach more about 'real-world' engineering, cover more material in frontier areas of engineering, offer more and better instruction in both oral and written communication skills and teamwork skills, provide training in critical and creative thinking skills and problem-solving methods, do more on engineering ethics and the connections between technology and society while reducing the number of hours in the engineering curriculum. This constitutes "an impressive wish list" (Felder et al., 2000, p26) for which their solution is better teaching/instructional methods with clearer instructional objectives and more innovative assessment strategies. However this alone may be insufficient; stakeholders in engineering education might need to open a dialogue about whose job it is to develop skills and attributes required for industry and how much educational establishments can realistically be expected to do.

More recently, Hassall et al. (2005) summarise the expectations of engineering undergraduate programmes as follows:

- A commitment to personal and professional development.
- Generic engineering skills.
- Personal organisation.
- Communication skills.
- The ability to work with others.
- Industrial and professional practice.
- Equality of opportunity.
- The development of a 'lifelong learning ethos'.

(Hassall, et al., 2005)

This holistic approach is very broad and with the deletion of the word 'engineering' it could apply to virtually any profession. A more abstract approach to engineering education is suggested by Ravesteijn, De Graaff and Kroesen, (2006). They suggest that engineers should possess three types of competencies: instrumental, strategic and communicative. *Instrumental* competence refers to the basics of engineering work. *Strategic* competence has to do with achieving economic and political goals. The *communicative* competence relates to creating a consensus as a social base for innovation and involves three particular skills: a future orientation, the ability for dialogue and the capability to move within a plurality of cultural codes (Ravesteijn et al., 2006). They make an interesting comment about the importance (for Western engineers) of understanding non-Western values as engineers increasingly work trans-nationally. Ravesteijn et al., (2006) also outline a recent debate occurring in Holland concerning the development of a new type of 'T-shaped' engineer. The suggestion is that an engineer's competencies should be of a technical nature (deep) but also of a social character (broad). However, they acknowledge that what 'social character' means is vague and difficult to specify.

A notable initiative by the Higher Education Academy in the UK has been a series of vocationally specific guides to employability coordinated by the Enhancing Student Employability Co-ordination Team (ESECT). The Student Employability Profile for Engineering (Kubler and Forbes, 2004) is available on http://www.heacademy.ac.uk/employability/Engineering.pdf. The profile includes twenty-five employability related outcome statements identified from the QAA Subject Centre Benchmarks (QAA, 2000; QAA, 2006). It lists five categories of qualities and attributes sought by employers in their graduate recruits. These are:

- Brainpower.
- Generic competencies - high level and transferable key skills such as the ability to work with others in a team, communicate, persuade and have interpersonal sensitivity.
- Personal capabilities - the ability and desire to learn for oneself and improve one's self awareness and performance. To be a self starter (creativity, decisiveness, initiative) and to finish the job (flexibility, adaptability, tolerance to stress).

- Subject specific knowledge.
- Technical ability.

(Kubler and Forbes, 2004)

This document is designed to be used by and with engineering students to help them expose and articulate skills they have acquired as well as to relate their skills to career planning and job search activities. It clearly contains all three elements of the cubic curriculum articulated above. However, it has been developed for graduates and may be of less relevance to students aiming to work as technicians.

Professional bodies clearly have a strong interest in ensuring educational institutions produce students whose knowledge, skills and abilities match their requirements. Indeed, the Institution of Engineering Technology (IET) is predicting a shortage of suitably qualified and skilled engineering technicians in the UK (Brierley and Rowlands, 2006; Brierley and Rowlands, 2007). In the UK the Engineering Council's mission is "to set and maintain realistic and internationally recognised standards of professional competence and ethics for engineers, technologists and technicians, and to license competent institutions to promote and uphold the standards" (http://www.engc.org.uk/). In the early 1980s the Engineering Council embarked on a fundamental review of the role and formation of professional engineers. The outcomes were published in a new edition of the Standards and Routes to Registration (SARTOR) (Engineering Council UK, 1997) and included an explicit requirement for accredited programmes to include the development and assessment of transferable skills within their curricula. SARTOR was updated in 2005 and replaced by two UK Standards for Professional Competence (UK-SPEC); one for Engineering Technicians and another for Chartered Engineers and Certified Engineers (Engineering Council, UK 2005, 2005b).

The Engineering Council UK recognises engineering technicians as a professional grouping and as part of their registration process has developed 'Standards of Competence and Commitment'. This is known as the UK-SPEC Engineering Technician Standard and the main elements (excluding the demonstration examples) are reproduced in Table 2.4.

	The Standard
A	**Use engineering knowledge and understanding to apply technical and practical skills.** *This includes the ability to:*
A1	review and select appropriate techniques, procedures and methods to undertake tasks;
A2	use appropriate scientific, technical or engineering principles.
B	**Contribute to the design, development, manufacture, construction, commissioning, operation or maintenance of products, equipment, processes, systems of services.** *In this context, this includes the ability to:*
B1	identify problems and apply diagnostic methods to identify causes and achieve satisfactory solutions;
B2	identify, organise and use resources effectively to complete tasks, with consideration for cost, quality, safety and environmental impact.
C	**Accept and exercise personal responsibility** *This may include the ability to:*
C1	work reliably and effectively without close supervision, to the appropriate codes of practice;
C2	accept responsibility for work of self and others;
C3	accept, allocate and supervise technical and other tasks.
D	**Use effective communication and interpersonal skills** *This includes the ability to:*
D1	use oral, written and electronic methods for the communication in English of technical and other information;
D2	work effectively with colleagues, clients, suppliers and the public.
E	**Make a personal commitment to an appropriate code of professional conduct, recognising obligations to society, the profession and the environment** *In order to satisfy this commitment they must:*
E1	comply with the Codes and Rules of Conduct of their Licensed Institution or Professional Affiliate;
E2	manage and apply safe systems of work;
E3	undertake their engineering work making and utilising risk assessments, and observing good practice with regard to the environment;
E4	carry out continuing professional development, including opportunities for this offered by their Institution, to ensure competence in areas and at the level of future intended practice.

Table 2.4: UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005 p. 6-7)

In the above, and in addition to having engineering knowledge and understanding, there is a clear expectation that technicians in the UK will be able to demonstrate a range of skills and attributes. The main skills appear to be communication, critical thinking, learning, problem solving, teamwork, self management and technical skills. The main personal attributes are being adaptable, being reliable, having common sense, being safety conscious, and professionalism.

Turning to Hong Kong, the Hong Kong Institution of Engineers (HKIE) http://www.hkie.org.hk/ is an International Member of the Engineering Council UK, although it also has links to professional organisations in Australia, Canada, China, Ireland and New Zealand. The HKIE is a member of the Washington Accord, the Federation of Engineering Institutions of Southeast Asia and the Pacific (FEISEAP), Commonwealth Engineers Council (CEC), and an affiliated member of the World Federation of Engineering Organisations (WFEO). The major focus of this association appears to be on providing recognition for the most senior grades of engineers rather than technician or lower grades (who might be expected to have much lower levels of international mobility). However the Institution admits Associate Members (AMHKIE) who are engineering technologists (engineering technicians) who are over 23, have obtained a Higher Diploma or Higher Certificate accredited/recognised by the Institution (or an acceptable equivalent), received adequate practical training, had appropriate responsible experience, and successfully completed the Institutions Assessment Interview. There is no indication of which specific knowledge, skills or attributes they are required to demonstrate.

2.5 Research into key skills and Further Education in the UK

It has been claimed that key and core skills have had an "almost totemic significance for the English post-16 education and training system" (Hodgson and Spours, 2002, p. 29). Green (1998) suggests that the concept of key skills has become central to all policy debates around post-16 education and training in the UK. Now that the categorisation '14-19' is used by the Department for Children, Schools and Families it would appear that skills development is an important issue for young people aged 14 and over.

Law and Glover (2000) suggest that policy initiatives over the past two decades have increased the pace of curriculum change, in contrast to previous times when curriculum had been relatively free from centralised control. It is clearly government policy for young people (whether in school, at university or undertaking vocational education) to acquire key skills (Drew, 1998). The Skills Strategy White Paper '21st Century Skills – Realising Our Potential' (DfES, 2003) and the second Skills Strategy White Paper 'Skills: Getting on in business, getting on at work' (DfES, 2005) show the development of a strategy to ensure employers have the right skills to support successful businesses, and that individuals gain the skills they need to be employable and personally fulfilled. In broad terms the government wishes to increase achievement at level 2[2] (the basic level for employability) and improve progression to level 3 and beyond. The Leitch Review of Skills (Leitch, 2006) claims that although the UK has a strong economy and world-leading employment levels, its productivity is poor and the country does not have a world-class skill base.

Higher Education appears to be embracing a much wider range of skills that is the case in Further Education. This may be because they have more autonomy from government, do not require students to take key skills qualifications, and have more flexibility in curriculum design. Drew (1998) claims that skills development has always been a feature of HE courses, although skills became more explicitly part of HE discourses in the UK in the mid to late 1980s. Within HE the skills agenda is becoming more prominent (Fallows and Steven, 2000; Tariq et al., 2004; Robley et al., 2005, 2005b). Initiatives have included the development of university-wide key skills policies (Tait and Godfrey, 1999), the creation of detailed employability skills templates for undergraduates (Fallows and Steven, 2000), the use of work-based placements to provide students with the opportunity to acquire transferable skills (Falconer and Pettigrew, 2003), the introduction of employability skills through a Case Studies to Advance Skills and Employability (CASE) project (Holmes and Miller, 2000) and the mapping of generic skills in medical education curricula (Robley et al., 2005, 2005b). The development and use of progress files to assess and record students' development has also been a feature of the HE sector's engagement with student skills, professional attitudes and personal development (Jackson and Ward, 2004).

This sample of projects demonstrates a commitment to skills development. Schofield (2000) claims that these have been encouraged (and funded) as part of the recent practice of benchmarking university curricula against externally set standards. Overall there appears to have been a growing recognition by HE institutions that students need key skills to succeed on degree programmes and to progress into employment (Brockington, 2002) although university is not expected to provide students with a complete and comprehensive skills-base in preparation for future employment (Nabi and Bagley, 1999). There is less agreement on the precise denotation of such skills (Brockington, 2002). Nabi and Bagley (1999) comment that there is a consensus emerging in the skills development and careers education literature which highlights the urgent need to help graduates acquire a broad range of 'personal self-reliance skills', regardless of their particular degree discipline.

FE institutions in England contribute more than a third of entrants to higher education (Parry et al., 2006) and consequently must be seen to have an important role in preparing young people for progression into higher education as well as into the workplace. However the FE sector in the UK remains heavily involved in offering predominantly low-level key skills qualifications to a broad cross-section of its learners in the hope that learners will be able to transfer the skills to a range of work and non-work contexts. Atkins (1999) argues that this approach is an inevitable outcome of a government policy of opting for the lowest common denominator set of skills, clearly a matter of some concern.

In the context of Further Education there is little evidence of large-scale research activity concerning key skills since Munday and Farriday (1999) undertook their major study for the Further Education Development Agency, now called the Learning and Skills Development Agency, investigating issues relating to the successful development of key skills in FE colleges. In this report it is argued that senior managers and governors need to demonstrate support, commitment and leadership in relation to key skills. Munday and Farriday (1999) recommend a whole college approach to key skills, with the creation of working groups involving staff at all levels to develop effective cross College structures managed by a Key Skills Co-ordinator. Colleges should identify clear roles and responsibilities within the structure, and develop effective key skills teams within curriculum areas. They should also raise awareness of employers of the value of key skills. Although they do not specify whether the delivery of key skills should be discrete or integrated into programmes, there is a general argument in favour of integration (Hammond, 2001). There is recognition of the need to adequately resource key skills in respect of staffing, staff training and development, the creation of learning centres and resource bases (Munday and Farriday, 1999).

If skills development is seen as an important part of curriculum, then it follows that it must be 'designed in'. This may be done in a number of ways depending on planning model or approach chosen (Drummond et al., 1999; Kelly, 2001a; McNeil, 2006; Morris, 1996b). A major issue appears to be the extent to which skills development is integrated or is taught in discrete units. McNeil (2006) suggests three possible delivery models, which form a continuum from 'stand alone' through 'mixed' to 'integrated' delivery. However Kelly's research (2001) reveals that in practice key skills delivery is typically complex and variable. This accords with other research that shows that many centres opt for modes of delivery that are part integrated and part discrete (Kelly et al., 2001; West and Dee, 2000). However some educational research shows that an integrated approach to learning key skills is more effective than 'bolt-on' approaches (Unit for the Enhancement of Learning and Teaching, University of Kent, 2004). Kelly (2001) concludes that it is not possible to give one solution to the fundamental problem of delivering a key skills curriculum effectively and efficiently; each institution should find its own way. An interesting aspect of his research was the "widespread recognition" (Kelly, 2001, p. 236) that it is both desirable and necessary to have students involved in tracking their own key skills progress.

It is noted that although employability remains an important policy issue it is controversial in practice. There appear to be practical difficulties with delivering the key skills qualifications. Bolton and Hyland (2003) claim that those working in FE are required to include key skills in many learning programmes without there being firm research evidence about what actually works. They comment that practitioners have no option but to try to make sense of key skills requirements and implement them in the best interest of learners. Furthermore their negotiation and engagement with key skills policies revealed a wide range of creative strategies that comprise a form of 'reflective pragmatism' (Bolton and Hyland, 2003). A further contradiction is that policy makers advocate that key skills should be embedded in subjects and developed in an integrated fashion while at the same time isolating key skills in order to set tests to assess them (Huddleston and Unwin, 2002).

The Key Skills qualification that was introduced in the context of Curriculum 2000 reform in the UK has been controversial, not least because students and practitioners have overwhelmingly viewed it as a 'hassle' and without much 'currency' (Hodgson and Spours, 2002). This negativity corroborates data found in earlier studies of students (Hammond, 2001; Abbott, 1997) and vocational staff (Green, 1998). Hodgson and Spours (2002) go so far as to claim that there has been a revolt against Key Skills qualifications. In fact, on the recommendation of Professor David Hargreaves, Head of the Qualifications and Curriculum Authority (Hargreaves, 2001) the combined Key Skills Qualification was removed although certification for individual key skills remains (and is still an essential element of apprenticeship training).

Another problematic area is that some people are concerned about the validity of assessing skills and behaviour (Ecclestone, 1997). Generally key skills curriculum evaluation appears to be an area that is not well understood. This is particularly significant for institutions that are interested in developing a broad range of skills with students. Two issues are pertinent: whether students are achieving the outcomes promised, and if they are, if these outcomes are the direct result of the curriculum, or of other factors (Leathwood and Phillips, 2000). For example, if critical thinking or acting appropriately in the context of cultural diversity are objectives, then it can be difficult to define the skills and attributes in meaningful ways, let alone assess whether students have achieved them. This becomes even more complex when skills are integrated into subject disciplines. As Yorke (1998) warns, the assessment of capability, done properly, is a complex and time-consuming task. However assessment is possible. Eccleston (1997) for example, suggests a variety of methods to assess knowledge, personal skills, cognitive skills, practical skills and attitudes/qualities/values.

Hayward and Fernandez (2004) even suggest that the 'key skills for all' policy for 16-19 learners advocated by the New Labour government following their election in 1997 has failed. They attribute failure to a policy that emphasises greater regulation of assessment (and increased bureaucracy) whilst at the same time espousing an ideological commitment to greater choice and diversity (for example relaxing the requirement to take key skills as part of the General National Vocational Qualification). Other issues they identify are inadequate policy instruments, inadequate ongoing investment in expertise development (to deliver and assess the key skills qualifications) and a failure of the majority of HE institutions to welcome key skills qualifications, leading to a general disinterest in key skills qualifications. Parents, particularly middle-class parents, and students have increasingly been able to choose a school or college to study in, and to choose whether to participate in learning programmes such as key skills. This has resulted in a general rejection of key skills as being irrelevant to an ultimate goal of participation in high quality higher education (Hayward and Fernandez, 2004).

There is very little detailed research relating to employability and the key skills curriculum in the FE sector. One study looked into key skills and transferability (Bolton and Hyland, 2003) and a doctoral thesis investigated teacher perception of key skills and transfer (Bolton, 2000). This indicated that the views and experiences of lecturers in FE are largely neglected although there is evidence that lecturers' perceptions of key skills and transfer vary considerably. Five different views emerged from a series of interviews with forty-one practitioners teaching on General National Vocational Qualification (GNVQ) Advanced Business Studies programmes in seven institutions. These were that key skills were seen variously as remedial skills, as vocational preparation, as developing appropriate workplace attitudes, as study skills and as lifelong learning skills. Bolton (2000) suggests that FE lecturers hold a range of views about the purpose of key skills and skill transfer and these views impact on how they approach skills development with their students. This is a significant issue that this present study will also consider.

Although not directly examining key skills, one interesting study by Bloomer and Hodkinson (2000) found that students' dispositions towards learning in FE were intricately related to their wider social lives, both inside and outside the college setting (Hodkinson and James, 2003). These cultural dimensions were strong and partly related to the nature of the particular institution attended (Bloomer and Hodkinson, 2000). Furthermore, for many learners, their dispositions changed over the time they were in FE. This has interesting implications for FE lecturers, who perhaps need to recognise their influence on the young people they teach, and the wider messages these learners pick up from the department and college they attend. The effects of departmental culture and organisational culture on students' development of skills and attitudes is a complex but significant issue worthy of further research activity.

Despite the research base not being strong, there is advice about key skills for college practitioners available from a range of sources. Since the introduction of key skills in September 2000 in the UK, the Key Skills Support Programme (KSSP) and others have been developing a body of knowledge about the best way to make key skills work, based on the experiences of practitioners, coordinators and managers (McNeil, 2006). The KSSP is led by the Learning and Skills Development Agency and Funded by the Department for Education and Skills and the European Social Fund; it is effectively therefore a governmental agency. The Learning and Skills Network (LSN) in partnership with Learning for Work supports the delivery and implementation of key skills within schools, colleges, work based learning and adult and community learning providers. They do this by providing advice, information and resources to students, teachers, trainers and managers. They have a comprehensive website http://www.lsneducation.org.uk/ and produce a range of publications including a key skill handbook for coordinators. Reports, brochures and newsletters containing practical advice about key skills delivery, management and assessment are produced by the Key Skills Support Network (KSSN) and are available online at http://www.keyskillssupport.net/supporting/publications/. The Welsh Joint Education Committee (WJEC, undated a, b, c) have also produced several key skills guidance reports which they claim to be based on international 'best practice' literature. Although the advice contained within these publications may be useful to practitioners, there does not appear to be a body of research-based literature concerning key skills in FE in the UK.

2.6 Research into key skills and Further Education in Hong Kong

There is very little research into the effects of educational policies and practices and curriculum management issues on Further Education in Hong Kong and nothing specifically about key skills. All levels of the education system have been undergoing critical examination and reform following Britain's return of Hong Kong to China in 1997 (Kennedy and Sweeting, 2003; Hong Kong Education Commission, 2004). The Education Blueprint for the 21st Century (Hong Kong Education Commission, 2000) has an ambitious vision: to build a lifelong learning society, to raise the overall quality of students, to construct a diverse school system, to create an inspiring learning environment, to acknowledge the importance of moral education and to develop an education system that is rich in tradition but cosmopolitan and culturally diverse. There are seven major initiatives in the blueprint: curriculum reform, language education, support for schools, professional development, student admission systems, assessment mechanisms and an increase in post-compulsory education opportunities.

Throughout the 155-page document are many exhortations for lifelong and life-wide learning, for example:

> 3.11 In the tide of changes, everyone has to meet new challenges. Adaptability, creativity and abilities for communication, self-learning and cooperation are now the prerequisites for anyone to succeed, while a person's character, emotional qualities, horizons and learning are important factors in achieving excellence. "Lifelong Learning and All-Round Development" is our expectation of everyone in this era. Education is infinitely important for everyone (Hong Kong Education Commission, 2000, p29).

Many skills and attributes are mentioned in the reform proposals, but these are not classified or defined. As the proposals start to be implemented they are becoming more explicit. For example, school curricula were redesigned in 2002 around Key Learning Areas taking account of a range of what were termed generic skills (collaboration, communication, creativity, critical thinking, information

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technology, numeracy, problem-solving, self-management and study skills), values and attitudes (see Figure 2.3).

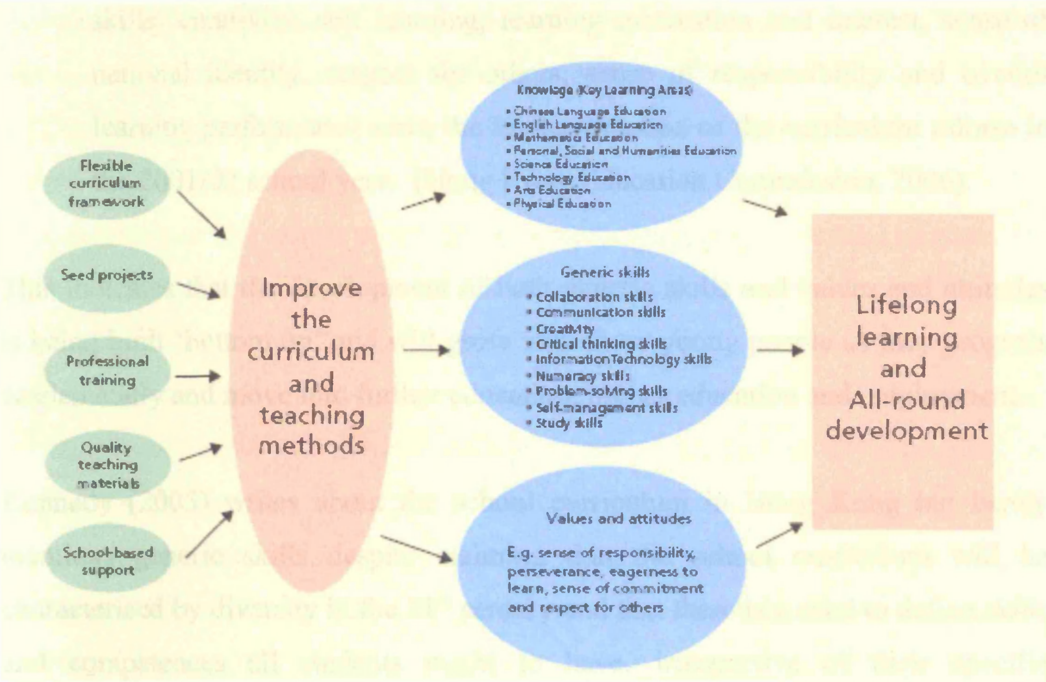

Figure 2.3: School curriculum reform in Hong Kong (Hong Kong Education Commission, 2002, p8)

It would appear that the generic skills are subsumed into the key learning areas rather than being taught as stand-alone subjects. One of the short-term targets of school curriculum reform (2001-2006) is to:

> infuse the priority generic skills (i.e. communication skills, critical thinking skills and creativity, etc) into the learning and teaching of existing subjects/key learning areas (KLAs) so as to develop students' independent learning capabilities in the acquisition and construction of knowledge (Hong Kong Education Commission, 2004).

As previously identified, in reform progress documents there is scant mention of generic skills (Hong Kong Education Commission in 2002, 2003 and 2004). These and other documents relevant to education reform in Hong Kong can be accessed at http://www.e-c.edu.hk/eng/reform/index_e.html). However in the most recent progress document (Hong Kong Education Commission, 2006) there is an encouraging statement in relation to primary and secondary schooling:

> Over 70% of primary school heads and over 50% of secondary school heads reported student improvement in communication, critical thinking skills, creativity, self learning, learning motivation and interest, sense of national identity, respect for others, sense of responsibility and overall learning performance since the implementation of the curriculum reform in the 2001/02 school year. (Hong Kong Education Commission, 2006).

This indicates that the development of both generic skills and values and attitudes is being built 'bottom up' and will grow with these young people as they progress academically and move into further education, higher education and employment.

Kennedy (2005) writes about the school curriculum in Hong Kong but barely mentions generic skills despite claiming that the school curriculum will be characterised by diversity in the 21st century and that there is a need to define skills and competences all students ought to have, irrespective of their specific curriculum experience. However, he does refer to attempts in Australia to define key competences and suggests that a similar approach has been adopted by the vocational education sector in Hong Kong (Kennedy, 2005).

There is little research into vocational education and training in Hong Kong, where purely vocational education is generally regarded as something for less academically able students (Morris, 1996). However, professional education (such as engineering) is treated differently because professions are highly respected among the Chinese (Kwan and Ng, 1999). Vocational training in Hong Kong is planned, designed and implemented in accordance with the macro-policy determined by Government (Hung, 1998) with the Vocational Training Council (VTC) being the principal institutional agency set up by Government responsible for planning and implementing policy on vocational training. Hung (1998) discusses how operative decisions (such as the introduction of new courses and elimination of old/obsolete courses, the setting up of new training programmes and the allocation of training assignments) which clearly have curriculum management implications are made by the Training Boards and General Committees. Members of these training boards and general committees are nominated by a trade association which is chosen by government, and these organisations may be business or industry related. Alongside them will be members from local Tertiary Education institutions (such as the Hong Kong Polytechnic University) and Government departments (such as the Labour Department or Industry Department) and management-based members (people who work directly for and within the VTC). This evidences a range of stakeholders who may influence VET curricula.

There is some evidence of a drive for wider participation in vocational education in Hong Kong (Lumby, 1999b; Lumby and Foskett, 1999; Lumby, 2000). Accompanied by a period of organisational restructuring within the VTC in 1999, this produced a number of significant changes, including a review of the balance of vocationally specific and generic skills and several changes to the curriculum in order to meet a double agenda; equipping students to contribute to their work in the short term and teaching them how to learn so as to prepare them to be adaptable in the longer term (Lumby, 2000). No report on the outcomes of these changes is available in the public arena.

A broad sweep through the literature looking for research into engineering education in Hong Kong reveals a study on the engineering and product design curriculum at the Hong Kong Polytechnic University. Siu (2003) considers that in Hong Kong a traditional focus on apprenticeships and techniques has been replaced by a focus on analysis and technology, and then further evolved to an approach emphasising knowledge and creative thinking. He considers that the "current concern is to encourage creativity and innovation" (Siu, 2003, p244). Siu (2003) draws on his previous studies and that of a colleague at the Hong Kong Polytechnic University (Heskett, 2003) to suggest that there have been changes in the job requirements of engineering and product designers. He concludes that in the past the role of designers was primarily to generate solutions to well-defined problems that were presented to them. In contrast, designers currently need to perform at a higher level, having a more comprehensive understanding of their profession to identify needs and initiate directions for design and production, and make decisions on a wide range of design, production and sales issues. Although this work is focussed on HE curricula and students, it might be deduced that engineering technicians working in engineering and product design in Hong Kong are also subject to more demanding and wide-ranging employer expectations.

Crookes and Thomas (1998) have undertaken a piece of research comparing innovation, conformity and creativity in respect of the problem solving abilities of Hong Kong Chinese and expatriate managers. They base their work on the four dimensions of national cultures (Hofstede, 1980) and conclude that there is a difference in the problem-solving behaviour preferences of expatriate and Chinese managers in both the private sector and the civil service. In part this is attributed to the values and prescriptions of Confucian teaching that are instilled into Hong Kong children such that they are conditioned to maintain social and structural harmony and which predispose a conservative stance towards risk taking and innovation in problem solving (Crookes and Thomas, 1998).

Bond (1986) provides some evidence of personality orientations towards submissiveness, introversion and conformity that might affect Chinese students' development of skills and personal attributes. Chan (1999) highlights the importance of Confucian philosophy in shaping Chinese teaching and learning style. She draws on work by Oh (1991) who suggests that Confucianism in present times is concerned with the correct observation of human relationships within a hierarchically-oriented society. The 'constant virtues' of filial piety, faithfulness, brotherhood, loyalty and sincerity find resonance in the attributes of being reliable, being committed, honesty/integrity and loyalty. However the impact of being brought up in a Confucian heritage culture and its impact on teaching and learning is an extremely complex issue, and should not be treated in an over-simplified manner (Watkins and Biggs, 1996; Watkins and Biggs, 2001).

2.7 Conclusions and conceptual framework

This chapter has defined vocational curricula as cubic and therefore comprising three elements: knowledge and understanding, key skills and personal attributes. Various internal and external stakeholders who may influence the curriculum for engineering technician students are identified. External stakeholders are the government, accreditation and qualification bodies, professional bodies and employers. Internal stakeholders are senior managers, curriculum managers, lecturers, support staff, key skills specialists and students. Powerful stakeholders determine curriculum priorities and may promote (or inhibit) the development of certain areas of knowledge and types of skills and attributes. Consequently it is

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important to understand who the main stakeholders are, and how influential they are, in each case study context before undertaking research in this area.

Figure 2.4 provides the conceptual framework that is used in this study. At the core of the conceptual framework is the cubic curriculum and surrounding it are the stakeholders. Internal stakeholders are separated from external stakeholders by a dotted line which indicates a permeable barrier in an open system. It is possible that there are commonly held assumptions about the need for engineers, the type of engineering expertise required and how engineers might best be formed and developed (in relation to an appropriate curriculum framework) among these internal stakeholders, although this cannot be taken for granted.

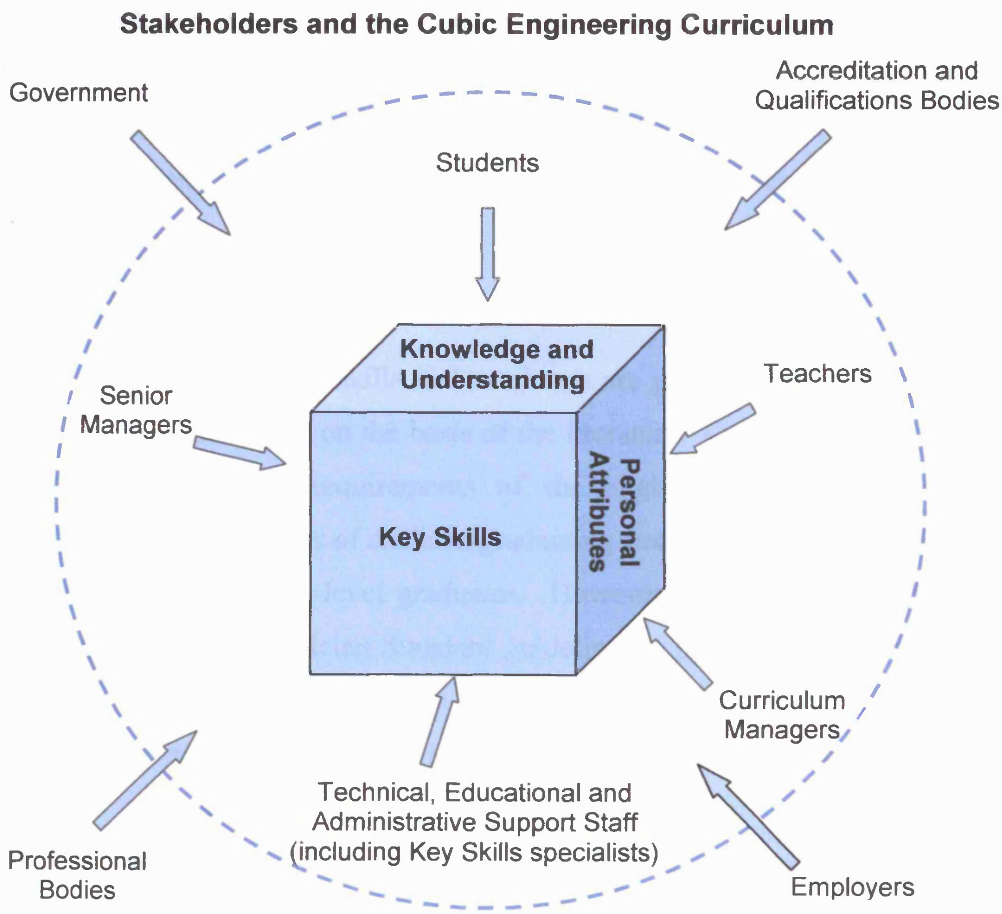


Figure 2.4: Conceptual framework: Stakeholders and the cubic engineering curriculum

The literature review indicates a broad international interest in employability, competencies, skills and attributes but little agreement about which skills or personal attributes are 'key'. Despite criticisms of key skills typologies and practical issues of implementing and assessing them, the inclusion of skills and attributes in the curriculum of vocational and academic courses continues to be actively promoted in many countries.

From an international perspective, contrasting approaches have evolved. In the UK HE is pursuing a broad employability skills agenda whilst FE is implementing the mandated Key Skills qualifications. Elsewhere a more holistic set of skills and personal attributes relevant to employability and lifelong learning predominate. The approaches taken in Europe and by several Asian countries appear less well developed than those in the UK, Australia, or North America. Internationally the concept of employability presented in this chapter is underpinned by the view that a range of skills are linked to learning, life and employment. However many skills typologies have been developed and over time these have broadened to include personal attributes.

Skills and attributes list

It is difficult to specify which skills and attributes are particularly important for engineering technicians solely on the basis of the literature. Only a little industry-specific material links the requirements of the engineering industry to the knowledge, skills and attributes of students graduating from college, and what there is mostly relates to university-level graduates. However it is possible to use the UK-SPEC Engineering Technician Standard guidelines (Engineering Council UK, 2005) along with elements drawn from the international skills frameworks and specific skills and attributes suggested in engineering articles to develop a holistic list of skills and attributes for engineering technicians. These are listed alphabetically and presented in Table 2.5. The perceived fit of these fifteen skills and sixteen attributes with the views of major internal curriculum stakeholders will be examined in this study.

Skills and Attributes for Engineering Technicians	
Skills	**Attributes**
Drawn from the UK-SPEC Engineering Technician Standard*	
Communication skills	Being adaptable
Critical thinking skills	Being reliable
Learning skills	Being safety conscious
Problem solving skills	Having common sense
Planning and organising skills	Professional presentation
Self management skills	
Team work skills	
Technical skills	
Additional skills and attributes drawn from the general literature and international taxonomies*	
Business management skills	Aesthetic appreciation
Creative thinking skills	Being motivated
Information literacy skills	Being able to deal with pressure
Initiative/enterprise skills	Being committed
Numeracy skills	Being intuitive
Technology skills	Cultural sensitivity
	Feeling positive about oneself
	Honesty/integrity
	Loyalty
	Sense of humour
	Work/life balance
* Presented in alphabetical order.	

Table 2.5: Skills and attributes for engineering technicians

It is noted that very little research has been done in the Further Education sectors of either the UK or Hong Kong in relation to key skills. The topic of key skills linked to engineering technician training in Further Education is very sparsely understood, in both Hong Kong and the UK and is clearly worthy of study.

Notes:

1. In September 2007 the Department for Education and Skills was replaced by the Department for Children, Schools and Families and the Department for Universities, Innovation and Science.

2. The UK's Qualification and Curriculum Authority (QCA) have a National Qualifications Framework (NQF) that starts at entry level and moves up to level 8 (leading expert or practitioner). Level 2 qualifications recognise the ability to gain a good knowledge and understanding of a subject area of work or study and to perform various tasks with some guidance or supervision. Further details are available on http://www.qca.org.uk/493_15773.html

3. Methodology

This chapter explores the methodological approach used to undertake the research. It outlines issues relating to data collection and data analysis and details how they are addressed in the study. In keeping with Cohen et al.'s view (2000) that research design is a complex task governed by the notions of 'fitness for purpose', this present study was designed to be both practicable and feasible. As previously indicated, it is situated in a field that is both short of research activity and worthy of further study.

3.1 The methodological approach

Dimmock and Walker (2005) believe that studies within the interpretivist paradigm, particularly those using narratives, case studies and interviews, potentially offer a deep understanding of a range of educational issues. The major purpose of this paradigm is to understand the subjective world of human experience (Cohen et al., 2000). The interpretivist paradigm is used in this study as it fits the research aims to understand how the key skills curriculum operates and how key skills and personal attributes are perceived and valued in relation to engineering technician education and training.

Furthermore this study takes a phenomenological approach because it is concerned about the world as it presents itself to people: as it is experienced by respondents within particular contexts and at particular times (Maxwell, 1996; Kvale, 1996; Willig, 2001). The context of the research is two engineering departments operating in Hong Kong and England and the timeframe is the academic year 2005/6. It is a cross-sectional study, based on the views of study participants gathered during February and March 2006.

3.2 Case study research

This study takes a case study approach. The use of these has become extremely widespread in social research, being particularly well suited to small scale research (Denscombe, 1998). Case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context (Yin, 2003). Cases are defined in terms of four dimensions: their conceptual nature, their social size, their physical location and their temporal extent (Miles and Huberman, 1994).

Case study research has several hallmarks (Cohen et al., 2000). Concerned with individual actors or groups' perceptions, it both describes events and analyses them, and also aims to provide readers with a flavour of the richness of the cases. One of the strengths of the case study is that is allows the researcher to use a variety of sources, types of data and research methods during the investigation (Denscombe, 1998; Yin, 2003). It might therefore be better called a research strategy than a research method. As is common with case study research, this present study involved semi-structured interviews and ethnographic methodology (in which the subject is allowed to express themselves in their own words) in order to achieve 'thick description' (Geertz, 1993). It also included card sorting activities and document analysis.

Case studies have been categorised in a number of ways, including three different forms of case study; 'exploratory', 'explanatory' and 'descriptive' (Yin, 2003). It is within the descriptive case study format, the presentation of a complete description of a phenomenon within its context, that the present study lies. The descriptive style of report aims to draw a tangible picture (in this study, how the key skills curriculum operates and is managed in two different contexts) based on careful probing and thoughtful analysis (Bassey, 1999). In this study the picture is how the key skills curriculum operates and is managed in two different contexts. There are precedents for using descriptive case studies in research into comparative education, where it is particularly useful in focusing on the complexities of educational practice (Crossley and Villiamy, 1984).

Case selection

Following preliminary work (described below), two cases were selected for the research. The first case is the Department of Engineering in a college that is part of a larger Further Education Institution in Hong Kong. The second case is the Engineering section of the Department of Technology in a large Further Education college in England.

The Department of Engineering at 'Asian College' was 'suitable' (Denscombe, 1998) for case study research purposes because it appeared to be typical of the forty-one departments (eleven of them in the engineering discipline) in the VET institution in Hong Kong. Because of the nexus structure operating at the institution, this was a curriculum 'lead' department, having a senior head in post. It provided a unique opportunity to investigate an institution and approach to the key skills curriculum about which little is known. Since 1997 Hong Kong has been a Special Administrative Region of China and is of particular interest for several reasons, including its development of a post-colonial curriculum (Kennedy, 2005).

The Department of Technology at 'Northern College' was suitable for case study research because student enrolment in engineering is broadly similar to the 'Asian College' department of Engineering for which it provides a reference point. The college is one of about 250 General Further Education Colleges in the UK that offer a broad range of vocational and academic subjects (Foster, 2005). However, it is one of the largest colleges of this type in the country.

Both departments have an explicit aim of preparing young people to work as engineering technicians and offer qualifications that have equivalent international professional recognition. Each department registers around 1,500 full and part-time students annually. Although the departments operate in different cultural contexts, there are some common elements: staff have taken very similar professional qualifications prior to teaching and the curriculum structure, teaching and assessment methods in the Higher Diploma programmes at 'Asian College' were originally derived from those in operation in the UK[1].

Given that the UK has a well developed national approach to key skills, and a Technician Standard (Engineering Council UK, 2005) it is particularly interesting to be able to compare the views of respondents in the English case with those of the Hong Kong one, where the approach to key skills is institutional and there is no published technician standard.

3.3 The research relationship

Three elements of the research relationship are particularly significant to the present study. These are to carry out the research in an ethical manner, to pay particular attention to the cross cultural element of the research and to undertake adequate preliminary work to build a productive relationship. These elements are discussed below.

Research ethics

Watt (1995) suggests that ethical issues be given a high profile because the conduct and outcomes of doctoral research should stand close scrutiny. Qualitative researchers should explore the values they bring to their research and the ways those values might be made concrete in the research activity itself (Pring, 2000). The British Educational Research Association (BERA) produce Ethical Guidelines for Educational Research in order to help researchers weigh up all aspects of the process of conducting educational research and to reach an ethically acceptable position in which their actions are considered justifiable and sound (BERA, 2004). The Association calls for all education research to be carried out with an ethic of respect for the person, knowledge, democratic values, quality and academic freedom. This broad communal code was carefully considered throughout the process of planning, conducting, analysing and writing up the present study. Before starting the research, a personal ethical checklist was drawn up (see Appendix A) and referred to periodically during the study. The basic ethical considerations (see Elmes et al., 1995) applied to the research include informed consent, right to withdraw, debriefing and confidentiality.

Cross cultural research

There are benefits from undertaking research in an international context if it is done with care. Educational policies and practices vary in different societies and cultures. Understanding how well these operate, as well as what learning outcomes they produce, is of interest to those involved in running and planning educational programmes. Dimmock (2002) states that successful policies and practices cannot generally be easily replicated and transplanted from one society to another. However lessons can usually be learned from others' experiences.

The knowledge base for understanding culture and its intricate connections with policy and practice is very sketchy, with much of the accumulated body of literature in educational management and leadership being generated by a culturally homogeneous group of scholars from English-speaking backgrounds. This present study may also fall into this camp; however it does represent a genuine attempt to identify similarities and differences in key skills curricula and the specific skills and attributes that are valued in two different cultural contexts.

Culture refers to the shared beliefs and symbols of a group of individuals. It is an amorphous, ambivalent and contested concept (Brislin, 1993). Culture is also a multi-layered concept. It is suggested (Schein, 1992; Cheng, 1996) that there is a hierarchy of culture from the classroom, to school, community and society or nation and another hierarchy of shared assumptions, values and norms (overt attitudes and behaviours) arranged from abstract to concrete and from deep to superficial. In this study the focus is on departmental culture although the influences of other levels (classroom, institution, community and society/nation) are recognised.

A well known cultural survey of nations is that of Hofstede (1997) who conducted a large-scale piece of research identifying patterns of work-related values in four dimensions (individualism; power distance; uncertainty avoidance; masculinity) and used these to construct a cultural map of the world, one that suggests cultural homogeneity by country. In this map the United Kingdom and China (Hong Kong is included as part of China) are ranked as follows (see table 3.1):

Intercultural Dimensions	**China Index Scores**	**United Kingdom Index Scores**
Power Distance relates to the degree of equality/inequality between people of a particular society.	PDI: 80	PDI: 35
Individualism focuses on the degree to which a society reinforces individual or collective achievement and interpersonal relationships.	IDV: 20	IDV: 89

Uncertainty avoidance concerns the level of acceptance for uncertainty and ambiguity within a society.	UA: 30	UA: 35
Masculinity pertains to the degree societies reinforce, or do not reinforce, the traditional masculine work role model of male achievement, control, and power.	MAS: 66	MAS: 66

Table 3.1: Intercultural dimensions. Adapted from Hofstede (1997) and http://www.kwintissential.co.uk/intercultural/dimensions.html

Hofstede (1997) identifies similarities between China and the UK in terms of masculinity and uncertainty avoidance, but significant differences in their power distance and individualism. In high power distance cultures (such as China) those in authority openly demonstrate their rank, subordinates are not given important work and expect clear guidance from above while expecting to take the blame if things go wrong, relationships between superiors/subordinates are rarely personal, politics is prone to totalitarianism and class divisions within society are accepted. There are several effects on intercultural communication. In terms of research practice in the present study it was deemed important to show clear respect to those in authority in Hong Kong (in terms of language, behaviour and protocol), to expect high levels of bureaucracy and to request senior staff to sanction access to other organisation members and the release of documentation. Much effort was put into establishing a working relationship during a preliminary visit and through follow-up communications. Identical procedures were applied to data collection in the UK as a matter of courtesy.

In low scoring individualistic cultures (such as China) 'we' is more important than 'I', conformity is expected and perceived positively, individuals' desires and aspirations should be curbed if necessary for the good of the group, the rights of the family (or the common good) are very important and rules are seen to provide stability, order and obedience. In terms of intercultural communication and research practice it is expected that individuals will refer to group decisions and norms, that requests for information may be refered upwards and that decision making (about permitting access, for example) may be a slow process. In the present study in relation to Hong Kong individual interviewees did not refer particularly to departmental or institutional policies or rules and appeared happy to express their personal opinions quite freely. The UK interviewees behaved similarly. It may therefore be that the Hong Kong respondents were not typically 'Chinese' in this respect.

Hofstede (1986) also identified ways in which the four dimensions of cultural values apply to teaching and learning. The issues of power distance and individualism appear relevant to understanding teacher-student relationships in the two countries in this study. For example, he claims individualistic societies (such as the UK) expect students to learn how to learn whilst collectivistic societies (such as China) expect students to learn how to do. This may indicate differing attitudes to skills and attributes in the two contexts.

Although Hofstede's work (1980; 1997) is well known and gives useful pointers to people working in cross-cultural settings, it is not without its critics. McSweeney (2002) for example, criticises the research in terms of the model, the implications of theorizing culture as 'national' and the empirical work. McDonald (2000) notes that people inhabiting a country under the same government may contain several cultures and that a culture may be present in many nations. He cautions against using nationality as a surrogate for culture. McSweeney (2002, p. 28) concludes that Hofstede's work is "a restricter not an enhancer of understanding particularities" and calls for more detailed research into national practices and institutions. 'Culturalism' (the reduction of people to prescribed social stereotypes which may be simplistic, exotic or degrading) is a significant issue particularly within social scientific research (Holliday, 2001), and is clearly something to guard against.

In relation to the Hong Kong aspect of the study, Hofstede's intercultural dimensions may be of limited value as Hong Kong people may not score the same as Mainland Chinese. Chan and Drover (1997) assert that Hong Kong has "a long history of affirming its own culture in the face of globalisation and a metanarrative of colonialism" (p.49). The Hong Kong Democratic Foundation claims that 'Chinese culture and heritage' and 'Hong Kong culture and heritage' are not synonymous (quoted in Kennedy, 2005). In fact the Hong Kong Education System is much closer to the UK model than the Chinese one, drawing on its colonial legacy with a strong British influence in the structure of schooling and the curriculum (Watkins and Biggs, 2001). Many of those working in Further Education have lived, been educated and/or worked overseas and these experiences will impact on their attitudes. This is not to sideline their Chinese heritage; it merely adds to the difficulty of attributing individual actions and beliefs to national characteristics. Kennedy (2005) suggests that Hong Kong people can claim to have local, national and international identities which all influence their identity and views in complex ways. This also reinforces the need for qualitative studies, such as the one presented here, that take a case study approach and try to capture the richness and diversity of expressed views and values.

Cross-cultural and inter-cultural studies are fraught with methodological difficulties. A significant challenge to researchers is the development of methodology and instrumentation to advance empirical study when working in a cross-cultural environment (Dimmock and Walker, 2002). The overriding methodological issue in cross-cultural research is one of *equivalence* in variable identification, operational definitions, instrument design, sample selection, sample treatment and analysis (McDonald, 2000). The meanings of key concepts should be defined equivalently and the research designed so that the instrumentation, administration, analysis, and interpretation are equivalent with reference to the cultures in the study (Adler, 1983). In this present study, careful thought was given to this methodological issue.

Preliminary work

Working in a non-native cultural context requires careful planning and sensitivity. An early decision was to base the research in Hong Kong on the large institution where the researcher had previously worked. However, in the interests of greater impartiality, it was decided not to work with departments that were prominent in the researcher's background as it would be difficult to avoid pre-conceptions about curriculum content and curriculum management issues that could be construed as researcher bias. Gaining access and building trust were major concerns; Chinese cultural norms generally require personal introductions, particularly to senior organisation members, and lengthy preliminary procedures (including obtaining 'top down' approval) are commonplace. Although this might be seen as a pragmatic basis of selection it was also a unique opportunity to access an institution which is not widely known about and that has not been the subject of much prior research activity.

A preliminary visit was made to Hong Kong in March 2005 to meet a range of people whose departments might be willing to participate in research. At that time outline approval was obtained from the Deputy Executive Director (Academic). The original point of contact was the Key Skills Team Leader, a staff member working for the Teaching and Learning Centre of the Council that ran the Colleges. Apart from gathering background information, the preliminary work particularly aimed to identify if the Student Affairs Officers' language skills were sufficiently well developed for a more detailed study of the way the new module was operating across a range of campuses and if there were any departments that might be willing to be involved in more in-depth study of their overall approach to key skills.

People from several departments (both teaching and administrative) took part in semi-structured interviews. Interviewees were selected because the Key Skills Team Leader knew they were interested in developing students' key skills; they had participated in key skills workshops and activities, and they had responded positively to a personal phone call inviting them to participate in the preliminary round of interviews. Where possible, tours of the department were made and conversations held with other staff members and students.

Reflection and discussion with the thesis supervisor led to a decision to attempt a comparative study with an English Further Education college and to pair two departments for investigation rather than to take a narrow focus which was only relevant to the Hong Kong institution. There seemed to be more issues that could be explored if the UK's well-established qualification-based key skills approach (set in a more general context of skills and attributes development for students) were compared to the newly-established institutionally-developed approach to key skills in Hong Kong.

Of the departments visited in the Further Education colleges in Hong Kong, Engineering appeared the most appropriate to be involved in further research. Staff had recently developed and introduced key skills modules into some of their courses, in addition to the introductory module for students mandated by the institution. Some staff appeared very keen that their engineering students developed and practised a range of skills prior to employment and the acting head of department was eager to find out more about good practice internationally. However, it was noted that all staff had heavy teaching and administrative loads and also that the institution was facing funding instability and introducing new policies and procedures related to quality issues and strategic planning. It was recognised that trying to collect a large amount of in-depth data from staff and/or students was not logistically or practically possible. In terms of language fluency (given that participants were not going to be able to speak in their mother tongue – Cantonese), lecturers and managers were seen to be very proficient in English, Student Affairs Officers quite proficient, and students poor to adequate (comprehension was fine, but their ability to express complex ideas and opinions was limited and hesitant). These issues were taken into consideration when planning equivalent data collection methods.

During the autumn of 2005 attention shifted to finding a Further Education college in England which contained an Engineering Department that could be seen as broadly comparable. College websites were reviewed and prospectuses examined. The most promising college (in terms of overall student numbers, range of vocational areas, large engineering department and accessibility for the researcher) was identified. Telephone calls and letters to the head of engineering secured a preliminary meeting at the college. This went well and the head agreed to participate in the research subject to some conditions. These were that teaching staff could choose whether or not they wished to participate, and that participating students would not be unduly inconvenienced. Permission to use the College/Department as a case study in a Doctoral research project was subsequently obtained from a more senior manager (a Vice-Principal).

The heads of both departments were sent formal letters, including a shortened version of the full Leicester University submission document and consent forms prior to the start of the research (Appendix B). These were followed by emails clarifying any questions and setting the practical arrangements with a contact staff member in Hong Kong and an administrator in England.

An important element of advance preparation was exploring data collection methods that might not disadvantage non-native English speakers. A range of employability resources and toolkits was examined and included attendance at a practical workshop at the Higher Education Academy, York on 25th November 2005 entitled 'Getting to Grips with Employability'. Card sorting appeared particularly promising and further research and development work was undertaken on this technique.

3.4 Data collection

It was intended that the research be conducted in such a way that sufficient data were collected to be able to:

a. explore *significant* features of each case;
b. create *plausible* interpretations of what was found;
c. test for the trustworthiness of these interpretations;
d. construct a *worthwhile* argument or story;
e. relate the argument or story to any relevant research in the literature;
f. convey *convincingly* to an audience this argument or story;
g. provide an audit trail by which other researchers may validate or challenge the findings, or construct alternative arguments.

(Bassey, 1999 p. 65)

Dimmock and Walker (2004) recommend the development of mixed methodologies and application of several data collection techniques when working in a cross-cultural environment. This advice informs the present study in which a range of data collection sources were identified (reports and publications, websites, course documentation and leaflets, stakeholder individuals and groups) and appropriate data collection methods employed (secondary research and primary research including interviewing, individual and group based card-sorting activities). As was noted above, the issue of equivalence (McDonald, 2000) is particularly important in data collection in cross-cultural research.

Varied sources and data collection methods were used to generate data that might be useful in answering the key research questions. Each question was broken down into subsidiary questions and sources of data identified (by considering the different stakeholders in the conceptual model) and then data collection methods identified (Appendix C). Data from external stakeholders (employers, professional bodies, accreditation and qualifications bodies and government) were collected using secondary methods (articles about them and documents produced by them available in the public domain and on their websites). Secondary data for the literature review were accessed as a distance student using several search databases. Articles that could not be downloaded directly via an Athens log-in were requested via the University of Leicester library. Some literature (mainly books and theses) was obtained through the local University library. Other secondary data were gathered as a result of on-line searches using key words.

In December 2005 and January 2006 arrangements were made so that data collection could be undertaken in the case study institutions during February 2006 in England and the week of March 20th 2006 in Hong Kong. Internal stakeholder data were mainly obtained from primary sources. Data from department heads, course leaders, lecturers and key skills specialists were collected using interviews, card sorting activities and through reference to college and departmental documentation. Data from student groups were collected using a group-based card sorting task.

Key informants

In terms of the way informants were selected and treated it was thought important to maintain a sense of the different contexts within which the case study departments operated. A decision was made not to try and 'match' respondents, which was proving impossible, but to use a form of systematic, non-probabilistic sampling (Keen and Packwood, 1995). The heads of department in each case were asked to identify a mixture of departmental colleagues who could be invited to participate in the study using 'chain referral' (Atkinson and Flint, 2001). Heads have a critical perspective on curriculum issues and knowledge of institutional priorities as well as good links to external stakeholders, and an understanding of their requirements of student learning outcomes. They have sufficient authority to provide a route to other informants (Groger et al., 1999). Department heads were asked to choose a mixture of course leaders and lecturers some of whom taught key skills and some who did not, and also to identify key skills specialists within the college whose views about key skills they thought would be relevant. This process of chain referral draws on the 'knowledge of insiders' which is not readily available to researchers and is difficult to acquire. The heads' choice of recommended respondents was discussed with them to obtain a mixture of key skills advocates and sceptics and in an attempt to minimise 'gatekeeper bias' (Groger, et al, 1999).

This form of snowball sampling has benefits, being mainly used to access previously hidden populations in order to gather in-depth information, but it also has potential problems. Atkinson and Flint (2001) draw on several sources to suggest that snowball sampling has particular problems of representativeness. Selection bias may limit the validity of the sample (which does not allow researchers to claim generality) and also be biased towards the inclusion of individuals with inter-relationships, therefore over-emphasising cohesiveness in social networks (Griffiths et al, 1993). Despite awareness of these concerns, chain referral was viewed as an appropriate method of contacting a range of people whose opinions about key skills would be relevant.

This process resulted in a slightly uneven pattern within the two institutions but is, none the less, respectful of different cultural contexts. A practical outcome is that the heads nominated different numbers of colleagues. This meant that in 'Northern College' five course leaders and lecturers, one departmental project manager and one college key skills specialist participated (i.e. eight individuals) while in 'Asian College' eight course leaders and lecturers, one departmental key skills specialist and one college key skills specialist participated (i.e. eleven individuals).

Course leaders were asked if some of their students could be approached and invited to participate in card-sorting activities. An unexpected difference between the two case study situations was the approach staff used to recruit student groups to the research. In the UK, the researcher was invited to come along during normal class time and take 20 minutes to undertake card sorting activities with student groups while others worked with their teachers. In Hong Kong this approach was not permitted; student volunteers were requested and came during their free time. Administrative staff at 'Asian College' also produced appreciation letters signed by the head of department for distribution to students; this was described as 'customary'. Others intending to undertake research in a Hong Kong context perhaps should be aware of this element of procedure and courtesy.

Staff and students at both case study colleges were extremely busy and under pressure. Their co-operation was much appreciated but care had to be taken not to make undue demands on them. In terms of the sampling frames (see Table 3.2) eight 'Asian College' course leaders and lecturers were drawn from a total of 54 staff and 31 students from 1160 full-time and 585 part-time students. In the event, all the students were full-time students. The six 'Northern College' members of teaching staff were drawn from a total of 80 staff, the 30 students from 278 full-time and 1056 part-time students. Three groups were part-time students. In order to preserve the anonymity of all concerned, participants were coded by college and by rôle.

In 'Asian College' Hong Kong		In 'Northern College' England	
Acting Head of Department	AC-HOD	Head of Department	NC-HOD
6 Course Leaders* * Also lecturers	AC1 AC-2 AC-5 AC-6 AC-7 AC-8	Programme Manager* Curriculum Leader* Course Leader* Departmental Co-ordinator for Key Skills* * Also lecturers	NC-4 NC-6 NC-5 NC-1
2 Lecturers	AC-3 AC-4	1 Lecturer	NC-2
Student Affairs Officer	AC-SAO	Engineering Scholarship Project Manager	NC-3
Acting Head of Teaching and Learning Centre	AC-HOD-TLC	Key Skills Co-ordinator	NC-KSC
31 students – 8 groups	AC-G1 AC-G2 AC-G3 AC-G4 AC-G5 AC-G6 AC-G7 AC-G8	30 students – 7 groups	NC-G1 NC-G2 NC-G3 NC-G4 NC-G5 NC-G6 NC-G7

Table 3.2: Key informants

In addition, one teacher was used to pilot the interview schedule and one student group was used to pilot the card sort activity in the UK. It would have been desirable to pilot the instruments in Hong Kong, but this was not practical. Following the pilots, minor changes were made by altering the wording of the questions and reducing their number, and enlarging the cards.

Data collection protocols, procedures and instruments

Before starting work on data collection, much thought was given to the potential difficulties caused by working in two countries and how equivalence in concept definition and instrument design might be achieved.

One obvious element that might cause difficulty in cross-cultural data collection is language and communication. In this study the researcher is a native English speaker as are the respondents in 'Northern College'. In 'Asian College' respondents are Hong Kong Chinese for whom English is a second language, albeit one for whom both English and Chinese are 'official languages' (Ng, Tsui and Marton, 2001). Although English is widely understood and spoken in Hong Kong and although it is the predominant medium of instruction in schools and colleges, including 'Asian College', care was needed not to place undue focus on language fluency or an understanding of the nuances of terminology. Key skills, even relatively well-known ones like communication, may mean different things to different people and to non-native English speakers. Particular care was needed in relation to Chinese students whose oral hesitancy might be exacerbated by the stress of having to talk to an unfamiliar person not in their mother tongue. One element of the preliminary work was to investigate Hong Kong staff and students' language abilities and to develop appropriate research instruments, including producing some bi-lingual materials.

Interviewing is one of the commonest methods used in small-scale educational research (Drever, 1995) being a flexible technique suited to a range of research purposes. Semi-structured interviewing was used in this study. A general structure was set up containing the broad area to be covered and the main questions established. Prompts, probes and follow-up questions were used as appropriate as the interview progressed in order to encourage interviewees to clarify and expand their answers, opinions and ideas. A very tight structure was not seen to be sufficiently flexible, and it was considered beneficial to provide some multiple choice definitions of key skills (as well as allowing interviewees to freely give their own definition) to facilitate comparisons between definitions that might otherwise become vague and abstract. Similarly, card sorting activities were used within the interviews to provide a common basic lexicon of skills and attributes. Students were not interviewed because the linguistic and logistical difficulties appeared too complex and time-consuming. Instead a group-based card sorting task was used with students to explore the place of key skills and personal attributes in the received curriculum.

Careful consideration was given to advice about interviewing from a range of sources before data collection was undertaken. Drever (1995) devotes a whole book to the use of semi-structured interviews in small scale educational research and space prohibits doing justice to all the relevant topics. Many aspects require careful planning and implementation, including sampling, approaching interviewees, negotiating access, planning the interview setting and writing and piloting interview schedules. The conduct of each interview is also important. Drever describes how to present oneself at interview, maintain distance and deal with difficult cases as well as verbal and non-verbal tactics that are useful in conducting the interview. Interpersonal factors (Denscombe, 1998) may affect any interview (who study participants think you are; your official position and the kind of person they take you to be) and these were seen as particularly relevant in doing cross-cultural research. Data preparation, data analysis, reporting and communicating the findings all require care.

Participants in both Hong Kong and England gave informed consent. Permission to conduct the research was obtained from senior college managers. Heads of Departments were then sent project outlines and given opportunities to ask questions and clarify what would be required in advance of, and during, face-to-face preliminary meetings. Staff who were approached as potential interviewees were given short project outlines and a list of questions in advance.

Interviews were started with the reading and signing of Interview Consent Forms (Appendix D) and were tape-recorded. The interviews were semi-structured and based around a series of standard questions linked to the research questions (Appendix E). The interviewing procedures and questions seemed to be adequate and participants in both England and Hong Kong appeared comfortable with the process. One hour proved to be an acceptable timeframe and yielded plenty of data.

Some data was collected using 'systematic elicitation' (Ryan and Bernard, 2000). Small laminated cards were used to provide a range of definitions of key skills to give interviewees something tangible to work with whilst expressing their own views (Appendix F). Fourteen skills cards and sixteen attributes cards were similarly used to stimulate a discussion on priorities and values (Appendix G). Chinese interviewees were given bi-lingual cards (English/Chinese). The cards also served to provide a tangible comparison point between the different stakeholders. Translation was undertaken by a native Chinese speaker and independently back translated by another native Chinese speaker to ensure accuracy. The card sort has been used as a qualitative data collection technique in many social science disciplines (Neufeld et al., 2004). It has been used as a means of understanding experience (Ryan and Bernard, 2000) and in producing a continuum of significance, such as most important to least important (Luniewski, Reigle, and White, 1999). There is a precedent in using card sorting in relation to employability: the Enhancing Student Employability Co-ordination Team (ESECT), part of the Higher Education Academy have developed and successfully used a card sorting activity with lecturers, course leaders and others involved in curriculum planning in HE institutions and also with students. Further information on the ESECT approach to employability and card sorting can be accessed via http://www.heacademy.ac.uk/1665.htm. Card sorts are flexible, they allow participants to prioritise, reflect on their choices, and re-position cards as they talk through their thinking. If done in groups it stimulates participants to discuss cards with their peers (who may hold divergent or similar views) and perhaps come to agreement about where to position cards.

Students were given written briefing sheets (Appendix H) which were supported by a verbal briefing and an opportunity to ask questions. The card sort comprised fourteen skill cards and sixteen attribute cards which had to be placed under one of three header cards ('is very important for success as an engineering student'; 'is important for success as an engineering student'; 'is not important/not relevant for success as an engineering student'). Chinese students were given bi-lingual cards (English/Chinese) and encouraged to undertake the task speaking in whichever language they were most comfortable. On completion of the task (15-20 minutes) a brief discussion was held to check the position of the cards at the top of the 'most important' category and the cards at the bottom of the 'not important/relevant' category. After the students had left, a record sheet was completed and brief notes made about the composition of the student group, the procedures they had used and impressions about the way the activity had gone.

The skill and attribute cards were also used within the interviews but in a different, more flexible way. In terms of the procedure used, department heads, course leaders and lecturers were given the skill cards and asked to identify those skills that they considered to be most important for their students. The cards were presented to each interviewee in the same (alphabetised) order. People were encouraged to look through the cards, lay them out and order/re-order them until they were happy. They were then invited to 'talk through' their reasoning for the layout. They then did the same with the attribute cards.

The card sorting activities worked particularly well with students. By providing a focus, students engaged fully in the activity without appearing to be self-conscious. One area of concern was that because the cards just contained the names of the skills and attributes (in both English and Chinese for the Hong Kong participants) there might be some cards that they didn't understand or held different understandings of (e.g. aesthetic appreciation). However there didn't seem to be any easy way of checking what individuals meant by the terms and none was attempted. When the cards were used with interviewees, there was scope for more flexibility and a more wide-ranging discussion was possible

Contemporaneous notes were taken during the interview and impressions were noted down shortly after the interview had finished. Interviews were transcribed and then interviewees were sent summaries of the interviews for approval and given the opportunity to comment on the notes. Interviews were subsequently coded for analysis.

3.5 Data analysis

In qualitative research there are a number of analytical approaches that might be used. Qualitative data analysis tends to require an iterative and progressive process of noticing, collecting and thinking about things (Seidel, 1998). Ryan and Bernard (2000) distinguish between linguistic and sociological traditions of qualitative data analysis. This study clearly takes the latter approach with analysis based on the principles of Interpretive Phenomenological Analysis (IPA). In a pure form empirical phenomenological research would require the researcher to suspend all presuppositions and biases in order to gain understanding of another individuals' perspective. IPA is a version of the phenomenological method which accepts that it is impossible to gain direct access to research participants' life worlds but asserts that it is valuable to explore participants experience whilst recognising that this exploration implicates the researcher's own view of the world as well as the nature of the interaction between researcher and participant (Willig, 2001). The phenomenological analysis produced is consequently an *interpretation* of the participant's experiences.

IPA shares the aims of other phenomenological approaches to data analysis in that it wishes to capture the quality and texture of individual experience. The approach requires engagement with transcripts of semi-structured interviews. In this project the semi-structured interviews were taped and contemporaneous notes were made. Transcription provided a further chance to build familiarity with the material and to consider nuances of meaning or expression missed during the interviews. In addition a project journal was kept to both track the researcher's activities and actions and record observations and emerging patterns.

Prior to interviewing, permission had been sought and obtained for recording interviews. On a purely practical level, transcription of interviews proved time-consuming. Each hour-long interview took between twelve and twenty hours to transcribe, depending on the clarity of the tape. Some interviewees mumbled and some phraseology, especially by the non-native English speakers was hard to make out. It quickly became clear that some indistinct areas would have to be represented by the symbol (?) or it would not be possible to finish the task. There were no major recording problems, perhaps because great care was taken with equipment checking and testing prior to every interview and frequent battery changing. Despite this care one interview contained a short section of indecipherable recording which had to be abandoned. In order to avoid potential embarrassment from the literal transcription of every 'um' and 'ah' and incomplete sentence, a decision was made to send summaries to interviewees. This was welcomed by the interviewees but added another lengthy task onto the process. In the event summaries went out four to six weeks after the original interviews which was not ideal; however it was simply not possible to do it more quickly. Interviewees were given the opportunity to write on the summaries and return them, as well as to make any additional comments and around half did so. Others did not return them and were assumed (after e-mail follow-ups) to have no major concerns about the content and to have given permission to use the material.

In this study both within-case and across-case analysis was undertaken. This enabled a sense of the cultural and organisational context to be maintained for each case situation, but also allowed for definitions of key skills and views of significant curriculum stakeholders and of individual skills and personal attributes for engineering technicians to be compared across the two case study departments.

To keep track of all the data, and to aid analysis, a form of categorising strategy (Maxwell, 1996) was developed from the conceptual model developed for the study (Figure 2.2) and the skills and attributes list (Table 2.5). Key skills definitions were coded according to Bolton's definitions so Vocational Preparation became KS:B2 and a definition of their own devising became KS:B6 (the number on a blank card among the set given to respondents). Data that appeared relevant to single skills or attributes was coded thus; Business management skills S-1 became KS:BUS, communication skills S-2 became KS:COM, the personal attributes being reliable A-14 became PA:REL, being safety conscious A-15 became PA:SAF (a full list is in Appendix I). These were essentially objectivist codes (Seidel and Kelle, 1995), standing as surrogates for the skills and attributes. Alongside this a further type of categorizing analysis was used which involved sorting the data into broad themes and issues (Maxwell, 1996). The issues that were coded included the type of key skills delivery model used: positive and negative views of the key skills curriculum, views of influential stakeholders and factual information about the institution, department and courses. These 'heuristic codes' (Maxwell, 1996) were used to signpost items in the data in order to be able to re-organise them later and helped to open up the data for further analysis.

Some of the data were collected through a form of systematic elicitation (Ryan and Bernard, 2000) based on card sorting activities as described above. Key skills definitions were tallied. To analyse respondents' views of skills and attributes generated though the more complex card sorting activities and interviews, data tables were produced using the rationale presented in Table 3.3.

Category	**Interviewees** allocated to this category	**Student groups** allocated to this category
'very important'	If skills or attribute card ranked 1st to 6th inclusive, if identified as 'primary', 'core', 'hub' or 'higher' (but with comments indicating high importance/ relevance to own students)	If card placed under 'very important' header
'important'	If skills card ranked 7th to 10th inclusive, if attribute card ranked 7th to 11th inclusive, if identified as 'secondary'	If card placed under 'important' header
'not important/relevant' (or interviewee claims is less important/ relevant)	If skills card ranked 11th to 14th inclusive, if attribute card ranked 12th to 16th inclusive, or identified as 'higher' (but with comments indicating relevance to students taking more advanced level qualifications only)	If card placed under 'not important/relevant' header
		cont.,

'not ranked/discussed' (and assumed to be less important)	If card neither placed nor mentioned during the interview.	If card not placed

Table 3.3: Categorising strategy for interview and card sort data

Interview data were reviewed to pick out comments about skills or attributes that enriched understanding of the information. Then the literature about each skill or attribute in relation to engineering technician students (where available) or engineering students (generally undergraduate level students) was reviewed to feed into the discussion of skills, attributes and their positions in the curriculum for engineering technicians. The perspectives in each case study department (staff and students) were reviewed and staff to staff and student to student comparisons made across the two institutions. The level of consensus among staff and students about the importance of each skill or attribute was considered. The fourteen skills and sixteen attributes were written up individually in descending order according to how many individuals or groups rated each skill as 'very important'. Comments were made about how well these matched the Specifications for Engineering Technicians (Engineering Council UK, 2005).

To contextualise the interview data information from secondary sources (notably college policy documents, course documentation and other course publications) was used in a consideration of how prominently key skills appeared as a curriculum issue, and in relation to the strategic issue of how supportive of key skills the organisation culture and context appeared to be. Data from student groups and staff sources were compared alongside a consideration of the skills framework that participants were familiar with. This allowed for application of contextualising strategies (Maxwell, 1996) to the interview data to look for relationships that connected statements and events within their context into a coherent whole and improved the trustworthiness of the findings. Finally, a summary of two elements of the cubic curriculum containing the most important key skills and personal attributes in each case was produced.

Stenhouse (1988) discusses how to present case study data, which can be extensive, and suggests 'portrayal reporting' using 'vignettes' (short descriptive pieces inserted into the writing to illustrate particular points). Description can enrich a research report and contribute to a better understanding of a case. However, quantity and coverage of data are not sufficient criteria for making data valid. The data must be worked appropriately and the notion of 'thick description' is used by many qualitative researchers in this context (Holliday, 2001 drawing on Geertz, 1993). To arrive at a thick description it is necessary to consider the many facets that make up the full social complexity of an event or situation and this was kept in mind during the data analysis stage of the research. Care was taken to select material for presentation from interviewees that was 'rich' and illustrative of more general issues and to attempt to follow these up with discursive comment and links with literature where possible.

Inevitably, and because of the many constraints of doing single handed small-scale cross-cultural research, some research findings can only be tentative and may be open to legitimate challenge. Overall, a genuine effort was made to reach logical conclusions based on the evidence found, and both the evidence base and the conclusions were never intentionally misrepresented or overstated.

In drawing conclusions and recommendations from the study, the conceptual model (Figure 2.4) was revisited and expanded to produce a generic model for the effective management of key skills in the curriculum of vocational students.

3.6 Trustworthiness

Various strategies are available within qualitative research to protect against bias and enhance trustworthiness of the findings. All research is selective and all research depends on collecting particular sorts of evidence through the prism of particular methods, each of which has its strengths and weaknesses (Mays and Pope, 1995).

The main threat to valid interpretation (Maxwell, 1996) is imposing one's own framework or meaning, rather than understanding the perspective of those studied and the meanings they attach to their words and actions. In this study care was taken to develop open questions, to give participants time and opportunity to reveal their views, and to develop data collection methods that did not rely on linguistic ability. It was appreciated that the questions, topics and language used may not be shared uniformly by respondents and that the replies returned might not have the same meanings for the respondents and researchers. There was also the possibility that participants might give untruthful or exaggerated information, perhaps in an attempt to 'help' the researcher (Cohen et al., 2000). In the Chinese context, issues of 'face' and related behaviours may result in communication strategies such as indirectness being used to avoid having to express negative or non-consensual views (Cardon and Scott, 2003).

Throughout the study there was recognition of the dangers of bicultural comparisons (Pratt, Kelly, and Wong, 1999). There is no attempt to claim that a particular group of Chinese (e.g. Hong Kong) is used to represent all Chinese or a particular group of non-Chinese (e.g. English) is used to represent all westerners. Care has been taken not to generalise the findings beyond the contexts within which they were derived – engineering departments in two institutions of Further Education in Hong Kong and England. Also, the findings may not fully represent the full range of views even within these two cases as they do not draw on information from everyone involved in the department, being a snapshot of informants' views.

The main threat to valid description (Maxwell, 1996) is inaccuracy or incompleteness of data. In this study interviews were recorded and transcribed verbatim in order to provide 'rich data'. Participants in both contexts appeared candid and member checks that were undertaken (although not all interviewees responded) confirmed they were happy with the views expressed at the time. Lincoln and Guba (1985) recommend member checks as the main way of avoiding misinterpretation of interview data.

Throughout the life of the project a high level of awareness of the possibility of respondent bias and researcher bias was maintained; even so it is impossible to guard completely against this. Knowing that the focus of the research is key skills may have encouraged participants to express a more positive view of the benefits of skills and attributes development in students than they really felt. It may also have encouraged departmental loyalty and a wish to defend policies and practices to an outsider. However a diverse range of views were expressed, not all supportive of the status quo, and this is reflected in the data analysis.

Information about institutional policies and procedures were triangulated with documentation and cross-referenced with data provided by a range of participants. These validity strategies were used to check the accuracy the data and to increase the credibility of the conclusions (Miles and Huberman, 1994). Some potentially beneficial strategies were not used; it was not possible to undertake the recommended prolonged and repeated observations to reduce researcher effect, not was it possible to investigate more lecturers and students. However it was felt that the best use was made of limited time and resources and that the research undertaken is credible and stands up to scrutiny.

A complex process is clearly involved in getting from data to a written report when undertaking qualitative research. Its complexity lies partly in the way in which themes are determined and fragments of data are selected and redeployed, and also in the way the final text is constructed (Holliday, 2001). The development of a conceptual model for this study provided structure for data collection, data analysis and presentation. In this study both qualitative and quantitative data were combined to provide a rich picture of the views and values of key skills and personal attributes in the engineering technicians' curriculum as well as the institutional and national contexts in which they operate.

3.7 Conclusions

This chapter has justified why the study was undertaken within the interpretivist paradigm using a phenomenological approach. A descriptive case study approach was the major research strategy used. Case study is particularly suited to investigations of contemporary phenomena within their real-life contexts (Yin, 2003) and an exploration of key skills curricula was clearly appropriate for this purpose.

The research was carried out ethically and with concern for a range of cross-cultural issues. The major issue in cross-cultural research was shown to be 'equivalence' in variable identification, operational definitions, instrument design, sample selection, sample treatment and analysis (McDonald, 2000) and this was addressed when designing the research project. Having explored a range of methodological and practical issues relating to the project and done extensive preliminary work, fieldwork was undertaken in the autumn of 2005 and the spring of 2006. Key informants were chosen using chain referral through the heads of department in each of the two case study colleges. A project diary was also kept. The fieldwork generated a large amount of documentary evidence and secondary data as well as semi-structured interview transcripts and card-sorting data which was carefully recorded and systematically analysed based on the principles of Interpretive Phenomenological Analysis (IPA). Case study data were brought together and presented using portrayal reporting and thick description linked to the conceptual model and literature.

The chapters that follow present the research findings. Chapter 4 explores the context within which the existing key skills curriculum operates. It gives an overview of 'Asian College' Hong Kong and 'Northern College' England and identifies the influential stakeholders in each case. The way the key skills curriculum operates in each college at institutional and departmental levels is then described. Finally interview data are used to uncover a range of issues that arise from the way the key skills curriculum operates in these different contexts.

Chapters 5 and 6 then examine in detail the views about specific skills and personal attributes revealed by interviewees and student groups within each case study department.

Note:

[1] The Institution enrolled its first cohort of students in September 1999. With its emphasis on "internationally acceptable" vocational education, its situation as a British colony at that time, and major recruitment of international (mainly Western) staff to establish departments and programmes, courses were based on British models.

4. Key Skills in the Engineering Curriculum

This chapter uses interview data, college documentation and course documentation to introduce the two case study departments and explore the contexts within which the key skills curricula operate. It starts with brief overviews of engineering at 'Asian College' and 'Northern College' followed by explanations of the institutional approaches to key skills and roles of key skills specialists. The analysis then moves to departmental level. The key skills delivery modes are described and the implications of these choices considered. The final section examines the engineering curriculum stakeholders, identifying which are particularly significant in each case, exploring some issues that interviewees raised and recognising future developments that may impact on key skills curricula.

4.1 Engineering at 'Asian College' Hong Kong

'Asian College' is one of nine campuses run by a local educational institution on behalf of the biggest VET organisation in Hong Kong. In 2006 54,000 students were enrolled on a wide range of sub-degree level courses with the institution. In the early 1990s courses were based on those offered in the UK but since that time both the institution and its disciplinary curricula have undergone major restructuring (Lumby, 2000). After Hong Kong's return to Chinese rule in 1997, and in line with other organisations, there was a 'localisation' policy resulting in much reduced numbers of ex-patriot teaching and managerial staff. However English remains the medium of instruction.

The institution currently offers full time and part time courses to young people aged 14 and over, as well as to people in employment seeking to update or upgrade their skills and knowledge. The stated vision of the institution is to be a leading provider of vocational education and training in the region. Its mission is to provide cost-effective alternative routes and flexible pathways for school leavers and adult learners to acquire skills and knowledge for lifelong learning and enhanced employability. It operates according to five core values: to serve with integrity, to be client-focused, to strive for excellence, to be entrepreneurial and to forge partnerships with stakeholders. Unsurprisingly for such a large organisation, the management structure is very complex (Appendix J). The campuses are run by principals who report to the Deputy Executive Director (Operations). There are two other Deputy Executive Directors in charge of Quality and Administration, and Development; all three report to the Executive Director, the Council Committees and ultimately the main VET organisation itself.

Courses are offered in nine disciplinary areas, of which two relate to engineering; 'Electrical and Electronic Engineering' and 'Mechanical, Manufacturing and Industrial Engineering'. The campuses are spread throughout Hong Kong, Kowloon and the New Territories and are grouped into a nexus structure (three head campuses each with two satellite campuses). 'Asian College' is a head campus occupying a six-hectare site on an island to the east of Hong Kong and most of the engineering disciplines are housed within its nexus. The head of the engineering department consequently takes the lead in co-ordinating and consolidating engineering courses and curricula across the institution. The college offers courses (Diploma, Higher Diploma, Higher Certificate and Associate Degrees) in full-time, part-time day release and part-time evening modes. 'Asian College' has partnerships with a number of colleges on the Chinese mainland, and many of its graduating students find career opportunities there.

A range of engineering courses is offered at Higher Certificate and Higher Diploma level in 'Asian College'. In 2005/6 there were 1,160 full-time and 585 part-time students enrolled on engineering courses (Table 4.1). These courses aim to produce engineering professionals who have a broad based understanding of engineering science and who can develop trade skills to meet the needs of employers (Woo, Tang and Poposka, 2000).

The acting head at 'Asian College' has worked for the department for 12 years and manages 40 teaching staff (workshop instructors through to principal lecturers). He has been involved in the development of many new engineering courses that mirror Hong Kong's shift away from general mechanical engineering and manufacturing and into service-based industries requiring lighter engineering and more inter-personal skills. Job prospects for students are good with 95% of students being employed within three months of graduating, many in mainland China.

Engineering Courses
FT HD in Electrical Engineering
FT HD in Energy Management Services (phasing out course)
FT HD in Environmental Engineering and Energy Management (new course introduced in 05/06
FT HD in Intelligent Buildings and Automation Engineering (2 year course)
FT HD in Mechanical Engineering
FT HD in Aircraft Maintenance Engineering
FT HD in Electrical and Mechanical Services
FT HD in Creative Toy and Intelligent Product Technology (phasing out course)
FT HD in Creative Toy and Intelligent Product Design (new course)
PT HD in Electrical Engineering
PT HD in Mechanical Engineering
PT HC in Mechanical Engineering
FT: Full-time PT: Part-time HD: Higher Diploma HC: Higher Certificate

Table 4.1: Engineering courses at 'Asian College' 2005/06

The department's major focus is on Higher Diploma level courses, the content of which are closely linked to industry requirements. The head stresses that the college's strategic objectives revolve around partnering with industry and producing good quality graduates to go into industry. However he recognises that many students come into vocational education because they have failed to do well enough in mainstream study to go directly to University (still a strongly-held aspiration of many Hong Kong Chinese students and their parents). The role of the institution as providing an 'alternative path' is strongly emphasised, and although preparing students to continue studying at higher levels is not an overt aim, course leaders report that around a quarter of students on Higher Diploma engineering courses go on to University rather than into industry. To ease this transition there are several articulation agreements with local and overseas Universities and this is seen as a legitimate part of encouraging lifelong learning.

According to the department head, over the previous 3-5 years the department has developed new courses that meet the requirements of the Hong Kong Governments' subvention scheme (i.e. they are fully-funded), increased their scholarship and donation funds through their strong industry network, and run corporate training courses in Hong Kong and on the Chinese mainland.

At the time of the research visit in March 2006 Engineering Department staff, alongside their core teaching activity, were working on two major projects. The first was a review of their entire course provision ahead of education reforms (known as 3-3-4[1]) which would remove their current entry-level student body, keeping them in school for a further year and requiring 'Asian College' to develop 'multi-entry, multi-exit' programmes of study. The second was an Institution-wide drive be able to self validate courses, rather than being validated by the Hong Kong Council for Academic Accreditation (HKCAA).

4.2 Engineering at 'Northern College' England

'Northern College' is one of the largest FE colleges in the UK with 33,000 students enrolled in 2006. The main college site is housed in a series of 1960s blocks in the city centre; it has two additional sites and runs a wide range of provision in around 60 community venues. The college is the major provider of post-compulsory education for the inhabitants of the city and the surrounding smaller townships, villages and rural areas. The most recent Ofsted Report identifies that the college operates in one of the most deprived local authorities in England. This can be attributed to the slow demise of traditional industries, resulting in considerable social and economic decline. On a more positive note, it has received significant inward investment and the college is a partner in an ambitious regional regeneration project which includes a new (and state-of-the-art) waterfront campus opening in time for the 2006/7 academic year. The college mission statement is 'Meeting learner needs and aspirations through excellence.' Key Skills are managed by the head of the Skills for Life department who reports to the assistant principal, academic. The college structure is given in Appendix K.

The college offers a vast range of courses in full-time, part-time day release and part-time evening modes. These span the spectrum of academic and vocational courses, from GCSEs, A-Levels, apprenticeships and introductory courses for school leavers through to postgraduate and professional courses for adults. There is also a range of adult and community courses and courses for those with learning difficulties and disabilities.

In the Department of Technology at 'Northern College' a wide range of engineering courses is offered (levels 1-5) including Modern Apprenticeships, Diplomas and Higher Diplomas and degrees, as well as custom made programmes for local and regional Engineering companies. FE learners are funded by the Learning and Skills Council (LSC). The department is part of a Centre of Vocational Excellence (CoVE) in Manufacturing Materials and Engineering. In 2005/6 there were 278 full-time and 1056 part-time students enrolled on engineering courses (Table 4.2). The head of department has worked in Further Education in various colleges for over twenty years and about 4½ years as head of Technology at 'Northern College'. His background is in engineering and he manages 80 teaching staff structured into three groups: engineering, construction and motor vehicle.

Over the previous 3-5 years the department has developed new courses (more apprenticeships and bridging programmes for school leavers through to foundation degrees), grown its student numbers, followed various LSC initiatives (including developing Individual Learning Plans for students), brought in a centralised departmental student records system, diversified and grown its income by running short courses and bespoke courses for industry, become a CoVE, acted as the Managing Agent for a regional Engineering Scholarship Project and involved three members of staff in the Engineering Foundation Scheme (for professional updating).

Although the department offers a route into Higher Education with sub-degree and degree programmes this is a difficult market for them as nearby good universities tend to attract the best qualified students. The head sees the HE market as very competitive and his main focus continuing to be part-time FE provision linked to local companies.

Engineering Courses
FT/PT BSc (Hons) Integrated Technology (1 year top-up in FT mode)
FT HND Electronic Engineering and Computing Technology 2-year
PT HNC Electrical/Electronic Engineering (conversion from HNC)
PT HNC Electrical/Electronic Engineering
FT HND in Aerospace Engineering 2 years
PT HND in Aerospace Engineering 1-year
PT HNC in Aerospace Engineering 2-years
FT HND Mechanical Engineering 2-years
PT HND Mechanical Engineering 1-year
PT HNC Mechanical Engineering 2-year
FT BTEC National Diploma in Engineering, Electrical, Mechanical or Aerospace Engineering 2-year
FT BTEC Level 2 First Diploma 1-year
FT BTEC Level 1 Introductory Diploma 1-year
Advanced Apprenticeship in Engineering (Level 3)
Apprenticeship in Engineering (Level 2)
FT: Full-time PT: Part-time HND: Higher National Diploma HNC: Higher National Certificate [BTEC registered]

Table 4.2: Engineering courses at 'Northern College' 2005/06

At the time of the research visit in February 2006 Engineering Department staff, alongside their core teaching activity, were busy preparing for the move to a new campus.

4.3 The key skills curriculum

The key skills curriculum is examined in terms of institutional policies and frameworks, the role of specialists, the departmental approach and the key skills delivery mode.

Institutional key skills policies and frameworks

As previously discussed (in Sections 2.3 and 2.6) in Hong Kong there is no formal policy on key skills (generic skills or employability skills) in relation to FE and no funding allocation from government for that purpose. Hong Kong's government does not mandate a key skills framework and the Education Commission does not provide an examination structure to assess key skills. 'Asian College' is therefore able to choose whether to undertake any formal key skills training with students and how it should be assessed and accredited. In contrast at 'Northern College' there is long-standing recognition by the institution of key skills as an assessed curriculum element in line with Government policy (Sections 2.3 and 2.5). Key skills qualification standards and assessment is overseen by the QCA which is a non-departmental public body, which at the time of the research was sponsored by the DfES.

There is evidence that the 'Asian College' takes key skills development seriously despite a lack of compulsion from external sources to do so. A key skills delivery document refers to a strategic plan, in which the institution aims:

> To produce well-rounded graduates with disciplinary knowledge and well-developed key skills for learning, employment and life, who value – and can take up – further learning opportunities. (Key Skills Delivery, undated)

A framework derived from the Canadian taxonomy Employability Skills 2000+ is currently in use at 'Asian College'. The 'Key Skills for the 21st Century' framework contains eleven skills organised into three domains (see Table 4.3). The full bilingual framework is provided in Appendix L.

Fundamental Skills	Personal Management Skills	Teamwork Skills
▪ Communication ▪ Managing Information, ▪ Using Numbers ▪ Thinking and Solving Problems	▪ Demonstrating Positive Attitudes and Behaviours ▪ Being Responsible ▪ Being Adaptable ▪ Learning Continuously ▪ Working Safely	▪ Working with Others ▪ Participating in Projects and Tasks

Table 4.3: Key skills for the 21st Century at 'Asian College'

This framework has been heavily promoted by the Teaching and Learning Centre (TLC), both internally and externally to local employers. After a period of several years when key skills workshops were offered by the TLC and key skills gradually started to appear in some courses, key skills were debated during 2004 by the Task Force on Academic Management and Curriculum Development. This group recommended that key skills should be formally introduced into the curriculum with a universal stand-alone key skills module. The integration of key skills into departmental curricula at both course and module level was mandated:

> Academic Departments are requested to note that a standalone Key Skills module is but one component of a comprehensive implementation of Key Skills across (the institution). Also required is a 'mapping onto the curriculum' at both the Course and Module level (Institution's Management Committee 3/05).

The curriculum mapping process (Figure 4.1) recommended for use during program auditing suggests the operation of a systematic and cyclical process.

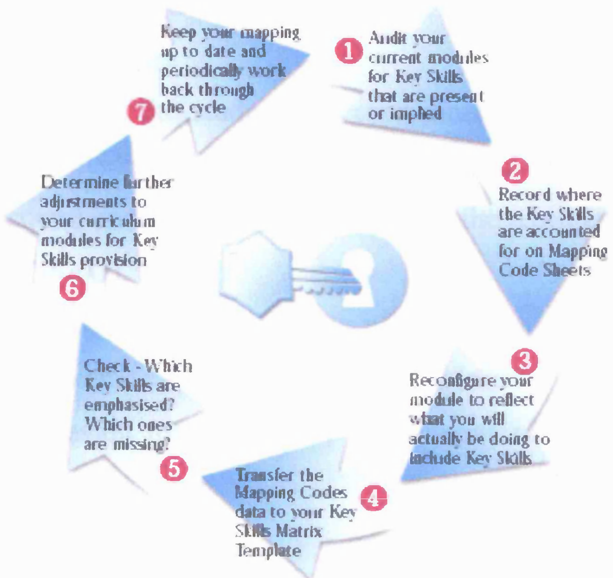


Figure 4.1: Mapping key skills in the curriculum (Key skills delivery leaflet, 'Asian College', undated)

In 2005 the college introduced a policy that all full-time first year students should take a 15-hour key skills module. This module sits outside departmental curricula and is run by the Student Affairs Office (SAO). The key skills module aims to give students an introduction to key skills, an awareness of their importance, information about how to take an inventory of their key skills competencies and alerts them to the importance of gathering artefacts into a Key Skills Career Portfolio that they can take and present to potential employers. The module contains six hours of classroom contact, six hours of practise and three hours of consolidation of learning and a presentation. At the end of the module students are assessed on their Key Skills Career Portfolio and also have to achieve a minimum 80% participation/attendance rate to pass. A pass award is mandatory for graduation. Appendix M gives the module outline provided to students. In addition departments may build more key skills development into their curricula, either as separate modules or as integrated elements, and although this is recommended it is not mandated.

The student affairs officer runs all the key skills modules on the campus, quite a logistical feat, comprising 58 classes of about 30 students on a rotating system (one week class, two weeks gap). As he comments:

> The aim is to help the students become more self-directed and life-long learners by providing them with a framework, a general approach, to identify, acquire and apply key skills to meet the requirement of their place of work (AC-SAO).

Thus the approach taken is for each student to identify a range of skills and personal attributes relevant to themselves, their course of study and their future career aspirations.

In contrast to this recent development at 'Asian College', at 'Northern College' key skills has been a feature of course provision for many years, certainly since the mid-1980s (when key skills were known as 'core skills' before evolving into 'common skills' and then 'key skills'). Kelly (2001b) charts the evolution of key skills and their take-up in vocational courses, highlighting the influential Dearing

Report (1996) that strongly advocated key skills being included in further education curricula. 'Northern College' has a dedicated Key Skills unit to help in planning, delivery and support of key skills overseen by the Director of Basic and Key Skills. Headed by the Key Skills Co-ordinator, there are three subject leaders (for each of the three key skills) in the unit and two other teaching staff. Their focus is on the key skills qualifications rather than a wider remit of skills development.

According to the interviewed Key Skills Co-ordinator economic and social difficulties in the region result in an above-average percentage of students coming into the college having achieved very little at school. These students often go onto Foundation Studies programmes and have a particularly high need for skills development. Improving the skills of students entering college at the lower levels appears to be a priority for the Key Skills Team as this is seen as a way to improve student retention and progression. However other students also benefit from enhancing their key skills. Despite this policy, not all Level 3 programmes stress the need to take one key skill at Level 3. This is attributed to the bureaucratic difficulties caused by the national generic assessment mechanism, and the low level of funding for the wider key skills.

The latest Ofsted Report indicates that key skills provision across 'Northern College' is well co-ordinated. Key policies and procedures are seen to provide a clear focus for managers and their staff. The report suggests that teachers' integration of key skills with their students' main vocational programmes is growing. This endorsement indicates that the college takes key skills seriously and provides a supportive framework for skills development. 'Northern College' has a well developed key skills policy which outlines delivery and assessment requirements. In a document produced by the Academic Policy Unit, 'Northern College' expresses a firm commitment to developing students' key skills:

> 3.1 Key Skills are now an essential part of our qualification framework. 'Northern College' is fully committed to the Government agenda of raising the standard of Key Skills and the wider Key Skills that are seen as integral

and fundamental to learning (Key Skills Policy document, 'Northern College', 2006).

In 'Northern College' there is a quality monitoring process that includes a cross-college Key Skills Network Group (to develop and share best practice), a system of school lesson observations, a system to track delivery and learner development, standardised key skills documentation and recording systems, internal verification and moderation of standards, management information systems to produce statistical analyses of key skills retention and achievement, and quality review processes.

The Key Skills Support Unit within the college staff 'The Learning Zone', providing support, teaching and resources. These specialists also work alongside lecturers in the classroom supporting learners on an individual or small-group basis. They administer key skills tests to students on entry to the college and provide feedback to the departments about individual students' existing skills and skill deficits. They also run the Key Skills Network which brings together staff who are teaching key skills and/or mentoring other lecturers in their academic discipline. The network aims to share good practice and keep staff abreast of curriculum and assessment changes.

Within 'Northern College' all 16-19 year old learners on full-time courses work towards a national key skills qualification[2] in Application of Number, Communication and Information Communication Technology (ICT) usually at a level below their main qualification (i.e. if they are taking a level 3 qualification they will take Key Skills at level 2). In addition Modern Apprentices work towards wider key skills (Improving own Learning and Performance, Problem Solving, Working with Others) as guided by the national framework (see Table 4.4). The college uses Edexcel, the UKs largest qualification awarding body, for its vocational and general qualifications, including key skills. More detailed information on the key skills standards are in Appendix N and online at http://www.edexcel.org.uk/quals/keyskills/.

Key Skills
Levels 1-4 ▪ Application of Number ▪ Communication ▪ Information and Communication Technology (ICT) ▪ Improving own Learning and Performance* ▪ Problem Solving* ▪ Working with Others* ▪ *These are commonly called 'wider key skills'

Table 4.4: Key skills (QCA, 2004)

The key skills Application of Number, Communication and ICT are assessed through a combination of an externally set and marked test (or achievement of a recognised proxy qualification) and internally assessed, externally moderated evidence portfolio. To be awarded a key skill qualification, a candidate must pass both assessment components. There are no tests for the wider key skills (Improving own Learning and Performance, Problem Solving and Working with Others) and these are assessed solely through a portfolio of evidence.

It is difficult to assess the success of key skills provision. 'Northern College' key skills statistics are confidential. However some information is in the 2005 Ofsted report. In terms of 'Achievement and Standards' 16-18 year olds, key skills retention rates and pass rates were close to the national average in each of the three key skills. 1 in 5 key skills enrolments resulted in a key skills qualification, a proportion which, although low, is better than the 1 in 7 of the previous year and the national average of about 1 in 6 ('Northern College' Ofsted Report, 2005). These consolidated figures cannot shed light on students' performance by academic department. It does show that in the college as a whole relatively few students taking key skills qualifications actually passed, and that, rather shockingly, this situation is 'the norm' across England.

In contrast to the well established key skills support unit at 'Northern College' there is no dedicated key skills support unit at 'Asian College'. As indicated above, specialist key skills teaching at a foundation level in 'Asian College' is done by staff working for the SAO independently of the teaching departments. The SAO encompasses a broad range of activities and responsibilities both practical and pastoral. Although the mandatory key skills module is a recent requirement, SAO staff have previously been involved running less formalised skill development workshops alongside their other roles (careers and counselling services, general education, sports and leisure and health services).

Another department containing people who might legitimately be considered key skills specialists is the TLC. This department works institution-wide providing a range of services and advice to teaching staff and senior management. Staff provide some key skills training, active membership of the Key Skills Working Group and produce written and online key skills resources for use by students, lecturers and student affairs officers. As the head of TLC says:

> We try to help with curriculum development by introducing some modern concepts about curriculum or ingredients. One example is key skills. ... About 6 years ago we anticipated that there would be a big change in the education system and also recognised from employers that key skills or soft skills would be very useful (AC-HOD-TLC).

There are no statistics on key skills outcomes at 'Asian College'. However the 15-hour Key Skills module is mandatory for 'Asian College' students and they cannot graduate without it.

In both colleges one important role for specialists is the provision of key skills resources, either for their own use or for teachers to use with students. At 'Asian College' key skills resources appear to fall into two main categories: teaching packages produced communally by SAO staff for use on all ten campuses (for the 15-hour Key Skills module) and resources produced by the TLC for teachers (much of which is available on the intranet, see Table 4.5 for details)

Key Skills Resources	
Forum on Key Skills (17th November 2001)	Online and CD-ROM
Key Skills for the 21st Century (Bilingual Framework)	Print and pdf
Key Skills Delivery (Booklet)	Print and pdf
Key Skills Resources	Online
Skills for Success: A Resource for Teachers for Developing their Students' Key Skills (14 leaflets, each focused on a different skill, drawing on international and local good practice)	Print and pdf
Symposium on e-learning and key skills	CD-ROM
Using a Key Skills Portfolio (English and Chinese versions)	Print and pdf

Table 4.5: Key skills resources available on the intranet of 'Asian College'

At 'Northern College' they do not produce many tailored resources, preferring to 'buy-in' materials. They use a diagnostic test and a range of developmental packages with students under license from another college. In addition they recommend other, widely available materials, such as those developed by organisations such as BTEC and the BBC. The diagnostic testing of students on entry to the college and the development of individual learning plans does not occur in 'Asian College' where there is a presumption that no students will have encountered key skills before.

Departmental approaches to key skills

As might be expected given the institutional approaches described above, key skills curricula in the two engineering departments are quite different. At 'Northern College' the major focus is on delivering key skills qualifications whilst at 'Asian College' there is a broader emphasis on exposing students to the generic key skills framework and helping them contextualise it for their own learning and career requirements. In both departments the engineering curriculum is busy with a great deal of technical knowledge and understanding to be covered and little space in the curriculum for the development of student skills and attributes. However, as is shown below, staff in both departments see benefits to students of developing a broad range of skills and personal attributes that are relevant to their chosen career as engineering technicians.

In both colleges, at departmental level, some engineering staff deliver key skills modules/units in addition to teaching their engineering specialisms. At 'Asian College' these lecturers have informal mentoring support from a more senior colleague (who was involved developing and delivering the modules in the previous year). At 'Northern College' there is a Departmental Co-ordinator for key skills who does much of the key skills qualifications teaching as well as mentoring colleagues.

The development of student skills and attributes clearly infuses the curriculum in both departments. The curriculum followed in 'Northern College' by Higher National Diploma and National Diploma students is that provided by Edexcel; further details are available on http://www.edexcel.org.uk/quals/hn/engineering/hnd/comm/. In addition to preparing students for careers in a particular engineering specialism, these qualifications explicitly aim to:

> develop a range of skills and techniques, personal qualities and attributes essential for successful performance in working life and thereby enable learners to make an immediate contribution to employment at the appropriate professional level. (Qualification Requirement for the BTEC Higher Nationals in Mechanical Engineering, undated, p.1).

Although this is taken from the Higher Diploma Specification for Mechanical Engineering, other engineering specialisms include exactly the same aim. The qualification specification includes a list of skills and abilities that learners are expected to develop. Communication, creative thinking, critical thinking, information literacy, learning skills, planning and organising skills, problem solving, self management and technical skills all emerge from this list. Numeracy skills and technology skills are implicit. Being adaptable, being motivated, professional presentation and reliability are attributes that are clearly signposted.

At the lower level, BTEC Nationals in Engineering (diplomas and certificates) explicitly take into account the UK-SPEC specific learning outcomes for Engineering Technicians as well as the knowledge and evidence requirements of the updated SEMTA National Occupational Standards and relevant NVQs at Level

3 and emerging Sector Skills Agreements and identified skills requirements (BN18458 – Specification – Edexcel Level 3 BTEC National Certificate and Diploma in Manufacturing Engineering – Issue 1 – May 2007). The range of skills and personal attributes identified in Section 2.7 are therefore directly relevant to this level of qualification. It is clear that *all* teaching staff involved with National and Higher National courses should have some input into developing students' skills and personal attributes relevant to their career choice.

It is noted that the detailed unit guidance provided by Edexcel for the units that make up the various qualifications, include a section headed 'key skills'. This section identifies any opportunities in the unit for learners to generate evidence to meet the requirements of key skills units. However it does not appear that staff who were interviewed at 'Northern College' use this section of the guidance directly.

As described above, after centrally administered diagnostic testing has taken place, engineering students take key skills qualifications at a level below that of the course on which they are enrolled. Although most students take three key skills, there is a group which also takes two of the wider key skills. The department are pioneering a scholarship programme for Higher Diploma students with the aim of encouraging more young people into engineering and providing them with a fast-track National Diploma qualification that contains 'additionality' (residentials, work placements and other work-based experiences, five key skills qualifications and a bursary while they study). However students can graduate without passing key skills qualifications (with the exception of students who are on apprenticeship programmes), although the college has retainment and achievement targets in relation to key skills, and its funding is affected if it does not meet these targets.

The engineering courses at 'Asian College' are designed to produce graduates who are capable of satisfying the various sectors of the engineering industry in Hong Kong. Along with academic aims (high academic standards and well-integrated engineering curricula, building and cultivating students' ability to pursue further study) there are departmental aims that relate to students' skills and attributes. These are:

- To develop in students an ability to think clearly, assess critically, reason imaginatively and communicate effectively when working independently or as a member of team.
- To nurture students to become competent professionals in their field of works.
- To engender in students the skills and attitudes which lead to an informed and professional approach to the analysis, synthesis, implementation and evaluation of engineering systems and equipment, and an understanding of operational management.

(Course Aims for Higher Diploma Courses, 'Asian College', undated).

Critical thinking, creative thinking, communication, learning skills and teamwork skills and the attribute of professional presentation are explicitly identified in the context of a broad range of skills and attitudes that make up an "informed and professional approach". As with 'Northern College' even staff who do not teach key skills modules should consequently be actively concerned with developing skills and personal attributes that they feel appropriate for students' chosen careers.

As described above, engineering students at 'Asian College' are initially exposed to key skills through the mandatory 15-hour Key Skills Module run by the SAO. Five of its full-time Higher Diploma Courses also currently contain two 15-hour key skills modules in the curriculum. Unlike the module run by the SAO (with its focus on career planning and development), the departmental modules focus on skills that enable students to improve the quality of their learning, work and performance at college.

Module I (Key Skills for Life Long Progress I) deals with getting to know each other and adapting to life on campus, the basic techniques of WebCT, communications, team work, planning and time management in relation to study and work. Module II (Key Skills for Life Long Progress II) covers techniques of problem solving and thinking, communications and team work, the skill sets for the trade and employers' expectations, the importance of developing a professional portfolio and meetings management. So the first module mainly relates to study skills, whilst the second module is more advanced. There is a greater element of preparation for employment in the second module with the consideration of the skill sets required by particular trades/jobs as indicated by industrialists and employers who talk to students (guest speakers) and the development of a professional portfolio. This allows students to contextualise the key skills and personal attributes to the particular engineering sector they are hoping to work in. Both modules are taught interactively in 2-hour blocks and have 100% continuous assessment based around a personal journal. These modules have run since a major course revalidation exercise in 2005/6 and further details (module outlines given to students) are in Appendices O and P.

The Key Skills for Lifelong Progress I and II are compulsory elements of some of the Engineering Courses and students are required to pass these as they would any other module in order to progress and eventually graduate. The General Academic Regulations state that the minimum pass mark for a module is 50%, with 50% as the minimum requirement in each different form of assessment as detailed in the Validated Course Scheme. Given the above, it is likely that all full-time engineering students leaving from 2006 onwards will have the 15-hour Key Skills module marked on their transcript and many will also have achieved Key Skills for Lifelong Progress I and II.

Key skills delivery modes

Three types of delivery mode (stand alone, mixed and integrated) are widely promoted to FE colleges (McNeil, 2006) although in reality the term 'mixed' covers several approaches, including supported, supplemented, specific integration, and General Studies (Kelly, 2001).

In 'Asian College', the compulsory 15-hour Key Skills module run by the SAO is clearly supplementary to course delivery. However, in respect of key skills modules over and above those provided by the SAO, departments are given flexibility about the extent to which key skills are integrated into curriculum. The guidance given is broad with departments being advised to choose from the following options:

Model 1: Supplementary to Course Delivery
Model 2: Taught in a Standalone Module
Model 3: Integrated into Individual Modules
Model 4: Across the Curriculum for All Students
Model 5: Hybrid – Combination of 2+5, 1+3, 2+3, etc.
(Key Skills Delivery leaflet, 'Asian College', Undated).

The rationale for this is that at departmental level "key skills delivery demands a thoughtful, co-ordinated approach" (Key Skills Delivery leaflet p.3). By providing a summary of various key skills delivery models and their main features, departments are urged to consider various factors including their students and other stakeholders, how much flexibility they have in relation to curriculum design and delivery modes as well as their available resources.

Some engineering courses have two additional modules of key skills whilst others have none, dependent on the course leaders' and course teams' views of curriculum priorities. Courses that offer key skills modules in the engineering department have opted for Model 2: Taught in a Standalone Module.

Figure 4.2 provides an overview of the mode of delivery of key skills for the Engineering Department of 'Asian College'.

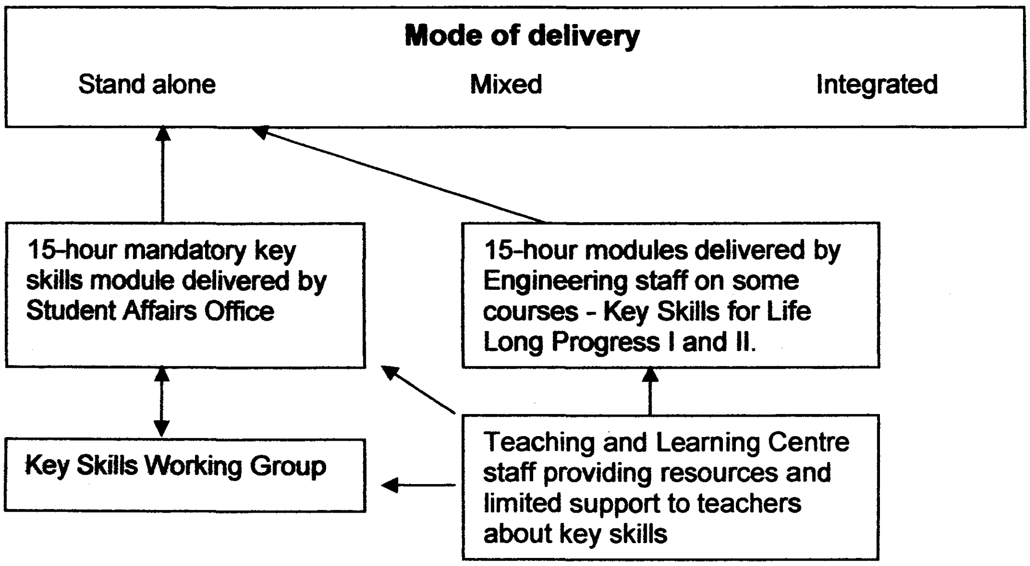


Figure 4.2: Delivery of key skills in the Engineering Department of 'Asian College'

Clearly the college policy of having a mandatory 15-hour key skills module for all students run by the SAO removes some of the pressure on the engineering curriculum to include skills development explicitly. And, as key skills are not a mandatory element of course design: they are in a less secure position in the curriculum than other, more technical, subjects. However there does appear to be a genuine employer-led demand for improved skills and attributes that the head wishes to address within the engineering curriculum. He has sufficient flexibility in curriculum design to do so.

Stand alone delivery has the advantages of being easy to timetable, straightforward to track students' progress, is manageable in terms of staff allocation and allows an identified group of staff to become key skills 'experts' in both delivery and assessment. A teacher (who taught the Key Skills for Lifelong Progress modules) at 'Asian College' makes a case for skills being taught separately as follows:

> Integration or separation? It is a dilemma, but to me there may be some overlap but other teachers don't have time to teach these skills, they are core modules, core subjects. So it is probably better to have them separated and teach them some techniques and the subject teachers know students have some skills available to them (AC-4).

For this lecturer, developing students' skills in class (such as project planning, information search/analysis, presentation skills and team working) in stand-alone mode is a productive use of students' time because other teachers can concentrate on their technical subjects and assume students have received a grounding in some essential skills.

Discrete delivery also has potential disadvantages. Because the SAO module is short, and only at the start of year 1, students may not have much incentive to update their Career Portfolios or to think much about key skills again. In their main course of study key skills could be marginalised and the principle of transferability of key skills could be undermined. It could also fail to exploit naturally-occurring opportunities in other areas of students' main courses of study. In addition, the responsibility for student assessment may be considerable for the staff involved. Although staff have received some initial training they may not feel that they have to 'champion' skills development if the subject comes under pressure during course revalidation.

A course leader at 'Asian College' is of the opinion that teaching key skills as a single module is a waste of time and that skill development should be integrated into other modules. He thinks that it should start in school because developing competence takes time. His view is that as the existing curriculum is already packed, skills and attributes should be developed through a range of external activities and situations, for example:

> ... through peer mentorship and through the student placement, summer job, final year project, right now we are working very hard to deploy students to the industry ... they learn more from a real life experience (AC-8).

At 'Northern College' engineering has also opted for stand alone key skills delivery despite integrated delivery being favoured by the Academic Policy Unit. According to policy documents 'Northern College's' key skills delivery is characterised by:

a. effective whole course planning for key skills delivery and achievement in the context of the mainstream programme
b. an appropriate plan in each School to increase the ratio of integrated to discrete key skills delivery
c. qualified, trained and supported staff in each School contributing to both integrated and, where necessary, discrete delivery methods
d. high quality resources prepared with regard to level, the context for learning, and the need to meet national assessment standards
e. support for key skills learning where it is assessed as necessary to underpin students' success.

(Key Skills Operational Framework, 7.1 Key Skills Policy Document, 'Northern College', p. 5)

In practice the Key Skills Co-ordinator and several lecturers within the engineering department strongly indicate that all formal key skills teaching (i.e. working towards the key skills qualifications) is done discretely in separately time-tabled sessions. Figure 4.3 provides an overview of the mode of delivery of key skills.

In taking a predominantly stand alone approach the department gains some benefits, as noted in the case of 'Asian College' above: effective teaching, specialist staff , contextualisation; and also students' base level of key skills are monitored, personalised programmes of study (which should increase motivation and interest) are used. Discrete delivery can easily be monitored for funding purposes. The Key Skills Support Unit provides specialist training and updating for staff as well as supporting students in class and in the 'Learning Zone' centre. This maintains a bridge to Governmental agencies which are rolling out policies and funding key skills programmes.

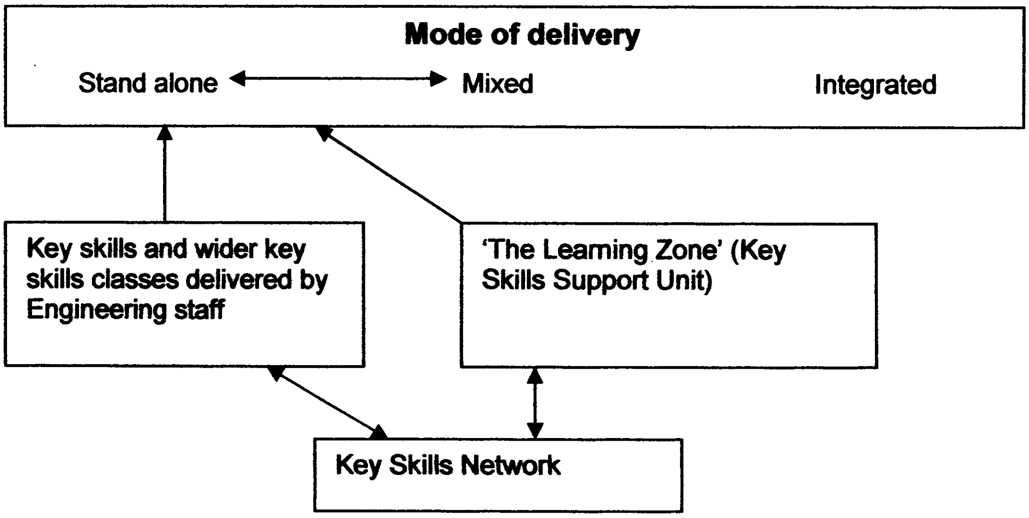


Figure 4.3: Delivery of key skills in engineering at 'Northern College'

The benefit of having dedicated teaching staff is commented on by one interviewee:

> The advantage of having them stand alone is that you tend to have a small team delivering them, a small team that is perhaps more committed to key skills (NC-1).

This person continues by commenting that integration has proved difficult in the past, with some colleagues finding it difficult to teach and assess key skills in their normal classes.

Disadvantages are that attendance in key skills is claimed to be poor; they are seen as an additional burden and outside the core curriculum. In practice integrated delivery is minimal. Many lecturers resist because it takes time away from delivering vocational content in curricula that are already full. There appears to be an element of 'tokenism' caused by the generic nature of the qualifications. The focus on a small number of key skills (those being examined) can also be seen to undervalue a broader spread of skills and attributes to better equip students for learning, for work, and for life. Any incentive to develop these has to come from individual lecturers or curriculum managers with a personal interest in them. Leadership from the head of department if he/she felt strongly that key skills were curriculum priorities would be an important factor in order for these staff to be given sufficient resources and time allocation to do the job effectively. With many engineering courses following BTEC curricula with little flexibility in terms of course design, this is unlikely to happen. For many students the development of broadly based key skills is likely to remain piecemeal within their discipline curricula or occur outside it completely. They may develop skills and attributes valuable to their chosen career path, but not recognise them explicitly or be able to discuss them coherently with employers.

The difficulty of integrating key skills within the engineering curriculum is not insurmountable. One teacher describes how he is able to find ways of making the generic key skills more vocationally relevant and more acceptable to students:

> I think in sort of truest sense, to deliver key skills they're better integrated and I'm happy to sit down with team members and try to organise that because you only have to look at the awarding body general syllabus, they've got all the key skills there, it only takes a few heads to do a bit of brainstorming and find pigeonholes for things to go into. It takes a bit of work, worth the effort put in to get the end result (NC-5).

Furthermore, there are other options outside the main curriculum for key skills development. For example in 'Northern College' the departmental co-ordinator for key skills suggests using one of the wider key skills (Improving own learning) as a way of improving the effectiveness of the Personal Development Planning sessions.

> I've been talking to a course leader this morning about whether or not he would find it beneficial to use one of the wider key skills [in the Personal Development Planning sessions] to bring more of a focus into it, so that they do plan the work that they will be doing, understand the importance of deadlines, the importance of reviewing what they've done and stuff like that (NC-1).

4.4 Curriculum stakeholders

Section 2.2 introduced the concept of curriculum stakeholders and the conceptual framework (Figure 2.4) identified both internal and external stakeholders who might influence the relative importance of elements in the cubic engineering curriculum. It was noted that stakeholder pressure is a significant influence on curriculum design and development (Walkington, 2002; MacPherson and Brooker, 2000) but that power is likely to be unevenly distributed (Finlay, 1998).

To better understand this issue, interviewees were asked which stakeholders they felt strongly influenced curriculum. The aim was to see if employers (with their skills agenda) or accreditation bodies (with formal skills requirements) were likely to push key skills as a priority area or if other stakeholder priorities were likely to be dominant.

From the discussions with the department heads it is clear that both are focussed on strategic issues. Both feel particularly influenced by governmental education bodies that are heavily involved in allocating funding, and both are trying to respond to employer needs. The department head at 'Asian College' discusses a number of stakeholders, including the government in respect of its role in allocating funding (subvention) and reform agenda (introducing a new structure for secondary education, promoting educational initiatives such as associate degrees). However local employers are particularly significant stakeholders:

> We have a Course Advisory Board associated with each course ... we include at least ten employers ... we tell our CAB members that our courses are industry led. We are not afraid of being led ... that's why our courses follow so perfectly with the trends or developments (AC-HoD).

He comments that because Engineering is capital intensive the department rely on their close links with industry and creating partnerships. Some support is financial (donations and scholarships) and other is structural, providing student placements and staff attachment opportunities. These employers can express their views directly about their skills requirements and influence curriculum accordingly.

The head of department at 'Northern College' feels that many stakeholders are putting pressure on the department, particularly employers, the Learning and Skills Council (LSC) who are the funding body for FE and the Higher Education Funding Council for England (HEFCE):

> There's a lot of pressure from a lot of sources, each concerned with their own side ... we try to respond to industries needs, to LSC initiatives, HEFCE iniatives and so on ... it's like juggling a dozen plates on sticks, and every time a plate is about to fall you have to spend more time on that area (NC-HoD).

So in the UK the key skills agenda is influencing curriculum development, although there are other priorities for the head to be concerned about. There is also evidence that the key skills that are prioritised are the three that are funded directly (Application of Number, Communication, Information and Communication Technology ICT), as the Institutional key skills co-ordinator explains:

> There is 'entitlement funding' for 16-19 year olds which says you've got to show that you are delivering key skills, tutorials and enrichment – that's the

three strands. ... The wider key skills are not part of that entitlement funding (NC-KSC).

Course leaders and lecturers, while conscious of their respective government's influences on curriculum, also feel that local employers (particularly in Hong Kong) and accreditation/qualification bodies (particularly in England) are significant (see table 4.6). Other stakeholder groups are not seen as particularly influential on curriculum decisions; local universities are identified by one interviewee at 'Northern College', and parents are identified by one interviewee at 'Asian College'. In both colleges, professional bodies are seen as influencing curricula only indirectly (through their role in accreditation in 'Asian College').

Stakeholder	**'Asian College'**	**'Northern College'**
Government via Funding Bodies	AC-HoD, AC-1, AC-6, AC-7	NC-HoD, NC-2, NC-3
Local Employers	AC-1, AC-2, AC-3, AC-4 AC-5, AC-6, AC-7, AC-8	NC-1, NC-3, NC-4, NC-6
Accreditation/Qualification Bodies	AC2, AC-5, AC-6, AC-8	NC-1, NC-2, NC-3, NC-4, NC-5, NC-6
Professional Bodies*		
College Directorate		
Local or Overseas Universities		NC-6
Secondary Schools		
Students/Parents	AC-2	
Any other stakeholders?		
Note: In HK, a professional body (the HKIE) accredits most engineering courses so distinguishing professional bodies from accreditation/qualification bodies is not helpful. In addition the Hong Kong Council for Academic Accreditation (HKCAA) accredits some courses.		

Table 4.6: Departmental staff views of influential curriculum stakeholders

At 'Asian College' all respondents recognise the primacy of serving the needs of local employers and they are identified as the most important stakeholder group (see Figure 4.4). Local employers' views are heard directly through the Industry Panel that is part of the Course Board. Some course leaders also rate professional

C

bodies highly because they are tied in with accreditation (notably the Hong Kong Institute of Engineers, HKIE), although the Institution is undergoing a major review with the Hong Kong Council of Academic Awards (HKCAA) which should result in being able to self-validate programmes.

The government, as the major source of funding (many courses being 'sub-vented') is also seen as highly influential on what courses are run and how many student places are offered; they are advised by the Engineering Industry Training Board. Other stakeholders are recognised (college directorate, local or overseas universities, secondary schools, students) but not seen as greatly influencing curricula.

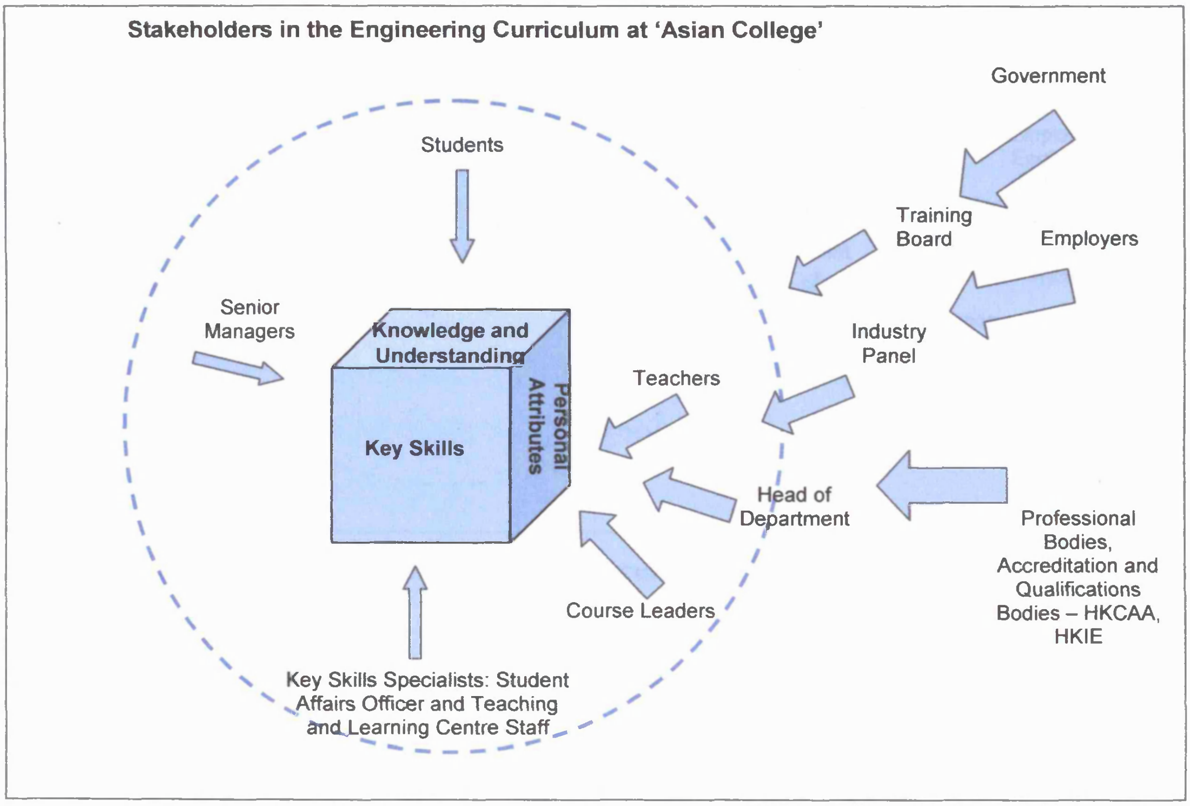


Figure 4.4: Stakeholders in the engineering curriculum at 'Asian College'

In contrast, at 'Northern College' the accreditation and qualification bodies are universally cited as the most influential group in relation to curriculum (see Figure 4.5). They are perceived to have a direct link to employer requirements:

> They supposedly move with the times, what industry requires (NC-5).

Respondents also identify local employers as influential, although for some people the government is more important because of its funding role via the LSC and it is noted that the funding structure is particularly complex in FE (Parry, Thompson and Blackie, 2006). Other stakeholders (college directorate, local or overseas universities, secondary schools, students) are recognised but not seen as influencing curricula to any great extent.

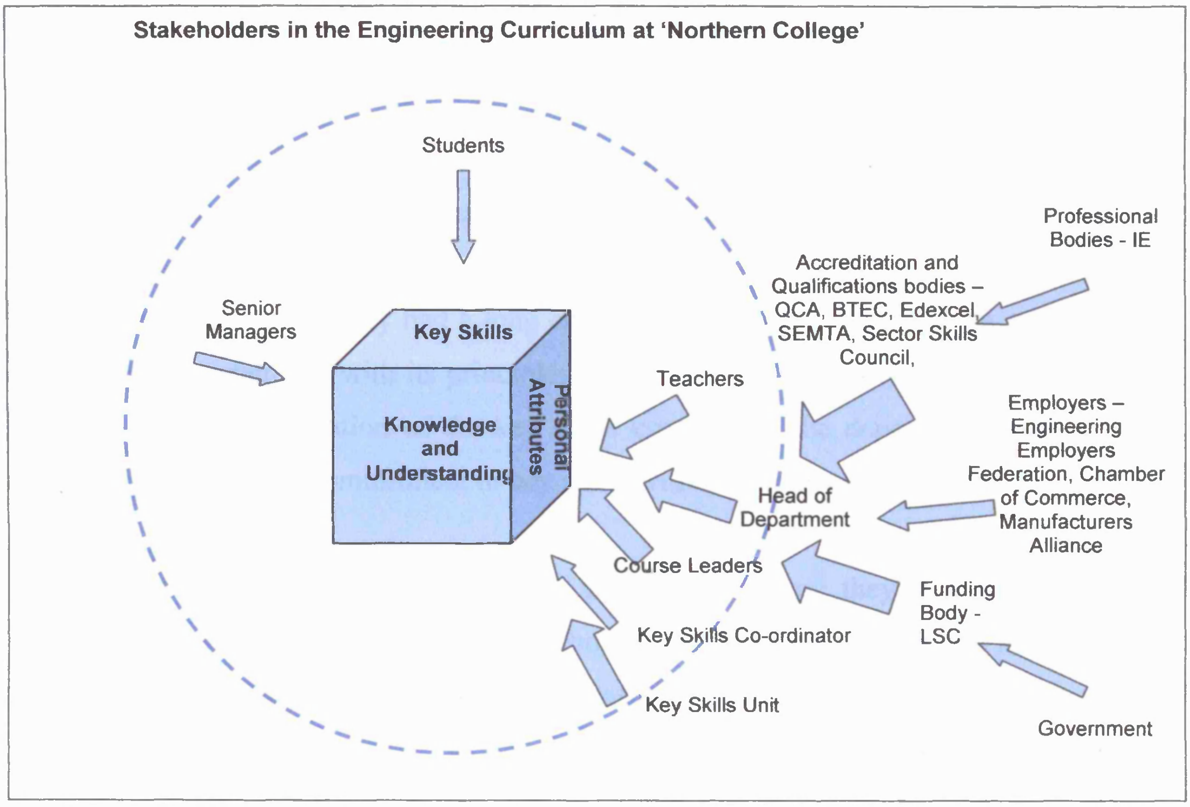


Figure 4.5: Stakeholders in the engineering curriculum at 'Northern College'

Overall it would appear that employability is of concern to those working in both case study departments although in Hong Kong this is largely in response to local employers and in England mainly in response to government funding initiatives promoting key skills qualifications.

4.5 Issues

A variety of issues about key skills and the key skills curriculum emerge from the interview data.

The importance of key skills

All respondents claim key skills are important for their students. It should be noted that definitions of key skills vary and that this is explored in Section 5.1. As the head of department at 'Northern College' explains:

> If you talk to staff about key skills, everyone agrees with the principles of key skills, and if you talk to employers, everyone agrees (NC-HoD).

'Northern College' has clearly had a long engagement with the skills agenda, and all concerned are familiar with its principles. At 'Asian College' (and despite the relatively recent formalisation of the key skills curriculum) the department head reinforces his long term commitment to key skills with reference to employers:

> There are some very consistent views over the years now, they [employers] are quite happy with out students technical skills and yet they always have these comments about students; they target the soft skills, the key skills (AC-HoD).

As might be expected, key skills specialists are particularly strong advocates of developing students' skills and attributes. At 'Asian College', it is claimed that:

> Key skills or soft skills is ... a priority because we have put down what kind of graduate we want ... we want to train them as lifelong learners, without key skills I don't think you can produce 'lifelong learners' (AC-HOD-TLC).

At 'Northern College' the Key Skills Co-ordinator comments that following government-led developments in core skills, key skills and curriculum 2000 there is an ongoing drive to improve the key skills curriculum for engineers:

> The reason that the government brought in this [current] version of key skills is that higher education was complaining and employers were complaining that people had got good vocational or subject-specific qualifications but couldn't do the accompanying things. So perhaps an engineer had got engineering qualifications, part of his job was then to write reports and if he's not got the literacy skills he can't express himself (NC-KSC).

With their strong vocational focus and desire to produce graduates ready for work, 'Asian College' teaching staff feel that employers want students to have developed at least some relevant skills and attributes. Typically:

> What the employer wants is that you know the basic technology so that there is the technical part, but the most important is how you interact with other people, how is your discipline, is your working attitude? I think the soft skill is very important, especially as nowadays you are not working alone (AC-7).

Developing skills through the curriculum

Several staff comment that they have been actively developing students' skills as part of the engineering curriculum for years, for example:

> Say 10 years ago we did not call them key skills, but all these elements were pieces in some modules, for example communication skills, we arrange our students to deliver presentations on their lab reports. For instance in our projects they need to search for information, to find extra things, and so is a kind of training for them ... but we didn't specifically name the skill (AC-6).

Teachers and course leaders have varied reasons for considering the development of student skills and attributes as an important part of their work. Many describe the rapidly changing industrial landscape and the requirement to keep updating, including this interviewee at 'Northern College':

> I tell students engineering is changing ... they're maybe 16 years old, they may work in engineering 'till they're 65 but the day they walk out at 65 they'll still be learning because it's changing continuously (NC-5).

Others have more practical reasons for encouraging students to improve their interpersonal skills:

> I do believe that there's a need for skills for other purposes, to be able to get on with each other, to gel as a class, a lot of the barriers that students have in getting along with each other, the trouble is that when they first arrive here, is that they haven't got the skills and they just can't communicate with each other. So until they can learn to shut up while somebody's talking and have basic good manners and listen. These sort of remedial skills are very important to everybody (NC-2).

Relatively poor student behaviour can be linked to youth and inexperience. An interviewee at 'Asian College' suggests that key skills can be used as a lever to encourage students to be more considerate and better prepared for the world of work:

> Some students maybe are too young, quite naïve and this is a problem. In fact they introduced the key skills to give students some idea how to behave, to make them more mature in their thinking (AC-2).

Student views of skills teaching

Set against endorsements for students to have key skills and positive attitudes, a range of issues arise from how key skills development is organised and managed in the curriculum.

Some staff think that students find the stand-alone modules beneficial, whilst others think students dislike them. For example, the SAO staff member who teaches engineering students at 'Asian College' considers that students are quite willing to participate in a key skills module and benefit from the course:

> Most of them think this module is quite meaningful. The feedback from the students is that the module is quite practical and can help them and also help prepare them to face the job market and enhance their job hunting skills (AC-SAO).

However this view of the SAO introductory module is not universally shared by the interviewed staff, for example:

> The impression I've got is ... the majority of them would feel it's pretty harmless but at the same time pretty useless (AC-1).

This lack of student enthusiasm is also noted in relation to the modules taught by engineering staff at 'Asian College':

> You only have to go to the first semester and ask these students, they say 'I don't want these key skills, so boring!' ... so unless you can make it more blended in if you like and more interesting for them, it's not going to work (AC-1).

However, despite cynicism and concerns that students don't like the module, the same teacher thinks that the module has some worth:

> I think for 15 hours, yes we should have it there, at least when we talk about time management they know the term ... we have given them a good grounding, at least a primer or introduction. I think that is useful (AC-1).

At 'Northern College' staff frequently comment on the unpopularity of the key skills qualifications among students. In line with Hodgson and Spours' research (2002), key skills do not receive much endorsement. For example:

> ... they have a bad name without a doubt, because everyone thinks of it as being extra work, to do over and above the normal qualification (NC-1).

> With students we spend quite some time (discussing key skills) because they're always asking 'why are we doing these? (NC-2).

> Them two words, Key Skills, it's dreaded! They don't take it a serious as they should at times (NC-5).

Clearly this lack of interest among students is a concern. Although staff feel that the development of skills and personal attributes is important for students they appear to have an uphill struggle to convince students of this. In England the generic qualifications framework that is in use clearly contributes to this difficulty. However in Hong Kong the lack of a formally recognised national approach to key skills and the institutional approach in use may lead students to undervalue skills and attributes as elements of their main programme of study.

Staff training and development

In both departments, staff training and development in respect of key skills appear to be a relatively low priority. None of the interviewees at 'Northern College' claims to have received much training, although most describe discussions with other colleagues who taught Key Skills. Unsurprisingly the departmental Key Skills Co-ordinator feels more confident in having a good understanding of the qualification requirements which change every few years:

> An additional role that I've got is to act as the co-ordinator for the department for key skills. This involves talking to the key skills department and co-ordinating some of the sections to get a common approach to key skills throughout the college (NC-1).

This lack of training may be a college-wide problem and even an FE sector problem in the UK:

> I feel that one of the reasons … key skills (are) not performing as well as they should do, is possibly because of a lack of training and education of staff. It's probably been forced upon people to teach key skills without them being fully prepared for it (NC-1).

However there is training available, certainly for new staff who, if they don't have a teaching qualification, are required to study for a Certificate of Education or a Post Graduate Teaching Certificate, both of which will involve assessing their key skills at Level 2. The Key Skills Coordinator has a major role in staff training:

> In college we've been doing a lot of core curriculum training as a starting point. ... We've also been encouraging staff to take the national tests themselves and then leading on from that we would like some of the staff to try to put together a portfolio so they have a better understanding of what we're asking students to do. ... As a specialist team part of our role is to train staff to spread the message (NC-KSC).

The Key Skills Coordinator also raises the point that not all staff feel confident teaching key skills:

> ... a lot of staff who come in to teach are from a very practical background, perhaps their spelling isn't very good and so they don't really want to get involved with teaching any sort of communication skills to students so I don't think we can avoid having some separate, discrete sessions for the Key Skills (NC-KSC).

In order to do his best with key skills teaching, the head of department has come up with a very pragmatic and practical approach:

> What we try to do is to have dedicated key skills staff and what we try to do is probably use our new members of staff rather than the old ones because they at least don't know any different! (NC-HoD).

At 'Asian College' the TLC have provided key skills training opportunities for several years as the key skills framework was being rolled out. Among the interviewed 'Asian College' lecturers the amount of training received varies. Perhaps unsurprisingly the two interviewees most actively involved in teaching Key Skills for Lifelong Progress modules have received the most training. They have both attended a workshop series programme in the previous academic year (run by the Teaching and Learning Centre). Other interviewees mention attending individual workshop sessions and using a principal lecturer as a source of guidance and advice; this person was very involved in developing the Key Skills for Lifelong Progress modules at their inception in 2005.

Funding and specifications changes in the UK

Staff at 'Northern College' claim that students are resistant to the key skills qualifications and to being taught them as discrete subjects. Lecturers recognise this, and have sympathy with their position, but largely feel trapped by the funding systems and the changing specifications. For example:

> ... the difficulty is that the government have separated out key skills and the funding got very complicated and we found that ... they kept rejecting the real assignments so we tended to be 'selling' the key skills taught as key skills which means that the students then don't see the connection with the vocational preparation which I think is not the right way to do it (NC-2).

> ... there's been a lot of people feeling the goalposts have been moved in terms of the external bodies' specifications ... and the people that are delivering are finding that the standard this year is different from last year, and quite appreciably so. It's a lot of work (NC-2).

> My personal view is that I want the students to be upskilled in order to use those skills in their vocational area but unfortunately the restraints or constraints of funding and the logistics of it mean that we do tend to get very caught up in getting them through their qualifications (NC-KSC).

In the UK the assessment regulations and the need to demonstrate progress can be frustrating for both teachers and students. At one extreme it can appear to be making work for the sake of it:

> If you have a student that produces a piece of work that achieves the key skill without fault, that isn't acceptable, he has to show evidence of progress. ... It's rather upsetting for the students when you're telling them, 'well, that's too good, go away and hand in a worse one! (NC-2).

The head of department clearly recognises these problems:

> It's just the implementation of how key skills has occurred, not only in this college, but in other colleges as well. It's become more formulaic in terms of its design and it's become too prescriptive and I think that causes frustration among staff (NC-HOD).

His frustration arises from two issues. Firstly, that the internal key skills moderator, not an engineer, is inflexible about assessment criteria. Secondly, that the funding mechanism favours discrete key skills teaching. The department (in common with all departments in the college) receives 'entitlement funding' of around £700 per student but is required to prove they are delivering three strands to students; key skills, tutorials and enrichment activities. This has led to pressure to timetable key skills classes as separate entities rather than integrating key skills into other curriculum areas in order to make proving their existence easier.

The head feels quite strongly that the frequent changes to the key skills qualifications have distanced them from their vocational context.

> ... at the moment, realistically in its basic format I don't think it adds any value at all to our students. ... When we used to run Common Skills there was a certain amount of academic freedom. At the moment we're having to give students extra, bespoke assignments just to satisfy the requirements of key skills ... The situation is difficult for staff, they get frustrated, which in turn is portrayed to the students, who are also unhappy at the extra workload (NC-HOD).

The comment that key skills are seen as an extra burden by both students and staff is echoed by all other interviewees at 'Northern College'. This leads to motivational problems for students and teachers alike, with key skills qualifications being seen as hurdles to clear rather than their skills development viewed as beneficial for academic progression and career enhancement. These comments are in line with research by Hayward and Fernandez (2004) who report similar criticisms of successive key skills policy interventions in the UK which have resulted in the development of assessment mechanisms that increase the bureaucratic demands on both teachers and learners.

Transferability of skills in the UK

In addition some staff at 'Northern College' have a genuine concern that teaching skills to get students through generic qualifications is not worthwhile, for example:

> For me, I don't see how we can have these generic skills, take communication, I think that communication to an engineer is completely different from communication to a hairdresser (NC-4).

This point is of major significance as it relates to a fundamental principle of skills, namely transferability. Transferability is the view that skills learned in one context can be transferred to another with little or no modification (Annet and Sparrow, 1985, quoted in Hyland and Johnson, 1998). Hyland and Johnson (1998) claim that the notion of transferable skills is hugely influential in the fields of education and training but that 'general transferable skills' do not exist. They argue that skills and qualities are context bound and that the key skills approach in the UK which requires students to take generic tests is ineffective at preparing them for the workplace.

Some of the difficulties of motivating students are linked to this problem of transferability with the skills qualifications being de-contextualised from the students' main course of study:

> There is a heavy commitment [by the institution] in getting the students 'qualified' with a basic level of achievement – I think the students feel that transferability is a bit of a problem in terms of when do they view that a skill is completed? (NC-2).

Developments impacting the key skills curriculum

In both colleges there are impending changes which are likely to affect the key skills curriculum. Despite the 'Asian College' head's commitment to improving student skills and attitudes as part of an ongoing concern with matching industry manpower needs, there is evidence that this may become more difficult. The department is under much pressure caused by a government squeeze on funding, an increasing reliance on income-generation activities and preparing for the impact of major reforms to the education system in Hong Kong (the 3-3-5 reforms which will mean students move to further or higher education a year earlier than at present). Major course restructuring is required to allow for the disappearance of entry-level students and to prepare multi-entry, multi-exit courses. When pressed about whether curriculum pressures would squeeze the Key Skills for Lifelong Progress modules out of courses, the head comments:

> At this moment I think we will only manage to have one unit. We still see the importance, unfortunately the time is not with us; we may just manage with one (AC-HOD).

The TLC is also reducing the amount of formal training on offer, running less key skills training in 2006 than in previous years. This is attributed by the head of TLC to the introductory phase having passed with key skills becoming quite 'mainstream' in lecturers' and course leaders' thinking. Also significant is the retirement of an experienced Teaching and Learning Advisor who headed a Key Skills Team and who has not been replaced. Finally, the work of the SAO in relation to Life Skills and Key Skills is under review. However, there is some ongoing activity:

> We're still producing resources for teachers, key skills leaflets, career portfolio and that sort of information. In the key skills modules, if they want help to produce teaching and learning materials we help them (AC-HOD-TLC).

And, it is noted that the TLC head is still working to raise the level of integration of key skills into the academic departments through his role on the Teaching and Learning Steering Committee:

> Actually the next step is – you teach the 15 hours key skills – is not enough. You ask them to do the career portfolio – is not enough. The key skills module is only offered in Year 1 and what the department or the Course

> Team has to do, either in Year 2 or Year 3, is to integrate the key skills into the curriculum so the students are required to use their career portfolio (AC-HOD-TLC).

Another important development is his involvement with a task force that has recently been set up to look at developing, and perhaps integrating, the life skills curriculum with the key skills curriculum (both of which are run by the SAO). The Life Skills modules are offered to students who come in on low level courses. More formalised ways of encouraging students to update the career portfolios started on the Key Skills module in year 1 as they approach the end of their courses and start job-hunting are under consideration.

In the UK yet more changes to the key skills qualifications are anticipated. The Key Skills Co-ordinator shares the concerns of the department head and other Engineering staff, that some of the key skills work is too prescriptive, and that the qualifications have been subject to too much 'tinkering' when more radical changes might be more beneficial. The significant changes brought in with Curriculum 2000 have hardly bedded in but are probably being altered as a result of the 14-19 White Paper linked to the Tomlinson Report (2005) in order to re-focus on 'functional skills'[3] which are to be developed within a new set of Diploma qualifications.

> There will be a range of vocationally-based diplomas from age 14. They are going to have a core which is going to include what they are calling now functional skills. This will probably be instead of key skills (NC-KSC).

The head of department mentions these new diplomas, one of which is being developed for engineering, which adds another level of complexity to the progression routes for young people. If this change, which is currently being piloted, occurs and key skills are replaced by functional skills, this will certainly require curriculum changes and staff training.

4.6 Conclusions

Both case study departments offer a broad range of engineering qualifications. In 2005/6 'Asian College' had 1,745 students enrolled, mostly taking Higher Certificate and Higher Diploma courses and the majority of these students were there full time (a ratio of approximately 2:1 full to part-time attendance). In the same academic year, 1,334 students were enrolled at 'Northern College' taking a wide range of courses, predominantly in a part-time mode (a ratio of approximately 1:5 full to part-time attendance).

In both departments external stakeholders were held to be more influential on curriculum than internal stakeholders, but different external stakeholders were emphasised in each context. Both heads of department particularly identified the importance of funding bodies to curriculum decisions. Other staff identified local employers (particularly in 'Asian College') and accreditation/qualification bodies (particularly in 'Northern College') along with their respective governments as significantly influencing curricula.

Both colleges have formal key skills policies although at a strategic level the approach towards the key skills curriculum in Hong Kong and England is quite different. As a consequence a developmental approach to key skills is used at 'Asian College' while an externally imposed qualifications-based approach operates at 'Northern College'.

In 'Asian College' only full-time students receive the SAO introductory module which leaves part-time students at a disadvantage. Some engineering students may not have key skills modules in their main programme of study either. In 'Northern College' full-time students will have some exposure to the key skills qualifications and those on apprenticeships will take key skills and wider key skills, as will students on the scholarship programme. Most other part-time students will not cover key skills at all.

Both departments deliver their key skills curriculum in stand-alone mode although they are advised and even encouraged by key skills specialists to aim for integrated delivery. Stand alone delivery is, however, easier to resource, time-table for delivery and assess. At departmental level in both colleges, some engineering teachers deliver key skills. At 'Northern College' they are supported by a Departmental Co-ordinator for key skills and by Key Skills Support Unit. At 'Asian College' there is more limited support from the Teaching and Learning Centre.

Although the key skills curriculum is quite different in the two departments, there are several common issues identified by teaching staff. There is support for students to improve their skills and attitudes to study and employment. However staff are concerned that students do not generally appreciate the need for key skills. In both departments staff training and development in relation to key skills is a relatively low priority. Staff who are trained engineers may feel unprepared, or even unwilling, to teach and assess students' key skills. The stand-alone delivery mode enables some staff to be 'key skills' specialists to some extent, whilst other staff may not feel it is necessary to actively integrate key skills into their modules. Additionally, in the UK, teaching staff feel that key skills qualifications are unpopular, subject to frequent changes, and too generic to be relevant to their engineering students for whom transferability is a difficulty.

In both colleges there are changes planned that will affect the key skills curriculum. Course design pressures at 'Asian College' will probably reduce the number of specialist key skills modules from two to one. The foundation level SAO module may be redesigned and there may be an attempt to integrate key skills into some curriculum elements for final year students preparing for work. At 'Northern College' changes to the key skills qualifications are planned which include replacing key skills with 'functional skills'.

The following two chapters examine in detail respondents' views of skills and personal attributes in an attempt to identify which are 'key' for their engineering technician students.

Notes:

[1] In October 2004 the Education & Manpower Bureau published the consultation document entitled Reforming the Academic Structure for Senior Secondary Education & Higher Education. Under the new structure young people would have 3 years in lower secondary school, 3 years in upper secondary school and 4 years on a normal undergraduate degree. Hence being known as 3-3-4. Full details are available on http://www.legco.gov.hk/yr0405/english/panels/ed/papers/ed1029cb2-emb-e.pdf

[2] The National Qualifications Framework (NQF) in the UK is complex and undergoing changes. The number of levels in the NQF has been increased from five to nine (in January 2006) with entry levels and levels 1 to 3 not changing, but levels 4 and 5 being affected (QCA, 2006). However it does not appear that the key skills qualifications have yet been altered and at the time of the research, the existing courses were being run according to the previous levels in the National Framework.

[3] Functional skills are those core elements of English, maths and ICT that provide an individual with the essential knowledge, skills and understanding that will enable them to operate confidently, effectively and independently in life and at work. Individuals of whatever age who possess these skills will be able to participate and progress in education, training and employment as well as develop and secure the broader range of aptitudes, attitudes and behaviours that will enable them to make a positive contribution to the communities in which they live and work. (The Department for Children, Schools and Families, 14-19 Eduation and Skills, 2007).

5. Employability and Key Skills

This chapter draws on data from interviews and card sorting activities with heads of department, course leaders, key skills specialists, lecturers and students. Staff views on employability are considered first. A detailed examination of key skills, one of the three elements of the cubic curriculum for engineering technician students, follows. These are presented in top-down order (i.e. the skills that are seen as 'very important' by a majority of respondents are ranked 1). Similarities and differences between cases are noted, as well as areas of agreement and disagreement between staff and student groups.

5.1 Definitions of key skills

Interviewees were asked how they would define key skills. The aim of this was to identify the extent to which departmental managers, course leaders and lecturers in the two cases held common perspectives about key skills. High levels of consensus would indicate a firm foundation for key skills to be managed, taught and assessed in an integrated way.

In order to facilitate comparison, participants were presented with six cards, five of which contained definitions from Bolton's typology (2000), the sixth being blank to signal that their personal alternative would also be acceptable. Table 5.1 provides a summary of the results.

Definition	**Main definition** = for joint definitions	**Secondary definition**
Key skills = remedial skills (B1) Students have been inadequately taught at school. They need to boost their skills (such as numeracy) in order to cope with the course.		
Key skills = vocational preparation (B2) Students need to be equipped with skills (such as communication, applying IT) required by employers so that they can get good jobs.	AC-5 NC-HoD NC-2 NC-3= NC-4 =* NC-5=	AC-3=* NC-6

Key skills = developing workplace attitudes (B3) Students need to develop attitudes such as punctuality, reliability, cooperation and other 'work skills' because potential employers look for these alongside students' paper qualifications.	AC-HoD= AC-1 AC-2= AC-7= AC-SAO NC-3= NC-4 =* NC-6	NC-1 NC-2
Key skills = study skills (B4) Students need to be equipped with a set of techniques that will help them be successful at college (such as information literacy, report-writing, presentation skills).		AC-3=* NC-6
Key skills = lifelong learning skills (B5) Students use skills every day of their lives in all aspects of their lives. They are part of a continuum that begins at school, continues through college and on into higher education, work and life.	AC-HoD= AC-2= AC-3 AC-4 AC-7= AC-8 NC-1 NC-5=	AC-SAO
Key skills = (B6) [Left blank for own definition]	AC-6*	

Notes:
NC-4 = * Three key skills are developing workplace attitudes, Wider key skills are vocational preparation.

AC-3=* Study skills for first year students, vocational preparation for second/final year students.

AC-6* Key skills is the development of good attitudes, not only workplace attitudes, a right approach to life developed at home, at college, in society.

Table 5.1: Staff definitions of key skills

The table shows a broad spread of opinions, although no-one defined key skills as remedial skills. It should be noted that in 'Northern College' one interviewee identifies 'remedial skills' as 'basic skills' and therefore as a lower level than key skills. He thinks that some student groups need to improve their basic skills because of deficiencies carried over from their school education. This may be an example of where the term 'key skills' carries a more specific meaning to UK educators than to those in Hong Kong.

In Bolton's view definitional differences were mainly attributable to individual perceptions rather than their college workplaces. This present study also generates a range of viewpoints in both colleges although different dominant definitions characterise the two cases. It is more common for staff at 'Asian College' than 'Northern College' to choose single definitions. This may be because they took the request to identify the definition that most closely matched their own more literally or because they have a more focused view of key skills than 'Northern College' staff.

Only one person at 'Northern College', the head of department, chose a single definition; 'vocational preparation' for this reason:

> Our job is to prepare them for the workplace and to give them the skills to gain a job, hold it down and develop their careers (NC-HoD).

However this perspective is echoed by *all* other interviewees in the department, although they prefer to link this to other definitions. For example:

> It depends on whether you see engineering as a profession. I'm expecting the students to go on to be engineers and therefore I would view 'preparing them for a job in engineering' as being the main thrust, but I do see that there's a need for key skills for other purposes (NC-2).

This indicates that 'vocational preparation' is the major foundation of the curriculum at 'Northern College' and it is noted that this is in line with Bolton's research (2000) with FE lecturers in the UK, where the largest group defines key skills in terms of skills required by employers.

However, staff also see key skills being valuable for other purposes. Attitudinal elements are highlighted in this study with five of the interviewees selecting the card 'developing workplace attitudes' and adding favourable comments, such as:

> Secondly I would go for developing workplace attitudes. There are in fact skills that are important but are not part of the skill framework that they are examined upon (NC-1).

This and other comments reflect the fact that staff at 'Northern College' are used to working with the narrow QCA framework. One interviewee (NC-4) suggests that the three key skills (communication, application of number and IT) aim to 'develop workplace attitudes' whilst the wider key skills (they named two: working with others and developing self) are 'vocational preparation'. This is an important point which relates to how key skills are categorised, taught and assessed in the UK. Because of the national qualifications framework for key skills that is approved, teachers feel that a narrow, generic approach is promoted. However there is a clear tension between this approach and what industry partners and contacts tell them is required of students. These stakeholders call for students to develop a range of attitudinal attributes whilst at college. This positive view of workplace attitudes runs counter to Bolton's research in which 'developing appropriate workplace attitudes' was the response of the smallest group (Bolton and Hyland, 2003).

At 'Asian College' five interviewees identify strongly with a single definition of key skills. However the definition chosen varies. One person chose 'vocational preparation' (AC-5), one 'developing workplace attitudes' (AC-1), two chose 'lifelong learning skills' (AC-3, AC-4) and one developed their own definition which has a strong attitudinal element:

> I would suggest that key skills is the development of good attitudes, is more than just the workplace (AC-6).

For this course leader, student behaviour is declining in parallel with community values such as 'keeping their promise', 'punctuality' and 'reliability' which he thinks should be countered so that students develop a better attitude to life in general as well as their time in college and at work.

The interviewed SAO officer who teaches key skills to engineering students (but who works outside the department of Engineering) primarily defines key skills as 'vocational preparation' while thinking 'lifelong learning' is very important for students. As his role is to introduce students to key skills and encourage them to reflect on, and look for ways to actively develop, their skills his choice of definitions is consistent with this task.

It is interesting to note that many 'Asian College' interviewees hold 'lifelong learning' as a core element of key skills development. In addition to the two people who chose this as their sole definition four other departmental staff picked 'lifelong learning' as either their 'main' definition or their 'equal' definition with 'developing workplace attitudes'. Several interviewees described rapid technological advance as a major driver in the encouragement of a positive approach to change, for example:

> The knowledge they learn from college is limited. However with the advances in technology if a student cannot learn by themselves they cannot make progress in the future and therefore we have to teach them how to learn things by themselves. If they can learn things by themselves, then they can progress to any level that they want (AC-2).

This emphasis on lifelong learning echoes the institutional definition of key skills promoted by the TLC which suggests that although key skills may be referred to by other terms (such as soft skills, generic skills, transferable skills, employability skills, core competencies) there is a general understanding of what they are.

> For our use, we are using the term *key skills* to describe the set of skills and attributes one needs to progress in life, take charge of one's own learning, and enter, stay in, and succeed in the world of work – whether one works on one's own or as part of a team. Key skills can be applied in the classroom, in the workplace, and in a wide range of daily activities (Key Skills Delivery Booklet, undated).

This also echoes the discourse of the Education Reform publications (Hong Kong Education Commission, 2000, 2002, 2004, 2006) where 'lifelong learning and all round development' are both exhorted and promoted as outcomes of improved curriculum and teaching methods (as was discussed in Section 2.3). This appears to contradict Hofstede (1986) whose view of cultural differences in teaching and learning suggests that in collectivist societies (such as China) the young are expected to learn and adults cannot accept the student role. In individualist societies (such as the UK) there is a contrasting view that one is never too old to learn: education is ongoing.

Kennedy (2005) claims that "the entire thrust of the reform agenda was life-long learning" (p65) with its emphasis on the concept of "pathway" (p73) where all education and training is linked so that there are no barriers either within or between school, further education and higher education. Certainly several interviewees situated the development of skills and attributes in a broad societal context in which school, college life and work were linked. This comment is typical:

> I think key skills shouldn't be started from college level, this should start much earlier, from the primary school, the secondary school, all the way along. You have to provide the environment, you need to nurture them (AC-8).

Lifelong learning appears to resonate with 'Asian College' staff, with one interviewee paraphrasing a well-known Confucian saying in order to defend their choice of this definition:

> In the key skills we help students to develop their career themselves. I give you an example; if the students feel hungry I give them some bread or a cup of rice, they feel is enough, but later they feel hungry again. I think the key skill is similar to this [analogy] how to make bread or cook rice, the next time they can do it themselves (AC-4).

So the broad approach and prevalence of the 'lifelong learning' definition appears to be underpinned by how Hong Kong Chinese teachers conceive their role in terms of teaching in an ongoing system (Ho, 2001). Gao and Watkins (2001) refer to the role of teachers "cultivating" not only cognitive development but promoting positive attitudes to society and responsible moral behaviour. This "cultivating" conception links back to Confucianism (Lee, 1996). Drawing on this (and other sources) Watkins and Biggs (2001) identify a Chinese view of teaching which is holistic and which contains a strong moral dimension set within a broad and long-term context. 'Asian College' staff appear to approach their teaching in this way.

Many interviewees prefer multiple to single definitions of key skills or discuss their preferred definition with reference to other ones. This does not appear to reflect confusion about the purpose of developing students' key skills but rather to signal recognition that key skills is a complex and multi-dimensional concept. This raises questions about the usefulness of Bolton's typology (2000) to understanding teachers' views of key skills.

5.2 Skills for engineering technicians

Engineering industry requirements were discussed in Section 2.4 with particular attention being given to the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005) and skills found in the general literature about engineering industry requirements and international taxonomies. From these sources fourteen skills were identified (Table 2.5) and used to create a card sort. During interviews (with staff) and a group-based task (with students) respondents were asked to identify which skills they considered most important for engineering technicians.

It should be noted that student groups worked with both sets of cards simultaneously, identifying skills and attributes that they considered 'very important', 'important' and 'not important/relevant' as well as prioritising their 'top five' skills/attributes. Interviewees worked with skills first and then attributes. This separation allowed for more detailed discussion of the various skills and attributes, as well as encouraging participants to group and rank skills/attributes in ways that they felt best reflected their individual viewpoint. Data are discussed below listed in descending order according to how many individuals and groups rated each skill. Where skills are ranked equally, those with more staff support are presented first.

1. Communication skills 溝通技能

Of all the skills, communication has attracted most interest with regular calls from engineering bodies worldwide for engineers to improve their communication skills (Finniston, 1980; Back and Sanders, 1998; Ahearn, 2000; Hissey, 2000). For engineering technicians there is an expectation that they can "use oral, written and electronic methods for the communication in English of technical and other information." (Engineering Council UK, 2005). Effective professional practice (McGregor, 2000) highlights the importance of engineering students developing communication abilities in relation to both written and oral expression. In a work situation they may be required to prepare, interpret and present information, correctly interpret instructions received and issue clear and accurate instructions to subordinates as well as to convey engineering information to colleagues and others (non specialists) including customers and members of the public.

Widespread recognition of the importance of students having good communication skills is apparent among departmental staff in both colleges. Indeed, there is a high level of agreement about how important communication skills are, most respondents at both colleges placing it as 'very important'. Table 5.2 summarises the views.

Communication skills 溝通技能 (S-2)	**'Asian College' staff**	**'Northern College' staff**	**'Asian College' student groups**	**'Northern College student groups**	**Number of responses in category**	
Very important	AC-HoD (1st) AC-2 (=1st) AC-4 (=1st) AC-6 (=1st) AC-5 (2nd) AC-8 (2nd) AC-1 AC-3 AC-7 AC-SAO	NC-4 (=1st) NC-HoD (2nd) NC-1 (2nd) NC-2 (=2nd) NC-6 (4th) NC-3 NC-5	AC-G7 AC-G8 AC-G4 AC-G1 AC-G3	NC-G1 NC-G2 NC-G3 NC-G4 NC-G5 NC-G6 NC-G7	15	14
Important			AC-G2 AC-G5 AC-G6		3	-

Not important/relevant (or interviewee claims is less important/ relevant)					-	-
Not ranked/discussed (and assumed not to be 'very important')					-	-
	10	7	8	7	Total: 32	

Table 5.2: Views of communication skills

For the head of department at 'Asian College' and all his colleagues, communication skills are 'very important', part of a primary group of skills that their students require. Four interviewees rank this skill first and two rank it second. It is perhaps unsurprising that this skill features so prominently; communication skills feature in the course aims for Higher Diploma students in the engineering department and it is a 'fundamental' skill in the key skills framework used by the institution. Oral fluency and written competency in both English and Cantonese/Chinese is the aim in the context of 'Asian College'. However there is clearly a concern that students may not be achieving the level of skill required by local employers, for example:

> The employer always says that the students are not good at presenting their ideas (AC-3).

> Employers complain about students' poor communication skills in English but communication in Chinese, they also express some concern; they feel it is getting worse each year. Written skills are getting worse, that is the general view (AC-HoD).

'Northern College' staff also recognise the importance of communication skills for their engineering students. This statement is typical:

> Technicians are in a position where they have to have good communication skills ... they need to be able to read and understand information they are

receiving, be able to have discussions with people and be able to write documents that are clearly understood (NC-1).

All interviewees at 'Northern College' place communication as a major skill area that is particularly important for their engineering technician students. The head of department ranks it second, as do two of his staff, and one interviewee ranks it first. Since communication is one of the key skills qualifications that students take at this college it might therefore be expected to have a high profile. While major efforts are being made in the UK to facilitate skills development, Stanga and Ladd (1990) state that relatively little is known about the obstacles students face when they attempt to develop their abilities. Hassall et al. (2005) suggest that accountancy and engineering students have relatively high levels of communication apprehension which must be tackled (and diminished) before communication skills can be effectively improved.

Students also see communication skills as being very important. In 'Asian College' five groups rank this as 'very important', three groups as 'important'. In 'Northern College' all seven groups see communication skills as 'very important'.

=2. Teamwork skills 團隊合作技能

Engineering technicians are expected to be team players. In the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005) teamwork is not listed as a stand-alone element, but is integral to their requirements. Under 'use effective communication and interpersonal skills' is 'work effectively with colleagues, clients, suppliers and the public.' Under 'accept and exercise personal responsibility is 'accept responsibility for work of self and others' and 'accept, allocate and supervise technical and other tasks'. These all indicate the centrality of teamwork to the job of being an engineering technician. However teamwork in an educational setting, such as a post-compulsory education classroom, differs from teamwork in a workplace (Berge, 1998) and must be organised and assessed carefully. Teamwork skills at both colleges appear to be highly valued and Table 5.3 provides a summary.

Teamwork skills 團隊合作技能 (S-12)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-2 (=1st) AC-3 (=1st) AC-4 (=1st) AC-8 (2nd) AC-HoD (3rd) AC-5 (3rd) AC-SAO (3rd) AC-1 AC-7	NC-3 NC-4 NC-5	AC-G2 AC-G3 AC-G4 AC-G7 AC-G8	NC-G1 NC-G3 NC-G4 NC-G5 NC-G7	14	8
Important		NC-HoD NC-1 NC-2	AC-G1 AC-G5 AC-G6	NC-G2 NC-G6	3	5
Not important/relevant (or interviewee claims is less important/ relevant))	AC-6	NC-6			1	1
Not ranked/discussed (and assumed not to be 'very important')						
	10	7	8	7	Total: 32	

Table 5.3: Views of teamwork skills

Teamwork at 'Asian College' is clearly a very important skill. All interviewees rate it 'very important' except one. Three rank it first, one second, three third (including the head) and two place it among bundles of 'most important' or 'primary' skills. However one person does not include teamwork among his four 'most important skills'. Teamwork skills are highlighted in the key skills for the 21st century framework used by the institution and also feature in the departmental aims for Higher Diploma courses. It is unsurprising that they are highly valued by departmental staff. Several interviewees (AC-4, AC-8, AC-SAO) make a close link with communication skills, for example:

> When they are working outside, or when they are going to study teamwork they often work with people. In teamwork they need to know how to work

> with the other person and how to communicate with the other person (AC-4).

The SAO officer highlights 'two concepts' which are linked. These are having a good relationship with others (working in a team) and communication skills (presenting one's own ideas and listening to/accepting the ideas of others). However he also suggests that:

> The outcome is very important. That means that in the team sometimes there is a team but it doesn't work! (AC-SAO).

This hints at the complexity surrounding managing effective team working in an educational setting. Researchers such as Ruiz Ulloa and Adams (2004) also make the point that students generally recognise the necessity of teamwork for improving interpersonal skills but still prefer individual work. They attribute this to a range of elements such as prior negative experiences including conflicts and the perceived difficulty of being assessed fairly.

At 'Northern College' teamwork is seen as 'important' as it is relevant but 'less academic' (NC-2) or 'basic' (NC-4). The head of department also slots them in with technical skills because:

> Engineering's not a one-man job, so you've got to share your technical skills with other members of staff and work as a team (NC-HoD).

One interviewee (NC-3) identifies teamwork as one of the five taught key skills that employers expect and two colleagues concur that teamwork is a 'very important' skill. One interviewee (NC-6) put teamwork second from bottom of their ranked listing of skills (only technical skills coming lower), indicating that for him this is not a priority area.

Five 'Asian College' student groups see teamwork as 'very important' and three groups see it as 'important'. Students at 'Northern College' are also positive about the importance of teamwork. Five groups place it as 'very important' and two groups think it 'important'.

= 2. Problem solving skills 解難技能

Problem solving skills are generally considered central to the work of engineers (Eide et al., 2007). For example:

> Problem solving is what engineers do. It is what they are, or should be, good at (Houghton, 2004, p.13).

Employers continue to call for improved problem solving skills, expecting college gradutes to have them. An Australian report (DETYA, 2000) revealed that employers found that engineering graduates both from universities and the Technical and Further Education (TAFE) sectors were "poor in many skills, particularly at problem solving and oral business communications which employers consider important but also in interpersonal skills" (p.viii) notably critical thinking and independent thinking. It is unclear whether Hong Kong students are also poor in these skills, but likely that UK students are deficient. Houghton (2006) claims that British students no longer develop basic problem solving skills in school with GCSE and even A-level papers containing 'problems' that only require students to undertake single step tests of knowledge of individual principles. This suggests that entry-level students to engineering courses might require high levels of support in developing the problem solving skills required by industry. It should be noted that 'problem solving' in the context of engineering has many definitions (Dekker, 1995) and that engineering problems vary according to their complexity and in the sophistication of the associated problem solving skills required (Kranov et al., 2002).

The data in this study shows clear support for problem solving as a very important skill for engineering technicians. This is unsurprising as problem solving is a 'fundamental skill' in the key skills framework for 'Asian College', and is highlighted in the BTEC specifications used by 'Northern College'. Table 5.4 summarises the views.

Problem solving skills 解難技能 (S-10)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	HoD (2nd) AC-5 (1st) AC-3 (=1st) SAO (2nd) AC-1 AC-2 AC-7	NC-HoD (hub) NC-1 (1st) NC-6 (1st) NC-2 NC-4	AC-G1 AC-G3 AC-G5 AC-G6 AC-G8	NC-G2 NC-G3 NC-G5 NC-G6 NC-G7	12	10
Important	AC-8	NC-3 NC-5	AC-G2 AC-G4 AC-G7	NC-G1 NC-G4	4	4
Not important/relevant (or interviewee claims is less important/ relevant)					-	-
Not ranked/discussed (and assumed not to be 'very important')	AC-4 AC-6				2	-
	10	7	8	7	Total: 32	

Table 5.4: Views of problem solving skills

The head of department at 'Northern College' places problem solving (along with numeracy) at "the hub" of the required skills whilst the 'Asian College' head ranks problem solving second (behind communication skills) in priority order. Other staff also rate problem solving skills very highly although it was noted that:

> Engineering is all about problem solving. It is quite ironic that the one key skill we do not teach is the problem solving one (NC-1).

One interviewee (NC-2) thinks that problem solving is a higher level skill (along with thinking skills and business management) and another (NC-6) comments that students leaving at 'HE Level' would have well developed skills in problem solving, numeracy, communication and self management. In 'Asian College' problem solving is very important, even a "primary skill" (AC-7). However one person comments that problem solving for lower level staff is not the highest priority skill:

> Perhaps this is less critical because they are at junior level ... they take things to their supervisor to provide answer (AC-2).

However he goes on to comment that in final year projects students *are* expected to demonstrate their problem solving skills, an issue raised by another interviewee (AC-5).

Students also see problem solving skills as very important. Five 'Asian College' groups place the skill as 'very important' while three groups place it as 'important'. 'Northern College' student groups show similar results. Five groups place problem solving as a 'very important' skill and the remaining two student groups rate problem solving as 'important'.

Zampetakis and Tsioronis (2007) state that engineering students need to think both creatively and critically. One interviewee at 'Asian College' expressed a similar view linking problem solving with both critical thinking and creative thinking. He placed the skill cards together with a comment that:

> If you want to solve problems then thinking is important. Without logical and deep thinking and reasoning I don't think you can solve problems (AC-3).

This statement echoes the framework used at 'Asian College' where one of the Fundamental Skills is titled 'Think and Solve Problems'. Furthermore this comment seems to place more value on critical than creative thinking. The linking of the 'thinking' skills is echoed by one of the 'Northern College' interviewees who also placed critical thinking and creative thinking alongside problem solving:

> I've got the thinking skills and the problem solving, business management, those sort of skills as being the body of the work that we have to impart to get the students thinking for themselves, to take on projects that they can complete themselves and not flounder about requiring assistance (NC-2).

Thus a complex bundle of skills are required for successful and independent learning. Houghton (2006) contends that in the field of engineering problem solving involves both analytical and creative skills. It is necessary to use analysis to comprehend a problem and the relationships in the situation, and to use creativity in devising a solution. The present study shows that critical thinking and creative thinking are generally less highly valued than problem solving.

3. Learning skills 學習技能

Being an effective learner is essential to success as a student and acquiring appropriate learning skills and habits allows students to progress their careers. This is highlighted in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005), in the requirement to demonstrate continuing professional development 'to ensure competence in areas and at the level of future intended practice.' FE colleges play a key role in providing development routes for individuals, training (and re-training) workers to keep pace with changing technology and meeting the needs of individuals for personal development (Foster, 2005) so it might be expected that learning skills feature prominently among learning objectives of education and training providers. In the UK it has been argued that learning to learn is a key goal in a 21st century curriculum (Claxton, 2003) because knowledge is changing so fast that educators cannot give young people what they will need to know because that is unknown. Instead there is a desire to develop "supple and nimble minds" (Claxton, 2003) so that they can learn whatever they need to. 'Learning continuously' is an element of the key skills framework in 'Asian College' and features as a course aim for Higher Diploma courses. In addition, and as has discussed in section 6.1, lifelong learning has become a central tenet of the education system in Hong Kong. Particular emphasis has been given to 'Learning to Learn' (Wong, Tang and Lee 2005) so as might be expected this has a higher priority in 'Asian College' than 'Northern College'. Learning skills certainly feature on the BTEC qualification requirements for engineering Higher Nationals which 'Northern College' staff should be aware of. Table 5.5 summarises the views.

Learning skills 學習技能 (S-7)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-2 (=1st) AC-4 (=1st) AC-5 (4th) AC-8 (4th) AC-1 AC-3 AC-7	NC-4 (=1st) NC-HoD NC-3	AC-G3 AC-G4 AC-G5 AC-G6 AC-G8	NC-G1 NC-G2 NC-G6 NC-G7	12	7
Important		NC-1 NC-2 NC-5 NC-6	AC-G1 AC-G2 AC-G7	NC-G3 NC-G4 NC-G5	3	7
Not important/relevant (or interviewee claims is less important/ relevant))					-	-
Not ranked/discussed (and assumed not to be 'very important')	AC-HoD AC-6 AC-SAO				3	-
	10	7	8	7	Total: 32	

Table 5.5: Views of learning skills.

The majority of staff at 'Asian College' clearly rate learning skills as very important for students and seven people place this skill as 'very important'. For example one participant (AC-1) places learning skills in a 'core' set that also includes technical skills, numeracy and technology skills:

> Learning – this is a core value … if you come away without being able to learn than you have a problem because you'll be learning all your life (AC-1).

This need for lifelong learning is noted by five interviewees (AC-2, AC-3, AC-4, AC-5, AC-8). Interestingly the engineering head of department does not discuss this skill at all and neither do two others. In contrast, the head at 'Northern College' includes learning skills in a 'learning side' grouping that also includes communication skills and information literacy. A colleague (NC-4) comments that learning skills (and communication) are the two most important skills for success as a student and places learning skills running alongside all the other skills. One other person places this skill as 'very important'. Learning skills appears mid-way down three other interviewees' lists (NC-1, NC-2, NC-6) or is ranked as 'important' (NC-5) along with comments that teaching students how to learn is a central part of the college curriculum:

> Learning [skills] and the planning and organising skills can be developed in colleges, the other skills would be developed much more in employment or the working situation (NC-1).

However, it may be that employers do expect students to arrive with well developed learning skills. One interviewee comments that employers prefer students to have five of the key skills that are in the qualifications framework, including 'Improving own Learning' because:

> Anybody who is looking for a career in a profession should be capable of taking responsibility for some of their own learning (NC-3).

In 'Asian College' four student groups see learning skills as 'very important' including one group that ranks it third in their 'top 5'. Three groups think learning skills are 'important'. Four student groups at 'Northern College' also see learning skills as 'very important' with one group ranking it second in their 'top 5'. Three other groups see it as 'important'.

=4. Self management skills 自我管理技能

In a work context engineering technicians have to perform reliably and effectively, usually without close supervision. They have to adhere to appropriate codes of practice, take responsibility for their work (and perhaps that of others) as well as accepting, allocating and supervising technical and other tasks. These fall under the section 'accept and exercise personal responsibility' in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005). In a college situation students also develop and apply these self management skills. In practical terms they may not supervise, but will certainly work with peers on projects and a range of tasks. This is a skill where there is evidence of a split between the two colleges, with 'Asian College' staff and students valuing self management more highly than those at 'Northern College'. The need to develop self management skills is indicated in the BTEC specifications for engineering Higher Nationals and while 'Northern College' staff view this skill as 'important' it is not a top priority. Table 5.6 provides a summary.

Self management skills 自我管理技能 (S-11)	**'Asian College' staff**	**'Northern College' staff**	**'Asian College' student groups**	**'Northern College student groups**	**Number of responses in category**	
Very important	AC-SAO (1st) AC-4 (=1st) AC-6 (=1st) AC-HoD (5th) AC-1 AC-3 AC-7	NC-6 (5th) NC-4	AC-G1 AC-G2 AC-G3 AC-G4 AC-G7 AC-G8	NC-G1	13	3
Important		NC-HoD NC-2 NC-5	AC-G5 AC-G6	NC-G2 NC-G3 NC-G4 NC-G5 NC-G6 NC-G7	2	9
Not important/relevant (or interviewee claims is less important/ relevant))		NC-1 NC-3			-	2
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-5 AC-8				3	-
	10	7	8	7	Total: 32	

Table 5.6: Views of self management skills

Seven interviewees at 'Asian College' place this skill in the 'very important' category. The head of department ranks self management skills fifth while the SAO officer ranks it first because:

> I think everything is about self management ... if you can manage your emotion you can manage your time (AC-SAO).

Generally teaching staff at this college value self management highly. Two interviewees (AC-4, AC-6) include it in a group of four 'most important' skills (although their four are not identical, they do agree on communication and self management). It may be that this is a skill area lacking in Hong Kong students joining straight from school. One comments that:

> Perhaps our students cannot learn this [self management skill] very much before joining this college. I think this is helpful for them, to make plans, to organise (AC-6).

One respondent thinks problem solving is a 'primary skill' (AC-7) and another (AC-1) that it is an 'implicit skill' that comes up naturally in the course. For one teacher self management skills are grouped with teamwork and communication as 'important' (AC-3). However three interviewees do not mention this skill among their 'very important' skills.

At 'Northern College' two interviewees suggest that self management is 'very important' although perhaps for different reasons. One comments that this is particularly true of their higher level students:

> I think a student leaving us at HE level will ...[be] good at problem solving, numeracy is fairly good, communication, self management. I would put them in that order (NC-6).

The other view (NC-4) is that self management is a 'basic level' skill, part of the foundation that other skills build upon.

The head of department places self management in a 'managing and organising' group (that also comprises business management, planning and organising, initiative and enterprise) but this group is not as important as other skill areas. He does see self management as relevant to his students because it contains elements of planning and time management and he comments that these feature in the engineering curriculum mainly in terms of project management. Two interviewees agree with the head that self management is 'important' and one person (NC-2) comments that self management is a 'less academic, physical processing skill'. Other staff rank self management quite low on their hierarchical list (NC-1) or consider it 'less important' (NC-3).

Students at 'Asian College' rate self management skills more highly than 'Northern College' students. At 'Asian College' six student groups think that self management skills are 'very important' and two groups that they are 'important'. However at 'Northern College' only one group thinks that they are 'very important' while six student groups feel that self management skills are 'important'. Student views therefore appear to accord with the views expressed by their teachers.

=4. Technical skills 技術使用技能

The development of technical skills is traditionally a core element of all engineering courses and regarded as essential to successful engineering practice (Walkington, 2002). Back and Saunders (1998) report that practitioners require entry-level engineers to possess sound analytical and technical skills and that most are realistic about how much technical education could be provided within the curriculum (their focus was undergraduates). Several of their survey participants suggest that specific technical skills required for a job could, and perhaps should, be taught on the job. This is in line with a larger scale study by Hissey (2000) who concludes that successful entry-level professional engineers possess fundamental technical skills which employers can build on. A 'solid technical education' allows new employees to quickly develop additional technical expertise and to assimilate organisational procedures, systems, products, customer requirements and objectives fairly easily (Hissey, 2000).

Engineering technicians are required to "use engineering knowledge and understanding to apply technical and practical skills" (Engineering Council UK, 2005. p.6) and this is the first area in which they must demonstrate competency if they wish to register. Two elements are highlighted: the ability to review and select appropriate techniques, procedures and methods to undertake tasks and the ability to use appropriate scientific, technical or engineering principles. This linkage of knowledge and skill highlights the difficulty of separating these two elements for curriculum purposes. It also raises questions about what distinguishes a 'technical' from a 'practical' skill.

The development of technical skills is a major curriculum element at 'Asian College'. It is a 'core skill' (AC-1) that is an integral part of the engineering courses. For example:

> Here we train a student to be a good technician so to them technical skill is fundamental (AC-3).

Furthermore it would appear that the department is successful in developing students' technical skills. The head of department reflects positive employer feedback in this statement:

> There are some very consistent views over the years now ... they [employers] are quite happy with our students' technical skills (AC-HoD).

A similar primary focus on technical skills is also clear at 'Northern College' where there is pressure to fit everything into the curriculum:

> You have to prioritise what they [students] actually do ... at the end of the day we've got to make sure that they are technically competent more than anything else (NC-HoD).

However, when interviewees were asked to consider all fourteen skills on the cards technical skills were not a top priority in either department. Among staff the picture is mixed with some interviewees rating this skill highly, some thinking it important, some claiming it is less important and some, particularly at 'Asian College', not discussing it as all among their 'most important' skills requirements. Table 5.7 summarises the views.

Technical skills 技術使用技能 (S-13)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-HoD (4th) AC-1 AC-3 (4th) AC-8 (5th)	NC-2 (1st) NC-4	AC-G3 AC-G2 AC-G6 AC-G7	NC-G1 NC-G2 NC-G3 NC-G4 NC-G6 NC-G7	8	8
Important	AC-7	NC-HoD NC-5	AC-G1 AC-G4 AC-G5 AC-G8	NC-G5	5	3
Not important/relevant (or interviewee claims is less important/ relevant)		NC-3 NC-1 NC-6			-	3
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-4 AC-5 AC-6 AC-SAO				5	-
	10	7	8	7	Total: 32	

Table 5.7: Views of technical skills

In 'Asian College' technical skills are ranked quite highly by four interviewees who place them forth or fifth or describe them as 'core'. However one interviewee (AC-7) describes 'technical skills' as 'secondary' (along with technology, numeracy/analytical skills) and four interviewees (who only identify what they consider 'very important/most important' skills) did not include technical skills at all. In 'Northern College' there is also a mixed picture. 'Technical skills' are rated a 'main skill' (NC-2) and consequently 'very important' by two interviewees and 'intermediate' or 'important' by two interviewees including the department head. However three people consider 'technical skills' as 'less important' with one ranking them twelfth (NC-1) and another ranking them last in their list (NC-6). This split may be because some staff equate technical skills with subject knowledge or because they see technical skills being mainly developed in the workplace.

Student groups seem to value technical skills more highly than their teachers. It may be that for them technical knowledge and technical skills are hard to separate. At 'Asian College' there is an even split between the student groups. Four groups that think technical skills are 'very important' and four groups place it in the 'important' category. At 'Northern College' five groups rate technical skills as 'very important' and one group places this skill as 'important'. This shows a greater emphasis on technical skills among 'Northern College' students than 'Asian College' students. It may be that 'Northern College' students (taking National Diploma or Higher National Diploma level courses) see a direct path from college into employment whilst many 'Asian College' students see opportunities to progress into higher education when they have completed their Higher Diploma.

> Each year around 20-30% of our students will join the full-time degree course … a lot of our students, they work in society and then they will take a part-time degree course (AC-7).

As a consequence technical skills may appear more directly relevant to 'Northern College' students' jobs and aspirations than those of 'Asian College' students.

=4. Numeracy skills 數字運用技能

It is perhaps surprising that numeracy skills should be seen as 'additional' skills rather than central to the work of engineering technicians. Technician courses in Canada are approved by the Ministry of Education and are required to meet a number of standards, including vocational standards, generic skills standards and general education standards and in these there is a clear emphasis on numeracy (see for example the standards for the education and training of mechanical engineering technicians http://www.edu.gov.on.ca/eng/general/college/progstan/techno/mechengtechn.html). An explicit link is made between numeracy skills and application of mathematical techniques which are in turn connected to effective problem solving and decision making. However in both the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005) and BTEC specifications for engineering Higher Nationals, numeracy skills are not prominent. It may be that numeracy is subsumed in engineering knowledge, hence being in 'Section A. Use engineering knowledge and understanding to apply technical and practical skills' requiring a technician to demonstrate an ability to review and select appropriate techniques, procedures and methods to undertake tasks and use appropriate scientific, technical or engineering principles. Other UK sources are more specific. For example advice given by Learndirect (2007) to people thinking about becoming technicians in the mechanical engineering is that they should have an aptitude for maths while electrical engineering technicians in addition should have good numeracy skills.

Hong Kong's education system places a high value on mathematics. In a recent OECD study (2004) that investigated 15 year olds' scholastic performance, Hong Kong students ranked first in mathematics and third in both science and problem solving. The UK as a whole was excluded from this study for failing to provide enough results. Given the Leitch review (2006) claims that "almost half of adults are not functionally numerate" (p1) it is likely that the education system in the UK is generally failing to provide school leavers with adequate numeracy skills which in turn has a direct impact on the education and training of engineering technicians. It might be expected that staff at 'Asian College' have fewer concerns about the numeracy skills of their students than those at 'Northern College.'

The results from this study show that 'Northern College' students and staff value numeracy skills more highly than those at 'Asian College'. Table 5.8 summarises the results.

Numeracy skills **數字運用技能** (S-8)	**'Asian College' staff**	**'Northern College' staff**	**'Asian College' student groups**	**'Northern College student groups**	**Number of responses in category**	
Very important	AC-1	NC-HoD (hub) NC-6 (2nd) NC-2 (=2nd) NC-1 (3rd) NC-3 NC-4	AC-G1 AC-G3 AC-G5 AC-G8	NC-G1 NC-G2 NC-G4 NC-G5 NC-G6	5	11
Important	AC-7	NC-5	AC-G2 AC-G4 AC-G6 AC-G7	NC-G3 NC-G7	5	3

Not important/relevant (or interviewee claims is less important/ relevant))	AC-HoD AC-3				2	-
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-4 AC-5 AC-6 AC-8 AC-SAO				6	-
	10	7	8	7	Total: 32	

Table 5.8: Views of numeracy skills

At 'Asian College' there is a low level of consensus among staff about numeracy skills. They do not appear to value numeracy highly, perhaps because their incoming students are quite competent and handle the mathematical element of the courses without major problems. One interesting comment concerns student weakness if numeracy is equated with analytical skills:

> Here I think is the analytical skills, not only calculation. This one [numeracy] will not be for our students, they are not strong in this part (AC-7).

For this interviewee numeracy is a 'secondary skill' and for five of his colleagues it does not feature in their 'most important' skill lists.

For one interviewee (AC-1) numeracy is a 'core skill' that comes up naturally in the courses and another person comments that:

> If they go out to work it [numeracy] is not that important (AC-3).

The 'Asian College' department head only ranks numeracy tenth (out of twelve skills) also indicating it is not a priority skill area. This is in stark contrast to the 'Northern College' head for whom numeracy (along with problem solving) is at 'the hub' of the curriculum:

> If you can't do the maths then you can't be an engineer. It's as simple as that because engineering is basically applied maths (NC-HoD).

This view of numeracy as a very important skill area is certainly shared by five colleagues. One sees numeracy as an 'important' skill (NC-5) but none place it as 'less important'.

Four student groups at 'Asian College' think numeracy is 'very important' whilst the remaining four groups think it is 'important'. Five student groups at 'Northern College' think numeracy is 'very important' including two groups that rank it fourth in their 'top 5'lists. Two groups think numeracy skills are 'important'. So it appears that 'Northern College' student groups give numeracy a slightly higher value than 'Asian College' student groups and follow their teachers' lead. Numeracy is a key skills qualification in the UK, so it is perhaps unsurprising that students and staff value this skill highly.

5. Critical thinking skills批判思考技能

In both 'Asian College' and 'Northern College' there is a divergence of opinions about the importance of critical thinking skills with very low levels of consensus, particularly among staff. Table 5.9 provides a summary.

Critical thinking skills 批判思考技能 (S-4)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-6 (=1st) AC-5 (=5th) AC-HoD (6th) AC-8 (6th)	NC-1 (6th) NC-2	AC-G2 AC-G3 AC-G5	NC-G1 NC-G3 NC-G4 NC-G6 NC-G7	7	7
Important	AC-3	NC-6	AC-G1 AC-G4 AC-G6 AC-G8	NC-G2 NC-G5	5	3
Not important/relevant (or interviewee claims is less important/ relevant)	AC-1 AC-7	NC-3 NC-4 NC-5	AC-G7		3	3
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-4 AC-SAO	NC-HoD			3	1
	10	7	8	7	Total: 32	

Table 5.9: Views of critical thinking skills

Critical thinking is seen as very important by four staff in 'Asian College', including the head and 'important' by one, but it is seen as a less important 'higher level skill' by two interviewees. It is a skill that students find difficult perhaps because of a legacy of rote learning developed whilst at school:

> Critical thinking is a flaw – somehow I don't know, may be it is the way we teach in school here – there are many things to learn and then regurgitate. Every time you ask them to answer questions they don't want to ask, it is very passive (AC-1).

Another interviewee (AC-6) suggests that although critical thinking (and he particularly comments on analysis) can be taught, there are some elements that can only be developed through experience. At 'Northern College' critical thinking is 'less important' to three interviewees and to the department head. This may match the view of other members of staff (NC-2, NC-4) who identify it as a 'higher level' skill that is not directly applicable to the majority of their students at this time. This accords with the view of Walker and Finney (1999) who suggest that a developed capacity for critical thinking is 'designed in' to HE programmes.

No student groups rank critical thinking in their 'top 5' of the most important skills and attributes. However three groups at 'Asian College' consider it as 'very important', four as 'important' and one as 'not important/not relevant'. Students at 'Northern College' appear to give this skill more value than their teachers. Five groups think it is 'very important' and the two other groups think critical thinking is 'important'.

6. Planning and organising skills 組織及計劃技能

In the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005) there is a requirement to demonstrate an ability to 'identify, organise and use resources effectively to complete tasks, with consideration for cost, quality, safety and environmental impact' and to 'accept, allocate and supervise technical and other tasks'. Both of these requirements demand planning and organising skills. For example Industrial Engineering technicians:

> Typically plan their own daily activities, prioritizing tasks to ensure maximum efficiency, and taking into account the extent to which scheduled tasks such as time studies and layout plans will involve other departments and operations. There are frequent interruptions to their daily schedule and a high degree of integration of their own planning with the work plan of the project development and design departments is required (Industrial Engineering and Manufacturing Technologists and Technicians Essential Skills Profile NOC 2233, undated).

In an educational setting, students are more likely to see planning and organising in terms of their coursework activities, workshop sessions, project work and preparation for examinations or tests. In this study staff views in both colleges are divided, while student groups at both colleges see the importance of planning and organising skills. Planning and organising skills are a BTEC requirement for engineering Higher Nationals. Table 5.10 provides a summary.

Planning and organising skills 組織及計劃技能 (S-9)	**'Asian College' staff**	**'Northern College' staff**	**'Asian College' student groups**	**'Northern College student groups**	**Number of responses in category**	
Very important	AC-2 (=1st) AC-8 (1st) AC-1 AC-7	NC-6 (6th) NC-5	AC-G3 AC-G5 AC-G6 AC-G8	NC-G1 NC-G2 NC-G4	8	5
Important	AC-HoD	NC-HoD NC-1 NC-2	AC-G1 AC-G2 AC-G4 AC-G7	NC-G3 NC-G5 NC-G6 NC-G7	5	7
Not important/relevant (or interviewee claims is less important/ relevant))	AC-3	NC-3 NC-4			1	2
Not ranked/discussed (and assumed not to be 'very important')	AC-4 AC-5 AC-6 AC-SAO				4	0
	10	7	8	7	Total: 32	

Table 5.10: Views of planning and organising skills

At 'Asian College' opinions vary considerably about how important planning and organising is as a skill. One interviewee ranks it first because:

> If people cannot plan, cannot organise, they will make a mess because most of our students when they graduate will be [employed in] a supervising job (AC-8).

One colleague agrees that planning and organising is a 'primary skill' (AC-7) while another thinks that it is one of four 'most important skills' (AC-2) suggesting that being able to complete tasks on schedule requires careful planning. Another person (AC-1) considers this skill to be 'implicit' in the course (a group that is different from those skills that are 'core' and those that are 'higher level'). However the department head only ranks this skill seventh (out of twelve) so consequently this is placed in the 'important' category, while one interviewee thinks it 'not important'. Four interviewees do not include planning and organising among their few 'most important' skills for engineering technician students.

At 'Northern College' there are also diverse opinions about planning and organising skills. The head of department places them in a group that includes managing yourself, business management, initiative and enterprise. However this grouping (four) sits below the 'hub' (problem solving and numeracy) and two parallel groups (learning, communication and information literacy in group two, technical skills and teamwork in group three) so can be seen as of mid-rank importance, and two colleagues agree although it may also be because planning and organising is seen as 'less academic' (NC-2) and to do with presentation rather than process:

> Planning and organising is important to get your work into the right format (NC-2).

Two interviewees rate planning and organising skills as 'very important' but two others think them 'less important'. As with 'Asian College' above, there is a divergence of opinions about this skill area among academic staff.

In terms of attitudes to planning and organising skills, student group views at both colleges are similar, generally valuing it more highly than their teachers. At 'Asian College' three groups see it as 'very important' and one group (AC-G8) ranks it third in their 'top 5' skills. Four other groups think it 'important'. At 'Northern College' two groups see it as 'very important' and one group (NC-G4) ranks it fifth in their 'top 5'. Four groups think it 'important'. It may be that because students spend a lot of time planning and organising their college work and other activities they consequently see this skill as useful.

7. Information literacy skills 資訊知識技能

Information literacy is one element of information technology (IT as it is called in Hong Kong) or information communication technology (ICT as it is known in the UK). Information literacy involves seeking, managing, analysing and using information critically and intelligently. The Education and Manpower Bureau in Hong Kong signalled its commitment to information technology in the school curriculum (Hong Kong Education Bureau, 1998) with a vision of education and school settings in which students were more motivated, inquisitive and creative, could acquire a global knowledge base, could process information effectively and develop the attitude and capability for lifelong learning. The use of IT as a tool for enhancing the effectiveness of learning and teaching is an underpinning element (Kennedy, 2005) with an expectation that students will be more engaged in higher order learning; and learn to be more discerning in their selection of information from external sources, cooperative learning and problem solving are promoted and students learn metacognitive skills (Board of Studies NSW, 1999). Thus the development of good information literacy is a skill closely linked to modern teaching and learning methods.

However, it may be that using the term 'information literacy' rather than 'information technology' caused some confusion to respondents, particularly at 'Asian College' where staff tended to talk about computer use so this skill is perhaps not clearly understood or the translation into Chinese was not clear enough. In the key skills framework used at 'Asian College', managing information is a 'fundamental skill' and perhaps using this terminology would have been better. However also at 'Northern College' the term ICT was most commonly used with a similar focus on the technological issues rather than the literacy aspect of computer/internet use. The summary of the expressed views is in Table 5.11.

Information literacy skills 資訊知識技能 (S-5)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-1 AC-7	NC-2 (=2nd) NC-6 (3rd) NC-1 (5th) NC-HoD NC-3 NC-4	AC-G4	NC-G1 NC-G2 NC-G6	3	9
Important	AC-8	NC-5	AC-G3 AC-G5 AC-G6 AC-G7 AC-G8	NC-G3 NC-G4 NC-G7	6	4
Not important/relevant (or interviewee claims is less important/ relevant))	AC-HoD AC-3		AC-G1 AC-G2	NC-G5	4	1
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-4 AC-5 AC-6 AC-SAO				5	-
	10	7	8	7	Total: 32	

Table 5.11: Views of information literacy skills

There is no consensus among 'Asian College' respondents. Information literacy comes very near the bottom of skills students require according to the department head at 'Asian College' and this view is shared by another staff member (AC-3) for whom it is 'less important'. Four colleagues do not include it among their list of very important skills and neither does the SAO Officer. One member of staff (AC-8) places it eighth (thus in the 'important' category) and another (AC-7) suggests it is one of a group of nine equally important 'primary skills'. Another person (AC-1) suggests that information literacy is an 'implicit skill' by which he means that students pick it up as the course progresses without it being explicitly taught. His view is that these are 'very important' for students.

At 'Northern College' information literacy is more highly valued by staff than at 'Asian College'. This may be a consequence of ICT being one of the taught and assessed key skills qualifications at the college as indicated by one interviewee (NC-3) who comments that employers expect the five key skills. The head of department includes information literacy in a group of skills that also includes communication and learning skills. Other members of staff see information literacy as a 'main skill' that ranks second (NC-2), third (NC-6) or fifth (NC-1) or 'very important' (NC-4). One person includes information literacy as an 'important skill' (NC-5).

The majority of student groups at 'Asian College' (five groups) think information literacy is 'important' and one group see it as 'very important'. However two groups see it as 'not important/relevant'. At 'Northern College' there is also a spread of opinion with three groups seeing it as 'important' and three groups as 'very important'. One group sees information literacy as 'not important/relevant'. Generally then, students at this college do not see information literacy as being as important as their teachers do.

8. Creative thinking skills 創意思維技能

Creative thinking is claimed to be an integral part of problem solving (Houghton, 2006; Standler, 1998) particularly in relation to engineering design. Creativity is subject to many definitions, but is usually defined as "the production of a result or idea that is new and valued" (Hsiao and Liang, 2003) or even more briefly as "shared imaginations" (DeWulf and Baillie, 1999). There have been recent calls for education systems to contribute towards development of creativity and creative problem solving (Craft, 2003). Chen, Jiang and Hsu (2005) claim that there are few studies on fostering industrial engineering students' creativity and that the area that is not well understood. Whilst this may be true, there is evidence that creative thinking is expected (Pujol, 1998, Siu, 2000) particularly among engineering design students. In the UK in May 2002, a symposium addressed the issue of developing innovative and creative science and engineering graduates. Since then the Higher Education Academy has developed resources and commissioned studies about creativity (for example, Jackson and Shaw, 2005). Pujol (1998) makes an interesting point that the type of creativity expected from technical college graduates is different from that expected from university undergraduates and postgraduates. This seems to accord with views expressed above, of creative thinking as a 'higher level' skill, or at least one that operates on a continuum from simple to complex.

Creative thinking is among the BTEC requirements for engineering Higher Nationals. This study found low levels of consensus about creative thinking, especially among staff. Table 5.12 summarises the views.

Creative thinking skills 創意思維技能 (S-3)	**'Asian College' staff**	**'Northern College' staff**	**'Asian College' student groups**	**'Northern College student groups**	**Number of responses in category**	
Very important	AC-SAO (4^{th}) AC-5 (=5^{th}) AC-7	NC-1 (4^{th}) NC-2 NC-3	AC-G2	NC-G3 NC-G5 NC-G6 NC-G7	4	7
Important	AC-HoD	NC-6	AC-G3 AC-G4 AC-G5 AC-G8	NC-G1 NC-G2 NC-G4	5	4
Not important/relevant (or interviewee claims is less important/ relevant))	AC-1 AC-3	NC-4 NC-5	AC-G1 AC-G6 AC-G7		5	2
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-4 AC-6 AC-8	NC-HoD			4	1
	10	7	8	7	Total: 32	

Table 5.12: Views of creative thinking skills

Creative thinking appears less highly valued at 'Asian College' than problem solving or critical thinking. This may be because the role of a technician is seen as primarily to diagnose problems and work through procedural solutions. For example:

> For engineering students, I don't know if they need this [creative thinking]. They should know how to solve [a] problem logically; how to do it step by step. I think this is enough (AC-3).

However, other staff members see creative thinking as crucial, and something that is missing in much Chinese education:

> The world is always changing, so we need some new ideas to deal with problems, to make the job much better. I think this is particularly important in Chinese community – we don't teach – we don't train [students] to be very creative (AC-SAO).

Creativity is an issue that is being addressed in the Education Reforms in Hong Kong. Kennedy (2005) suggests that creativity, problem solving and entrepreneurship are at the heart of "modern growth theory" (p11) and are being embedded in the proposals for school curriculum reform. This theory requires students to spend time in areas that have potential to enhance economic growth in a knowledge-based economy. As previously discussed (Section 2.4) the planned curriculum reform in Hong Kong includes creativity along with problem-solving and critical thinking skills among the generic skills that students should develop at school level and beyond. It may be that problem solving as a perceived area of deficiency will be improved in the future.

One lecturer at 'Asian College' considers critical thinking a 'higher level' skill (AC-1) and a colleague concurs that it is not relevant. Three people though value it highly. However the head places it ninth in his 'top down' list (and consequently 'important') and a colleague (AC-3) considers it less important than other skills. Four interviewees do not include creative thinking among their 'most important' skills.

For some staff at 'Northern College' creative thinking is a 'higher level' skill, although attitudes are divergent: some discuss this as a positive thing (NC-2) and others as less relevant for technicians (NC-4). However, a view expresses a role for creative thinking at the technician level:

> For technicians ... creative thinking is a way of helping the company make progress and help themselves make progress (NC-1).

Overall, three people identify creative thinking as 'very important', with one of these (NC-3) suggesting that employers value creative thinking highly and bundling critical thinking with teamwork, problem-solving and communication as employers' major skill requirements when hiring students. In addition, one staff member sees creative thinking as 'important' and two as 'less important'. The head of department does not discuss creative thinking and it is therefore assumed to be a less important skill to him.

Among the student groups at 'Asian College' there is a split: four groups think creative thinking is 'important', and three place creative thinking in the 'not important/not relevant'category. In contrast, 'Northern College' students are much more positive about the value of creative thinking. Four groups think it 'very important' including one group who rank it equal third of their 'top five' with critical thinking (NC-G6). The three other groups view critical thinking skills as 'important'.

These low levels of consensus among students and staff indicate that creative thinking is a skill that is not a well defined curriculum area at either 'Asian College' or 'Northern College'.

9. Technology skills 科技技能

Technology is a broad concept and one that is difficult to define adequately. In the context of engineering, technology skills are closely tied to the area of specialism being studied or practised. Technology can refer to material objects (machines, equipment, hardware) but may also encompass software, systems, methods of organisation and techniques and tools. Technology is a practical consequence of engineering that draws on a scientific knowledge base. Science, engineering and technology are often bracketed together and known as SET (DTI, 2006). It might be expected that students being educated and trained as engineering technicians would develop technology skills appropriate to their academic course and intended work situation. However it may be that this is an area more closely linked to the workplace and that organisations expect to train technicians to use specific types of technology 'on the job'.

In terms of the study findings, consensus about technology skills, except among 'Northern College' students, is low. Table 5.13 provides a summary.

Technology skills 科技技能 (S-14)	**'Asian College' staff**	**'Northern College' staff**	**'Asian College' student groups**	**'Northern College student groups**	**Number of responses in category**	
Very important	AC-1		AC-G3 AC-G7	NC-G4 NC-G5 NC-G1 NC-G6	3	4
Important	AC-5 AC-7	NC-2 NC-4 NC-6	AC-G2 AC-G4 AC-G6 AC-G8	NC-G2 NC-G3 NC-G7	6	6
Not important/relevant (or interviewee claims is less important/ relevant))	AC-3	NC-1 NC-3 NC-5	AC-G1 AC-G5		3	3
Not ranked/discussed (and assumed not to be 'very important')	AC-HoD AC-2 AC-4 AC-6 AC-8 SAO	NC-HoD			7	1
	10	7	8	7	Total: 32	

Table 5.13: Views of technology skills

At 'Asian College' there is a wide spread of opinion. The department head does not place this skill at all, nor do five other staff and one colleague suggests it is 'less important'. However one person (AC-7) places technology skills as one of four 'secondary skills' and therefore 'important' and another ranks it seventh ('important') with a rather cryptic comment that:

> Most employers want you to upgrade yourself, this is the technology (AC-5).

However one interviewee (AC-1) does consider technology to be a very important skill, claiming it is a 'core skill' that comes up 'naturally' in the courses.

At 'Northern College' technology skills are not placed by the head of department. They are ranked last by one study participant (NC-1) and are claimed to be 'less important' by two people (NC-3, NC-5) and in a group of 'less academic' skills by another colleague (NC-2) although for him they are still important. One person (NC-4) includes technology skills as an 'intermediate level' skill and they are ranked eighth by another interviewee (NC-6) which makes them 'important'.

Student groups at 'Asian College' express a mixed views. One group ranks it fifth in their 'top 5' and another agrees it is 'very important'. Four groups think technology skills are 'important'. However two groups think they are 'not important/relevant'. Students at 'Northern College' are generally more positive about technology skills with two groups ranking them fourth, and two agreeing that they are 'very important'. The remaining three place technology skills as 'important'.

10. Initiative and enterprise skills 主動及企業技能

As modern economies have developed there has been a shift in employment culture from one of dependency on few large employers, to one comprising 'portfolio' careers which might include contract employment and periods of self employment (Dearing, 1996). Certainly in Higher Education, there has been some pressure, not least from the Department of Trade and Industry (DTI, 2000-2001) in Britain to encourage the provision of enterprise (entrepreneurship) education. Keogh and Galloway (2004) identify a range of "enterprise-type activities" (p536) in which chartered engineers may be involved throughout their careers, such as management of major projects, assessment of risk, development of business strategies, management of people and business start-ups. However it is debatable if these are relevant to engineering technicians' work. Table 5.14 provides a summary of the findings from this study which indicates a mixed picture of values about this skill.

Initiative and enterprise skills 主動及企業技能 (S-6)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-6 (=1st) AC-7	NC-2 NC-4	AC-G5	NC-G5	3	3
Important	AC-HoD AC-8	NC-HoD NC-5	AC-G1 AC-G3 AC-G7	NC-G1 NC-G3 NC-G6	5	5
Not important/relevant (or interviewee claims is less important/ relevant))	AC-1 AC-3	NC-1 NC-3 NC-6	AC-G2 AC-G4 AC-G6 AC-G8	NC-G2 NC-G4 NC-G7	6	6
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-4 AC-5 AC-SAO				4	-
	10	7	8	7	Total: 32	

Table 5.14: Views of initiative and enterprise skills

Several interviewees commented that initiative and enterprise would be better split into two areas and there was some confusion, particularly among the Chinese participants about this category; in particular they wanted to discuss having initiative or taking initiative, which might be better in the 'attributes' category. It may be that the translation was a contributory factor in promoting this; the results should therefore be treated with caution and any future study might prefer to use the single term 'enterprise skills'. Bearing this in mind, the staff at 'Asian College' do not generally see initiative and enterprise as a particularly important skill, for example:

> Enterprise, no – when they come here choosing engineering they are less inclined that way (AC-1).

The department head places this skill as 'important' (ranking it eighth and therefore 'important') as does another staff member (AC-8) for whom this is the case if initiative (but not enterprise) are included. Two people think it is 'not important' and four do no include it in their 'very important' lists. In contrast, some interviewees see initiative and enterprise as a 'primary skill' (AC-7) or as 'very important' (AC-6). The latter sees initiative and enterprise among four 'most important' skills; the others being critical thinking, communication and self management. However, overall, the level of consensus is low, also the case at 'Northern College'.

At 'Northern College' there is some support for initiative and enterprise skill from the head of department. He places it in a 'managing and organising' group with a comment about its increasing relevance:

> The entrepreneurial business side – in engineering we need to help manage the business, what are the new markets that we need to start looking into? (NC-HoD).

A colleague (NC-2) identifies initiative and enterprise as a 'higher level' skill, while it is also seen as 'important' by one teacher (NC-5) and as an 'intermediate' skill by another (NC-4) (equating to 'important' rather than 'very important'). In contrast, three participants either rank it towards the bottom of their lists (NC-1, NC-6) or think it 'less important' (NC-3).

Student groups express a range of opinions about this skill. At 'Asian College' one group thinks initiative and enterprise 'very important' although none place it in their 'top five'. Three groups think it 'important' but four groups think it 'not important/not relevant'. At 'Northern College' there are similar results. One group thinks it 'very important' but not in their 'top five' and three groups think it 'important'. Three groups think initiative and enterprise skill is 'not important/not relevant'.

11. Business management skills 商業管理技能

Employers increasingly expect graduate level engineers to have an understanding of fundamental business principles (Back and Saunders, 1998). Even entry-level engineers need to understand that engineering is a business and that business failure is usually the result of poor business skills rather than poor technical skills. As a result they should appreciate the need for quality service, responsiveness and relationship building. However it is not clear the extent to which such business management skills are relevant to engineering technicians in their daily work. In this study, business skills are a low priority area, and are the skills least valued by respondents as can be seen in the summary Table 5.15.

Business management skills 商業管理技能 (S-1)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important		NC-2			-	1
Important		NC-HoD NC-5	AC-G3 AC-G6	NC-G7	2	3
Not important/relevant (or interviewee claims is less important/ relevant))	AC-HoD AC-1 AC-3 AC-7	NC-1 NC-3 NC-4 NC-6	AC-G1 AC-G2 AC-G4 AC-G5 AC-G7 AC-G8	NC-G1 NC-G2 NC-G3 NC-G4 NC-G5 NC-G6	10	10
Not ranked/discussed (and assumed not to be very important)	AC-2 AC-4 AC-5 AC-6 AC-8 AC-SAO				6	-
	10	7	8	7	Total: 32	

Table 5.15: View of business management skills

At 'Asian College' business management is generally seen as not important or not relevant. The department head ranks it last in his hierarchical list and no colleagues see it as at all important. For example:

> For the engineering student [business management skills] are a little bit far away from them (AC-7).

A colleague echoes this view, commenting that business management is a 'higher level skill' and that:

> We don't teach business, that's not for us (AC-1).

However at 'Northern College' a mixed picture emerges about how business management skills are viewed and valued. The head of department puts together a group of 'managing and organising' skills that includes business management. He says that students study Business Management units at National level, at HND and HNC levels and clearly wishes more could be done:

> We don't use it [business management] as much as we could do, but it's all down to what do you take out so that you can put it in? (NC-HoD).

It may be that he is in tune with local industry requirements because as a colleague who rates business management as an 'important' skill comments:

> We think of industry ... I think it's got to be taken on board a bit more now ... I think everybody needs to be involved with business management type skills (NC-5).

Two interviewees identify business management as a 'higher level' skill (NC-2, NC-4) indicating that it is not relevant to their students. Three people place business management definitely as a 'less important' skill.

Six 'Asian College' student groups see business management skills as 'not important/not relevant'. Two groups see them as 'important'. Six 'Northern College' student groups agree business management is 'not important/not relevant' with one group thinking it is 'important.'

In the context of 'Asian College' it appears that staff agree that business management skills are not important and students recognise this. However in 'Northern College' while students clearly don't value business management skills, and their teachers are generally of the opinion that they are not relevant, there may be more ambiguity about the place of business management skills in the curriculum.

12. Language skills (foreign language)

Interviewees were asked if there were any other skills that were not included in the set of cards that they thought important for their students. The head of department at 'Northern College' identified 'foreign language skills' as an area he was investigating. However a lack of funding for language education was a problem that required careful consideration of priorities:

> There is this thing called the LSC [Learning and Skills Council] taper, which we can only draw down so much funding per student and we've decided that practical skills in the workshop are more important than foreign language skills (NC-HoD).

However, the head sees lack of foreign language skills holding engineering back in the UK because of not being able to fully participate in global markets:

> We sell most of our engineering business to English speaking countries or English speaking businesses – we sell very little to non-English speaking businesses and we import more goods from them than we actually export.... It's down to communications in a sense, but it's language communication which is a thing we need to develop (NC-HoD).

In the context of 'Asian College' students (who are Hong Kong Chinese and speak Cantonese) are taught in English which is the official medium of instruction. As discussed above (under communication skills) students are required at college and by employers to be competent in both Chinese and English. Increasingly, and especially for those working in mainland China, Mandarin is also required.

5.3 Conclusions

Looking at the single and multiple definitions together, two definitions stand out in each case situation. In 'Asian College' 'lifelong learning' is the dominant definition along with 'developing workplace attitudes'. For 'Northern College' staff 'vocational preparation' is the dominant definition with 'developing workplace attitudes' as a secondary definition. Although both sets of interviewees agree on the value of helping students develop attitudes to work that are required by employers, they place this in different contexts. In 'Asian College' a long term, holistic attitude to the purpose of vocational education is advocated. In 'Northern College' a tight, professional orientation is promoted. This might be a reflection of changing attitudes in England since Bolton's research (2000) or be because they are a different vocational group (engineers rather than business people). There is evidence of quite high levels of agreement and departmental understanding of institutionally promoted definitions of key skills in both contexts.

Taking the data overall, communication comes out as being the most important skill for engineering technicians. Teamwork and problem solving are ranked second, learning skills third, and self management, technical and numeracy skills are bundled together fourth. Initiative and enterprise skills and business management skills are clearly the least important/relevant skills.

Table 5.16 summarises departmental perceptions of skills in four groups ('Asian College' staff, 'Asian College' students, 'Northern College' staff and 'Northern College' students). The table presents the skills 'top down' with the UK-SPEC Engineering Technician Standard skills (Engineering Council UK, 2005) shown in green and other skills in black.

Analysis of data from the case studies reveals a mixed picture in terms of how skills are valued in the cubic curriculum. All eight of the skills identified from the Engineering Technician specification are prioritised by 'Asian College' staff members which indicates that this specification is both applicable to, and relevant to, the Hong Kong context. Other skills are shown to be viewed as less important by interviewees and student groups at 'Asian College' as might be expected.

'Northern College' respondents' views are more disparate and the distinction between 'very important' and 'less important' does not appear to follow the engineering technician requirements closely. Further research may reveal if this is because the job of an engineering technician has evolved in England since the specification was produced, or if the study participants' views were atypical. There does not appear to be as high a level of agreement among staff and student groups at 'Northern College' than at 'Asian College'. This may be because students' key skills have been debated more recently in Hong Kong than in England.

'Asian College' Staff	'Asian College' students	'Northern College' staff	'Northern College' students
Communication Teamwork Problem solving/ Learning/ Self management Technical/ Critical thinking/ Planning and organising Creative thinking Information literacy/ Initiative and enterprise Numeracy/ Technology Business management	Self management Teamwork/ Communication/ Problem solving/ Learning Technical/ Numeracy/ Planning and organising Critical thinking Technology Information literacy/ Creative thinking/ Initiative and enterprise Business management	Communication Numeracy/ Information literacy Problem solving Teamwork/ Learning/ Creative thinking Self management/ Technical/ Critical thinking/ Planning and organising/ Initiative and enterprise Business management Technology	Communication Technical Teamwork/ Problem solving/ Numeracy/ Critical thinking Learning/ Creative thinking/ Technology Planning and organising/ Information literacy Self management/ Initiative and enterprise Business management
Note: Skills in green are specified in UK-Spec for Engineering Technicians (Engineering Council UK, 2005).			

Table 5.16: Hierarchical list of views of key skills

It is possible to identify those skills which are seen as 'key' in the two case study departments. It appears that at 'Asian College' there is a high level of agreement that the following five skills are most important for engineering technicians; communication, teamwork, problem solving, learning, self management, technical (although the actual ranking varies a little) see Figure 5.1.

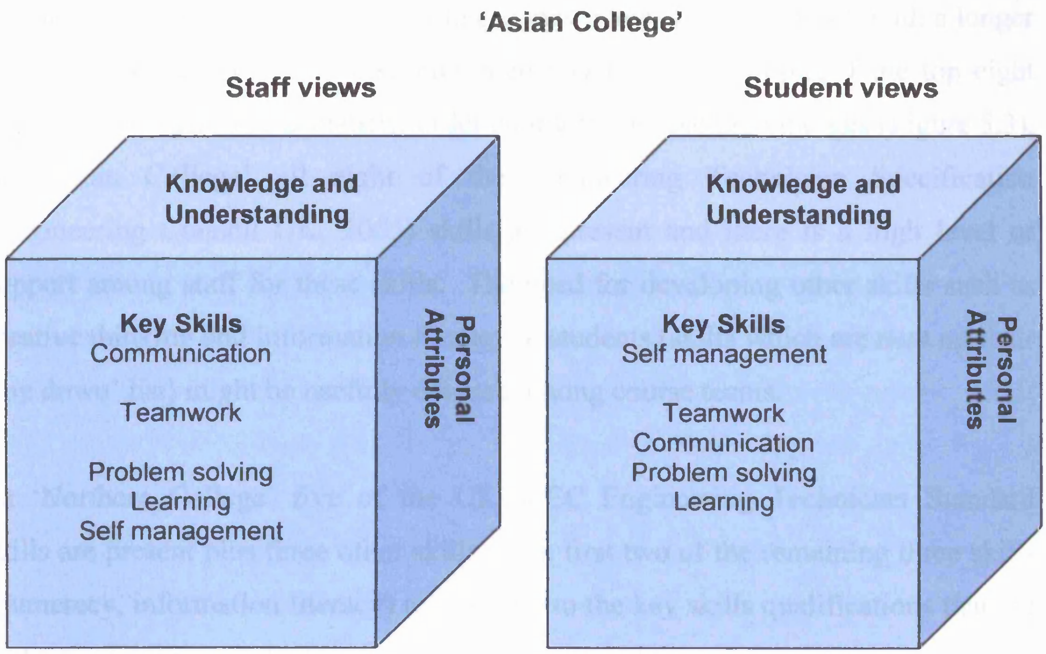


Figure 5.1: Most important skills for engineering technicians at 'Asian College'

At 'Northern College' there is consensus among staff and student groups about three skills being most important for engineering technicians: communication, numeracy and problem solving (although the ranking varies). Three other skills are highly rated among staff and student groups: information literacy (staff), technical skills and critical thinking (students), see Figure 5.2.

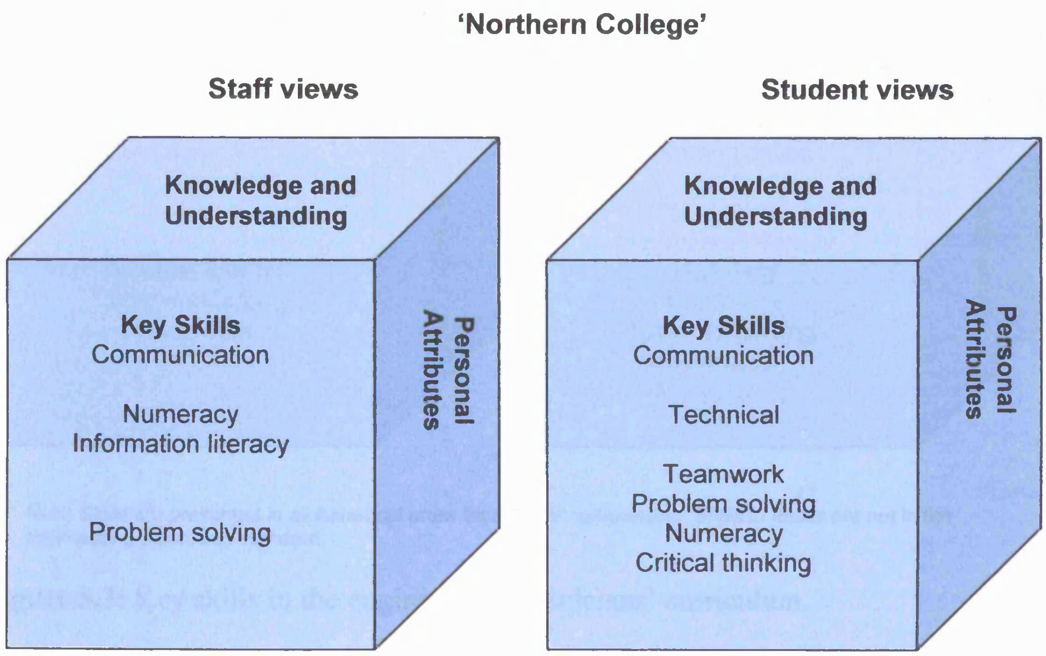


Figure 5.2: Most important skills for engineering technicians at 'Northern College'.

Curriculum planning staff at both colleges may actually need to work with a longer list of skills as 'key' than those presented above. For example, if the top eight skills are considered in alphabetic order an interesting picture emerges (Figure 5.3). At 'Asian College' all eight of the Engineering Technician Specification (Engineering Council UK, 2005) skills are present and there is a high level of support among staff for these skills. The need for developing other skills such as creative thinking and information literacy in students (skills which are next on their 'top down' list) might be usefully debated among course teams.

At 'Northern College' five of the UK-SPEC Engineering Technician Standard skills are present plus three other skills. The first two of the remaining three skills (numeracy, information literacy) correspond to the key skills qualifications that the Institution wishes students to take and therefore it is not surprising to see them prioritised. At 'Northern College' course teams might wish to consider other skills in the UK-SPEC Engineering Technician Standard (self management/ technical/ critical thinking/ planning and organising) which are next on their 'top down' lists to see how significant they are for their courses and students.

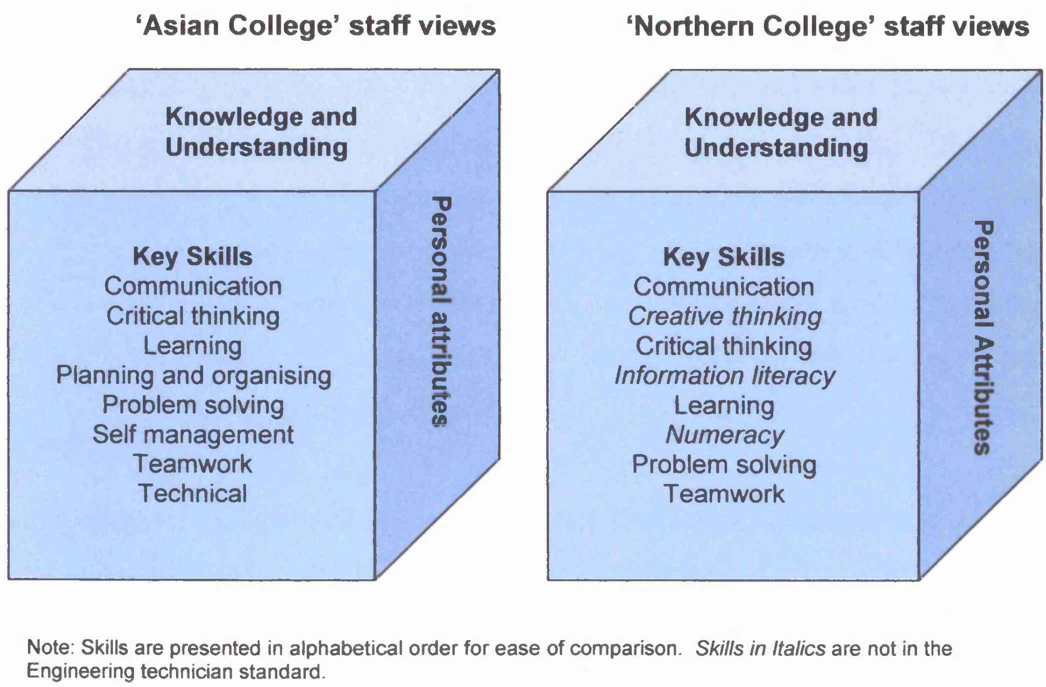


Figure 5.3: Key skills in the engineering technicians' curriculum.

Course teams in both cases may find it helpful to consider the views of influential stakeholders when determining which skills are to be prioritised. In order to maintain curriculum coherence, and in determining their desired learning outcomes, staff should consider skills alongside the other elements of the cubic curriculum: personal attributes, knowledge and understanding.

The following chapter explores personal attributes in a similar way to that used for skills. Participants' views of personal attributes are listed and discussed. Staff views about how to best develop the important attributes that they identify are considered.

6. Personal attributes

Although knowledge and skills are generally made explicit in the curriculum, personal attributes are often implicit. This may be because they are less important curriculum elements than knowledge and skills, because they are viewed as irrelevant to the curriculum, or because they have simply not been considered at all. So the views of internal stakeholders are central to understanding the place of personal attributes in the cubic curriculum. This chapter contains data from interviews and card sorting activities with heads of department, course leaders, teachers, key skills specialists and student groups. Attributes are presented in 'top down' order. Similarities and differences between cases are noted, as well as areas of agreement and disagreement between staff and student groups. Staff views of how to develop personal attributes that they perceive as important are considered. Student groups worked with a combined set of skills and attributes cards. The cards they identified as their 'top 5' most important skills or attributes are then discussed.

6.1 Personal attributes for engineering technicians

Engineering industry requirements in terms of personal attributes for technicians were discussed in Section 2.4. These included attributes identified in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005), in literature about engineering industry requirements and in international taxonomies. From these sources sixteen personal attributes were identified (Table 2.5) and used to create a card sort. During interviews (with staff) and a group-based task (with students) respondents were asked to identify which attributes they thought were most important for engineering technicians.

The findings are discussed below with attributes listed in descending order of how many individuals and groups rated each as 'very important'. It should be noted that many interviewees thought that *all* the attributes were important and found prioritising them difficult. When asked to discuss those attributes that they thought most important, many restated some and simply said that they were very important for their students. It may be that prioritising attributes is something they are less comfortable with than prioritising skills, that the terms are self-explanatory, or that they were tiring towards the end of the interview process. However, as several interviewees commented, staff may see certain attributes as important (such as common sense or a sense of humour, for example) but not feel that they can be taught. This practical issue is addressed in section 6.2.

1. Being committed 承擔及責任感

Commitment is not one of the attributes that is a priority for engineering technicians in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005). However it appears to be very important to students and staff in both case study departments. It is the attribute that is most frequently placed as 'very important' with student groups in particular seeing a link between success as an engineering student and commitment to the course and to being an engineer. Table 6.1 summarises the views.

Being committed **承擔及責任感** (A-5)	**'Asian College' staff**	**'Northern College' staff**	**'Asian College' student groups**	**'Northern College student groups**	**Number of responses in category**	
Very important	AC-HoD 5th AC-2 AC-3 AC-4 AC-6 AC-7 AC-8	NC-3 1st NC-6 1st NC-2 3rd NC-1 4th	AC-G1 AC-G2 AC-G3 AC-G4 AC-G5 AC-G6 AC-G7 AC-G8	NC-G1 NC-G2 NC-G4 NC-G5 NC-G6 NC-G7	15	10
Important	AC-1 AC-5	NC-HoD NC-5		NC-G3	2	3
Not important/relevant (or interviewee claims is less important/ relevant)		NC-4			-	1
Not ranked/discussed (and assumed not to be 'very important')	AC-SAO				1	-
	10	7	8	7	Total: 32	

Table 6.1: Views of being committed

At 'Asian College' being committed is clearly an extremely important attribute. Seven staff members view being committed as 'very important' with the head of department placing this attribute fifth in his hierarchical list. The remaining two respondents place this attribute as 'important'; none think it less important or not relevant however the SAO officer does not discuss it at all. Commitment is explicitly linked to success:

> To be committed to your job, to your course and to have some goal that you commit yourself to achieve, this is an important point because otherwise you don't have success (AC-2).

At 'Northern College' there is also clear evidence that commitment is highly valued. Two interviewees rank it first, one third and one forth. The head of department and one colleague consider it 'important' while one person thinks it a 'less important' attribute. Several interviewees gave reasons linking a need for commitment to professionalism, even in the face of low pay:

> That's probably the top of the list – being committed. ... We're trying to promote the idea of engineering of 'this is a profession you're going into, it's not a job' (NC-3).

> ... the personal things like having a sense of humour, feeling good about yourself, and so on are of value, but they come secondary to the ability to be a committed person in terms of engineering courses (NC-2).

> You're not going to get paid a lot as an engineer, so you need to be committed to engineering and enjoying the things that engineers do and seeing the purpose and potential of the work we do (NC-1).

All eight 'Asian College' student groups and six of the 'Northern College' student groups place being committed to the course and to engineering as 'very important', with one 'Northern College' student group considering it 'important'.

This heavy emphasis on commitment may also be because in an educational setting successful completion of a course requires students to turn up regularly, to participate in classes and practical sessions and to complete coursework and project work on time. Because these activities evidence commitment to teaching staff and students they are strongly promoted.

=2. Honesty/integrity 誠信

Being honest and acting with integrity is another attribute that is not identified in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005). However 'Asian College' staff and student groups in particular value this attribute highly. Table 6.2 summarises the views.

Honesty/integrity **誠信** (A-8)	**'Asian College' staff**	**'Northern College' staff**	**'Asian College' student groups**	**'Northern College student groups**	**Number of responses in category**	
Very important	AC-1 AC-2 AC-5 AC-6 AC-7 AC-SAO	NC-1 3rd NC-6 3rd NC-3 NC-4	AC-G1 AC-G2 AC-G3 AC-G4 AC-G5 AC-G6 AC-G8	NC-G3 NC-G4	13	6
Important	AC-HoD	NC-HoD NC-5	AC-G7	NC-G1 NC-G2 NC-G5 NC-G6 NC-G7	2	7
Not important/relevant (or interviewee claims is less important/ relevant)		NC-2			-	1
Not ranked/discussed (and assumed not to be 'very important')	AC-3 AC-4 AC-8				3	-
	10	7	8	7	Total: 32	

Table 6.2: Views of being honest and acting with integrity

At 'Northern College' four members of staff agree that honesty/integrity is 'very important' and of these three rank it third. The head of department and one colleague place this attribute as 'important'.

This compares with six 'Asian College' staff who place it as 'very important' and the head who places it as 'important.' One 'Northern College' staff member thinks honesty/integrity is not important/relevant. Although three 'Asian College' interviewees do not include this attribute in their short list of priority attributes this does not preclude it being relevant to them. There is some evidence that this attribute links closely to commitment:

> If you are honest, with integrity, then you must be committed, otherwise how can you be a man with integrity? That's why I say they are the same (AC-8).

Among students, seven groups at 'Asian College' place this attribute as 'very important' and one student group places it as 'important'. At 'Northern College' two of the student groups think honesty/integrity is 'very important' while five student groups agree it is 'important'.

In the skills framework used by 'Asian College', honesty and integrity feature as 'personal management skills' in terms of 'being responsible' and 'demonstrating positive attitudes and behaviours'. It may be, therefore, that these students have been encouraged to think about honesty and integrity in terms of dealing with others and in terms of academic work (avoiding plagiarism) more overtly than students at 'Northern College'.

=2. Being motivated 幹勁 / 積極性

Being motivated is another attribute that is not identified in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005) but is one that is highly valued by respondents at both case study colleges. Student groups in both departments express more consensus about the importance of this attribute than their teachers do. It may be that for students motivation is similar to commitment and demonstrated in terms of both attendance and contribution in class. Being motivated is a BTEC requirement and in the 'Asian College' skills framework 'show interest, initiative and effort' is an element of the personal management skill 'demonstrate positive attitudes and behaviours'. Table 6.3 presents a summary of the views.

Being motivated 幹勁 / 積極性 (A-11)	**'Asian College' staff**	**'Northern College' staff**	**'Asian College' student groups**	**'Northern College student groups**	**Number of responses in category**	
Very important	AC-HoD 1^{st} AC-2 AC-3 AC-7	NC-1 1^{st} NC-6 2^{nd} NC-3 =3rd NC-HoD	AC-G1 AC-G5 AC-G6 AC-G7 AC-G8	NC-G1 NC-G2 NC-G3 NC-G4 NC-G6 NC-G7	9	10
Important	AC-5		AC-G2 AC-G3 AC-G4	NC-G5	4	1
Not important/relevant (or interviewee claims is less important/ relevant)	AC-1	NC-2 NC-4			1	2
Not ranked/discussed (and assumed not to be 'very important')	AC-4 AC-6 AC-8 AC-SAO	NC-5			4	1
	10	7	8	7	Total: 32	

Table 6.3: Views of being motivated

At 'Asian College' staff express a mixed picture of the importance of being motivated. The head ranks it first and three colleagues agree that it is 'very important'. One person thinks it 'important' but four do not include it in their short list of most important attributes, so it cannot be 'very important' to them. One interviewee identifies being motivated as less relevant than other attributes. Support for the importance of being motivation is expressed in terms of it enabling people to progress:

Being motivated … because if they don't have self-motivation they will not, they cannot get a better progress in their work, or even their career (AC-2).

And, perhaps students recognise early in their academic careers that motivation is a core element:

If you praise good work and criticise poor quality work to them early on then they can change their attitudes. Those that aren't committed and motivated leave the course. We find that very early on … those that are lacking those skills take themselves off because they can't maintain the pressure and compete with their peers (NC-6).

Student groups, particularly those at 'Northern College' think being motivated is a 'very important' attribute. Six 'Northern College' student groups and five 'Asian College' groups place being motivated in the 'very important' category. One 'Northern College' student group and three 'Asian College' student groups place it in the 'important' category.

=2. Being reliable 可靠性

Being reliable is an attribute that can be identified from the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005) and is significant to respondents in both case study departments. Being reliable is a BTEC requirement and in the 'Asian College' skills framework 'be responsible' is a personal management skill requiring reliability. Table 6.4 summarises the views.

Being reliable 可靠性 (A-14)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-HoD 4^{th} AC-1 AC-5 AC-6 AC-7	NC-1 2^{nd} NC-6 5^{th} NC-HoD	AC-G1 AC-G2 AC-G3 AC-G4 AC-G7 AC-G8	NC-G1 NC-G2 NC-G3 NC-G4 NC-G5	11	8

Important	AC-8	NC-4 NC-5	AC-G5 AC-G6	NC-G6 NC-G7	3	4
Not important/relevant (or interviewee claims is less important/ relevant)		NC-2 NC-3			-	2
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-3 AC-4 AC-SAO				4	-
	10	7	8	7	Total: 32	

Table 6.4: Views of being reliable

The head at 'Asian College' and four staff members see being reliable as a 'very important' attribute, while another sees it as 'important'. Four people do not include this attribute on their short 'most important' lists. 'Northern College' staff do not express a consensus view; the department head advocates that being reliable is 'very important' along with two colleagues who rank it second and fifth respectively. However two people rate this attribute as 'important' and two others consider this attribute to be 'less important'. Support for this attribute is linked to employer requirements:

> I think definitely they [students] need to be reliable, employers want that (NC-5).

Student groups in both case study departments have more agreement about being reliable than their teachers. Six 'Asian College' student groups and five 'Northern College' student groups view being reliable as 'very important'. Two groups from each college view it as 'important'. For them reliability may be expressed in relation to individual contribution to group-based projects and tasks.

3. Being safety conscious 危機感/ 安全意識

Being safety conscious is an attribute that features in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005) and in the 'Asian College' skills framework as the personal management skill 'work safely'. Student groups are clear that this is a 'very important' attribute, and this view is matched by 'Asian College' staff but 'Northern College' staff do not rate it as highly as the other respondents and there is little consensus among this group. Table 6.5 summarises the views.

Being safety conscious 危機感/ 安全意識 (A-15)	**'Asian College' staff**	**'Northern College' staff**	**'Asian College' student groups**	**'Northern College student groups**	**Number of responses in category**	
Very important	AC-HoD 2^{nd} AC-1 AC-4 AC-6 AC-7	NC-3 5^{th}	AC-G1 AC-G2 AC-G3 AC-G4 AC-G7	NC-G1 NC-G2 NC-G3 NC-G4 NC-G5 NC-G6 NC-G7	10	8
Important	AC-5	NC-4 NC-5	AC-G5 AC-G6 AC-G8		4	2
Not important/relevant (or interviewee claims is less important/ relevant)		NC-1 NC-2 NC-6			-	3
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-3 AC-8 AC-SAO	NC-HoD			4	1
	10	7	8	7	Total: 32	

Table 6.5: Views of being safety conscious

The head at 'Asian College' ranks being safety conscious second in his list of most important attributes while the head at 'Northern College' does not include this attribute in his list. Four other staff at 'Asian College' think that being safety conscious is 'very important' and one that it is 'important'. At 'Northern College' one person ranks this as his fifth most important attribute and two colleagues think it 'important'. However three people think it is less important than other attributes. Safety consciousness is clearly relevant to industry:

> Certainly they [employers] are looking for people being conscious of safety because it's massive (NC-3).

All student groups at 'Northern College' think this attribute is 'very important'. Five student groups at 'Asian College' agree and another three think it is 'important'. This may be because the courses require students to undertake laboratory and practical work where health and safety issues are promoted and safe working practices are emphasised.

4. Being able to deal with pressure 應付壓力能力

Being able to deal with pressure is an attribute that is not identified in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005), and 'Asian College' staff and students appear to value this attribute more highly than those at 'Northern College'. Their views are summarised in Table 6.6.

Being able to deal with pressure 應付壓力能力 (A-1)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-5 1st AC-HoD 6th AC-5 AC-SAO	NC-1 5th NC-2 6th	AC-G2 AC-G3 AC-G4 AC-G6 AC-G7 AC-G8	NC-G5 NC-G6 NC-G7	10	5
Important	AC-1 AC-7	NC-3 NC-5 NC-6	AC-G1 AC-G5	NC-G1 NC-G2 NC-G3 NC-G4	4	7
Not important/relevant (or interviewee claims is less important/ relevant)		NC-4			-	1

Not ranked/discussed (and assumed not to be 'very important')	AC-3 AC-4 AC-6 AC-8	NC-HoD			4	1
	10	7	8	7	Total: 32	

Table 6.6: Views of being able to deal with pressure

One 'Asian College' interviewee (AC-5) places being able to deal with pressure as his most important attribute (ranked first) and three other colleagues, including the head also place this attribute as 'very important'. Two others think it 'important' but four do not include being able to deal with pressure in their short lists of the most important attributes for engineering technician students. Staff at 'Northern College' also express a range of opinions with two claiming that being able to deal with pressure is 'very important' and three that it is 'important' The head of department does not include it in his list of significant attributes and one person thinks it less important than other attributes. Being able to deal with pressure appears to be relevant in helping students deal with college life and in order to prepare them for work:

> I think one of the things we do very well here is trying to show them [the students] how to deal with pressure. ... We tend to mother our students much better than universities, so they are aware that if they have problems they can come to us and discuss them ... it is important to give them a sense of belonging and a sense of support, being able to help them achieve (NC-2).

> If I was an employer I would want somebody who could deal with a bit of pressure, because they are going to be under pressure (NC-4).

The majority of 'Asian College' student groups (six) place being able to deal with pressure in the 'very important' category. The remaining two view it as 'important'. Three student groups at 'Northern College' see this attribute as 'very important' and four see it as 'important'. Students, particularly those at 'Asian College', may view dealing with pressure as a very important attribute because they find their engineering courses challenging in terms of their workload or in relation to their ability. These rather different issues that might lead students to feel under pressure may need further exploration by teachers and course leaders; although too much pressure can be bad, feeling capable of dealing with pressure is beneficial.

5. Having common sense 常識

Having common sense is one of the attributes that is a priority for engineering technicians in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005). In both departments there is support for common sense being a relevant and desirable attribute although several interviewees commented that common sense could not be taught. Table 6.7 summarises the views.

Having common sense 常識 (A-6)	**'Asian College' staff**	**'Northern College' staff**	**'Asian College' student groups**	**'Northern College student groups**	**Number of responses in category**	
Very important	AC-1 AC-4	NC-2 1st NC-5 3rd NC-4	AC-G2 AC-G3 AC-G4 AC-G5 AC-G8	NC-G3 NC-G6 NC-G7	7	6
Important	AC-HoD AC-6 AC-7	NC-HoD	AC-G1 AC-G6 AC-G7	NC-G1 NC-G2 NC-G4 NC-G5	6	5
Not important/relevant (or interviewee claims is less important/ relevant)		NC-1 NC-3 NC-6			-	3
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-3 AC-6 AC-8 AC-SAO				5	-
	10	7	8	7	Total: 32	

Table 6.7: Views of having common sense

At 'Asian College' two staff members think that having common sense is 'very important'. The department head and two colleagues think it is 'important'. However five others do not include this on their short list of priority attributes. 'Northern College' staff have mixed views about common sense. The head of department places it as 'important' although some colleagues value it more highly; one person places this attribute first, another places it third and another places it in the 'very important' category. However three people think that having common sense is less relevant than other attributes. Five members of staff at 'Asian College' do not include having common sense among their most important attributes. Several interviewees singled out common sense as an important, but problematic attribute:

> Common sense is rather a strange thing. To me everyone should have common sense but what is it? In engineering we like things to be proven and not, you know, go with a hunch, but sometimes you've got to use your common sense to get a job done (AC-3).

> I know in fact the students graduate for the course, they join the industry, most of the knowledge they need basically is common sense, is not technical. Not just common sense but also judgement (AC-2).

> Having common sense [is important] from a health and safety point of view. I say to students 'you can make things safe, but you can't make things idiot proof!' (NC-5).

Three 'Asian College' and four 'Northern College student groups think that common sense is important. Five 'Asian College' student groups place it as 'very important' and three 'Northern College' student groups also place having common sense as 'very important'.

6. Being adaptable 適應能力

Being adaptable is an attribute that can be identified from the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005). It is in the BTEC engineering course requirements and is a personal management skill in the 'Asian College' key skills framework. Generally adaptability is an attribute that is more highly valued by staff than students in this study. Table 6.8 summarises the views.

Being Adaptable 適應能力 (A-2)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-5 =1st AC-HoD 3rd AC-2 AC-4 AC-8	NC-5 1st NC-6 6th NC-1	AC-G2 AC-G6	NC-G6	7	4
Important	AC-7	NC-3 NC-4	AC-G1 AC-G3 AC-G4 AC-G5 AC-G7 AC-G8	NC-G1 NC-G2 NC-G3 NC-G4 NC-G5	7	7
Not important/relevant (or interviewee claims is less important/ relevant)	AC-1	NC-2		NC-G7	1	2
Not ranked/discussed (and assumed not to be 'very important')	AC-3 AC-6 AC-SAO	NC-HoD			3	1
	10	7	8	7	Total: 32	

Table 6.8: Views of being adaptable

There does not appear to be much consensus about the importance of being adaptable. The 'Asian College' head places being adaptable third in his ranked list. In contrast the head of department at 'Northern College' does not rank this attribute at all. At 'Asian College' one interviewee places being adaptable first and three colleagues agree that it is 'very important'. At 'Northern College' one person also places this attribute first and two colleagues also place being adaptable in the 'very important' category. However, at 'Asian College' one person places being adaptable as 'important' and one includes it in his residual, 'less important' category. Three interviewees do not discuss it at all. At 'Northern College' two staff members place being adaptable as 'important' while another suggests it is 'less important'.

It is suggested that adaptability and the ability to deal with pressure are linked:

> Being adaptable. Now this is very important because the pressure nowadays is very heavy … if you are not able to be adaptable there will be problems – mentally is not a good situation. And also similar is that you can work under pressure (AC-2).

Furthermore it may be that in the UK context, adaptability has particular historical significance:

> Being adaptable, I think it's a very important thing. When you go back to the 60s when we had a lot of power from the unions … when they broke the back of that and made people integrate more, do more things, rather than 'that's my job, you don't cross that line' I think that probably one of the best things that happened in engineering over the last 30 years (NC-5).

And this attribute may be one that develops over time rather than one that can be taught:

> Experience of life helps people be adaptable (NC-5).

The majority of student groups, six at 'Asian College' and five at 'Northern College', agree that being adaptable is 'important'. Two other 'Asian College' groups and one 'Northern College' group rate it more highly, as 'very important'. One student group at 'Northern College' places being adaptable in the 'not/less important' category.

7. Loyalty 忠誠

Loyalty is not one of the attributes that is a priority for engineering technicians in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005). It is an attribute about which respondents have little consensus as shown in the summary table 6.9.

Loyalty 忠誠 (A-10)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-5 AC-7	NC-3 2nd NC-6 4th	AC-G3 AC-G5 AC-G7 AC-G8	NC-G4	6	3
Important	AC-HoD AC-1 AC-8	NC-1 NC-4	AC-G1 AC-G4	NC-G3 NC-G6 NC-G7	5	5
Not important/relevant (or interviewee claims is less important/ relevant)		NC-2	AC-G2 AC-G6	NC-G1 NC-G2 NC-G5	2	4
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-3 AC-4 AC-6 AC-8	NC-HoD NC-5				
	10	7	8	7	Total: 32	

Table 6.9: Views of having a sense of loyalty

Some 'Northern College' staff value a sense of loyalty highly. Two place it in the 'very important' category, with one ranking this third and another ranking it fourth. Two people place loyalty in the 'important' category and one claims that it is 'less important' than other attributes. The head of department and another interviewee do not discuss loyalty at all.

At 'Asian College' there is also a mixed picture with two people placing loyalty in the 'very important' category, the head of department and two others placing it as 'important' and five people not discussing loyalty at all.

Student groups at both colleges also express a range of opinions about the importance of loyalty. It is somewhat more highly valued at 'Asian College' than 'Northern College'. At 'Asian College' four student groups place loyalty as 'very important' and two groups place it as 'important'. At 'Northern College' only one group places it as 'very important' while three groups place it as 'important'. However two groups at 'Asian College' and three at 'Northern College' place having a sense of loyalty in the 'not/less relevant' category.

8. Cultural sensitivity 對不同文化的敏感性/觸覺

Although cultural or cross-cultural sensitivity is not one of the attributes that is a priority for engineering technicians in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005) it has been argued that engineering is an international profession and one where employees are increasingly expected to work effectively in cross-national teams (Ravesteijn, et al., 2006).

Being sensitive to other people and other culture is an attribute that clearly has more resonance for respondents in England than in Hong Kong. All 'Northern College' staff and students place this attribute as 'very important' or 'important' and they are evenly divided between these categories. In contrast the majority of 'Asian College' students and staff either think cultural sensitivity is not important or do not discuss it at all. Table 6.10 provides a summary of the views.

Cultural sensitivity 對不同文化的敏感性/觸覺 (A-7)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important		NC-5 2nd NC-2 5th NC-4	AC-G3	NC-G3 NC-G4 NC-G5 NC-G7	1	7
Important	AC-1 AC-7	NC-HoD NC-1 NC-3 NC-6		NC-G1 NC-G2 NC-G6	2	7

Not important/relevant (or interviewee claims is less important/ relevant)			AC-G1 AC-G2 AC-G4 AC-G5 AC-G6 AC-G7 AC-G8		7	-
Not ranked/discussed (and assumed not to be 'very important')	AC-HoD AC-2 AC-3 AC-4 AC-5 AC-6 AC-8 AC-SAO				8	-
	10	7	8	7	Total: 32	

Table 6.10: Views of being sensitive to other people and other cultures

At' 'Northern College' one interviewee ranks cultural sensitivity second, another fifth and a colleague agrees it is 'very important'. The head of department and three staff members think cultural sensitivity is 'important'. Although there might be an element of 'political correctness' about this attribute in the UK, it is certainly seen as a core issue at 'Northern College':

> Being sensitive to other people and other cultures. I think in this day and age it's probably coming to the fore now, would probably be one of the strong ones at the moment (NC-5).

> I think the basics are – you need to be sensitive to other people to survive anywhere, a sense of humour, common sense, feel positive and being honest are the basic foundation (NC-4).

In contrast at 'Asian College' no interviewees think cultural sensitivity is 'very important'. Two people think it is 'important' while the head of department and seven others do not include it in their discussion of the most important attributes for engineering students. This may be due to the college population being homogenously Cantonese:

> We don't have a lot of issues with that because we don't have a multi-ethnic society (AC-1).

This is in stark contrast to the situation at 'Northern College':

> We have quite a mixed cultural population within the college and within the department and it is most important that they [students] appreciate it (NC-5).

Student groups' views are similar to their teachers, with the majority of 'Asian College' student groups (seven) placing being sensitive to other cultures in the 'not important/relevant' category. However one group thinks cultural sensitivity 'very important'. In 'Northern College' four student groups agree it is 'very important' and three that it is 'important'.

9. Feeling positive about oneself 正面的自我形象

Feeling positive about oneself is not an attribute that is a priority for engineering technicians in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005). It does, however, feature as a personal management skill in 'Asian College's' Key Skills for the 21st Century framework. Respondents generally hold this to be a relevant attribute for students. Table 6.11 summarises the views.

Feeling positive 正面的自我形象 (A-13)	**'Asian College' staff**	**'Northern College' staff**	**'Asian College' student groups**	**'Northern College student groups**	**Number of responses in category**	
Very important	AC-SAO	NC-3 =3rd NC-4		NC-G4 NC-G6 NC-G7	1	5
Important	AC-HoD AC-7	NC-HoD NC-5 NC-6	AC-G2 AC-G3 AC-G4 AC-G5 AC-G6 AC-G7 AC-G8	NC-G1 NC-G2 NC-G5	9	6

Not important/relevant (or interviewee claims is less important/ relevant)	AC-1	NC-1 NC-2	AC-G1	NC-G3	2	3
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-3 AC-4 AC-5 AC-6 AC-8				6	-
	10	7	8	7	Total: 32	

Table 6.11: Views of feeling positive about oneself.

At 'Asian College' among staff there is little consensus about the value of feeling positive about oneself. The student affairs officer places it as 'very important', the head of department and one colleague place it as 'important'. However one person considers feeling positive not to be important and six interviewees do not discuss it at all and so it might logically be of lesser importance to them than other attributes.

'Northern College' staff also express a range of opinions. One person ranks feeling positive about oneself third and another agrees that this is 'very important'. The head of department and two colleagues think it is 'important'. However two people think it less important than other attributes for engineering technician students to feel positive about themselves. One teacher discusses how feeling positive develops over time and is an element that contributes to their personal job satisfaction:

> Feeling good about themselves, that develops as the two years progresses. They [students] come in sometimes with a very low opinion of themselves and their ability. ... I get a lot of pleasure from the job, seeing students become more positive (NC-6).

Most student groups value feeling positive about themselves, the majority placing it as 'important'. This is the case among 'Asian College' students where seven groups view it as 'important' while one views it as 'not important/relevant'. At 'Northern College' although one group agrees it is 'not important/relevant', three groups place feeling positive about oneself as 'important' and three as 'very important'.

=10. Professional presentation 個人表達(信心及專業)

It is perhaps surprising to see professional presentation placed so low on the personal attributes ranking list. Professional presentation is one of the attributes that is essential for engineering technicians in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005). It is highlighted in the BTEC specifications for engineering and is an element of the fundamental skill 'communication' in the 'Asian College' key skills framework. Although professional presentation does not appear to be a high priority for respondents, it is clearly something that student groups see as important. Table 6.12 summarises the views.

Professional presentation 個人表達(信心及專業) (A-12)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-3	NC-3 4th	AC-G2 AC-G8		3	1
Important	AC-HoD AC-7	NC-HoD NC-1 NC-6	AC-G1 AC-G3 AC-G4 AC-G5 AC-G6 AC-G7	NC-G1 NC-G2 NC-G3 NC-G4 NC-G5 NC-G6 NC-G7	8	10
Not important/relevant (or interviewee claims is less important/ relevant)	AC-1	NC-2 NC-4			1	2
Not ranked/discussed (and assumed not to be 'very important')	AC-2 AC-4 AC-5 AC-6 AC-8 AC-SAO	NC-5			6	1
	10	7	8	7	Total: 32	

Table 6.12: Views of being able to present yourself in a professional manner

One member of staff at 'Asian College' thinks professional presentation is 'very important' because:

> The students they learn a lot of technical stuff, but if they don't know how to present themselves they end up in failure, they won't have a successful career in their life (AC-3).

The head of department and a colleague think it 'important' and one colleague that it is 'less important'. However the majority of staff do not include professional presentation among their 'most important' lists. One interviewee comments that, unlike many other attributes, professional presentation is something that students can be helped to develop:

> ... for instance this one [professional presentation] I think we can influence but I don't think I can teach motivation or commitment (AC-3).

At 'Northern College' one person ranks professional presentation fourth and 'very important' while two others and the head see it as 'important'. Two colleagues think it 'less important', although one comments that from an employers' point of view it is particularly relevant to some jobs:

> Depends on the job. If they are dealing with customers, I'd want somebody who could ... deal in a professional manner (NC-4).

The majority of student groups think professional presentation is important. At 'Northern College' all seven groups place it in the 'important' category. At 'Asian College' six groups concur whilst two rate it more highly as 'very important'. This emphasis among students for professional presentation may be a response to the number of presentations that they are required to do for coursework.

=10. Having a sense of humour 幽默感

Perhaps it is not surprising that having a sense of humour is not a specified attribute for engineering technicians in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005). However there is some support for it being a relevant attribute, especially among 'Northern College' student groups as shown in Table 6.13.

Sense of humour 幽默感 (A-16)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-6	NC-4		NC-G1 NC-G7	1	3
Important	AC-7	NC-5		NC-G2 NC-G4 NC-G5 NC-G6	1	5
Not important/relevant (or interviewee claims is less important/ relevant)	AC-1	NC-1 NC-2 NC-3 NC-6	AC-G1 AC-G2 AC-G3 AC-G4 AC-G5 AC-G6 AC-G7 AC-G8	NC-G3	9	5
Not ranked/discussed (and assumed not to be 'very important')	AC-HoD AC-2 AC-3 AC-4 AC-5 AC-8 AC-SAO	NC-HoD			7	1
	10	7	8	7	Total: 32	

Table 6.13: Views of having a sense of humour

Staff tend not to see this attribute as important. At 'Northern College' four members of staff think a sense of humour is 'less important' as does one person at 'Asian College'. Most 'Asian College' staff (six) and both heads of department do not discuss this attribute at all, signifying it is not particularly relevant to their students. This is perhaps because what constitutes humour is so subjective:

> Not so much emphasis is put on having a sense of humour because there are so many senses of humour – it could be taken in the wrong way (NC-3).

However one staff member at each college advocates that this attribute is 'very important' and one at each college that it is 'important'. One reason given is that a sense of humour serves quite a sophisticated social purpose:

> Having a sense of humour you can deal with pressure and it can help you develop good working relationships with the working partners and also, what I believe is, if a person can always make jokes or have a sense of humour, then you are a confident person and he feels positive about himself (AC-6).

Student groups at 'Asian College' see this attribute as being of less significance to them with all eight groups placing it in the 'not important/relevant' category. In contrast, 'Northern College' student groups are much more positive about it, with two groups ranking having a sense of humour as 'very important', four groups as 'important' and only one as 'not important/relevant'.

11. Work/life balance 平衡家庭與工作生活的能力

Having a work/life balance is not a high priority for respondents in either case study department and is not in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005). However work/life balance does have some support as a relevant attribute, particularly among engineering technician students. Table 6.14 summarises the views.

Having a balanced attitude to work (study) and home/social life is thought to be 'very important' by only one member of staff at 'Asian College' who ranks it third. Indeed this interviewee thinks it relevant to Hong Kong society and even something that government and employers should promote more actively:

> Nowadays we have to learn how to balance the workload and the family life. .... society should [produce] TV advertisements - that is government's

job. Even the employer - several companies, they do have a family day (AC-8).

Work/life balance 平衡家庭與工作生活的能力 (A-4)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important	AC-8 3rd			NC-G5 NC-G6	1	2
Important	AC-5 AC-7	NC-HoD NC-1 NC-6	AC-G2 AC-G3 AC-G4 AC-G5 AC-G6 AC-G7 AC-G8	NC-G2 NC-G3 NC-G4 NC-G7	9	7
Not important/relevant (or interviewee claims is less important/ relevant)	AC-1	NC-2 NC-3 NC-4	AC-G1		2	3
Not ranked/discussed (and assumed not to be 'very important')	AC-HoD AC-2 AC-3 AC-4 AC-6 AC-SAO	NC-5		NC-G1	6	2
	10	7	8	7	Total: 32	

Table 6.14: Views of having a balanced attitude to work (study) and home/social life

Overall there is little consensus among 'Asian College' staff about this attribute. Two people think work/life balance is 'important' but one person thinks it less important. Six interviewees do not express a view about this attribute so it is not significant to them. At 'Northern College' there is also a spread of views with no-one rating work/life balance 'very important'. The head of department and two colleagues rate work/life balance as 'important', however three interviewees think it not particularly important, despite this rather contradictory comment from one of them:

> They need to appreciate a balance … I do think that you need to make sure students do keep a balance. I don't think it's only bright people that go off the rails when they're working too hard, the less intelligent can as well (NC-2).

Seven student groups at 'Asian College' rate work/life balance as 'important'. Four student groups at 'Northern College' agree while two groups rate it even more highly as 'very important'. One group at 'Northern College' does not place this attribute (being unable to agree among themselves) and one group ranks it 'not important/relevant'.

12. Being intuitive 直覺

Perhaps it is not surprising that being intuitive does not feature as an attribute in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005). Among respondents only 'Northern College' students value this attribute. Table 6.15 summarises the views.

Being intuitive 直覺 (A-9)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important				NC-G5	-	1
Important	AC-7			NC-G1 NC-G2 NC-G3 NC-G4 NC-G6 NC-G7	1	6
Not important/relevant (or interviewee claims is less important/ relevant)	AC-1	NC-1 NC-2 NC-3 NC-4 NC-6	AC-G1 AC-G2 AC-G3 AC-G4 AC-G5 AC-G6 AC-G7 AC-G8		9	5

Not ranked/discussed (and assumed not to be 'very important')	AC-HoD AC-2 AC-3 AC-4 AC-5 AC-6 AC-8 AC-SAO	NC-HoD NC-5			8	2
	10	7	8	7	Total: 32	

Table 6.15: Views of being intuitive

One 'Northern College' student group see being intuitive as 'very important' and the remaining six groups see it as 'important'. In contrast all eight 'Asian College' student groups place this attribute in the 'not important/relevant' category.

Five 'Northern College' staff think that being intuitive is not important or less important for engineering technician students than other attributes. The head of department and one of his colleagues do not express a view about this attribute which therefore seems unlikely to be relevant to them.

At 'Asian College' only two staff members express a clear opinion about this attribute. One thinks that it is 'important' but another that it is 'not important'. The head of department and seven other respondents do not express a view about this attribute which suggests that being intuitive is of low significance to them.

13. Having aesthetic appreciation 審美能力

Aesthetic appreciation is the attribute that is least valued by respondents. It is not an attribute that is in the UK-SPEC Engineering Technician Standard (Engineering Council UK, 2005). Table 6.16 provides a summary of the views.

Aesthetic appreciation 審美能力 (A-3)	'Asian College' staff	'Northern College' staff	'Asian College' student groups	'Northern College student groups	Number of responses in category	
Very important					-	-
Important	AC-1			NC-G1 NC-G5	1	2
Not important/relevant (or interviewee claims is less important/ relevant)	AC-7	NC-1 NC-2 NC-3 NC-4 NC-6	AC-G1 AC-G2 AC-G3 AC-G4 AC-G5 AC-G6 AC-G7 AC-G8	NC-G2 NC-G3 NC-G4 NC-G6 NC-G7	9	10
Not ranked/discussed (and assumed not to be 'very important')	AC-HoD AC-2 AC-3 AC-4 AC-5 AC-6 AC-8 AC-SAO	NC-HoD NC-5			8	2
	10	7	8	7	Total: 32	

Table 6.16: Views of being able to appreciate the aesthetic value of things

No study participant views aesthetic appreciation as 'very important' and only three see it as 'important', one at 'Asian College' and two at 'Northern College'. At 'Asian College' one person (AC7) states that it is less relevant and eight do not comment on this attribute at all. Five staff at 'Northern College' are clear that this is not a very relevant attribute for engineering technician students.

The majority of student groups rank aesthetic appreciation as not important/relevant. All eight 'Asian College' student groups and five 'Northern College' student groups put aesthetic appreciation in this category. However two 'Northern College' groups view it as 'important'.

6.2 Developing students' personal attributes

Discovering how key skills and personal attributes can best be developed and assessed was not part of the research aims. However this topic emerged during the semi-structured interviews when several participants, particularly those from 'Asian College', made comments about how difficult it is to develop students' personal attributes. Despite seeing this as relevant to engineering courses, it is clear that this is an area they find tricky, for example:

> Teaching technical [skills] is always easy you know, but teaching mentality is difficult (AC-HoD).

This interviewee indicated that the development of attributes is also time consuming:

> Very difficult, really difficult. It's not like technical skills; you can teach them within a short time. They should be taught but time is not allowing us (AC-HoD).

Others could see some attributes being taught or developed (such as professional presentation) but had reservations about others, for example:

> I think some of these can't be taught. I think it's very difficult. How do you get honesty and integrity? I think it's something an engineer needs to have (NC-14).

> Some they can do by themselves, some may not. For example, the communication skills. In fact, some students are very good communicators, some are not. And we can see that some students they always keep silent, not like to talk; they are a good listener but they not willing to talk to their classmates, their teachers, even you ask them they don't talk too much. However we can make some programme in the course to try to help them at least to voice out their idea. For the teamwork skills we can incorporate that in our course because for projects, for those group work, laboratory, actually these are the areas we can develop them to work as a team. This

we can do. Learning skills we can do that, and planning and organising skills we can incorporate in our course in various different modules, so we can make improvement to our students. Attributes, ah, not much we can do, not much. Personal character is not easy to change. You grow up, you meet more people, you have more work experience, then your character change (AC-2).

In this participant's view, then, skills can be developed through the curriculum but attributes are linked to both the passage of time and exposure to the workplace. Other respondents also favoured practical experience for helping students develop appropriate personal attributes:

> Although I said is difficult to teach, something we are doing right now is work placement and industry-based project. Now students will go out to industry to get their first taste of what it is like in the workplace, they mix with employees in organisations. Now in doing that I hope they will feel what people are thinking and also how the people are doing; they learn from them. To teach is very difficult, let them feel, let them know (AC-HoD).

> I'm doing it [developing student skills] through the peer mentorship and through the student placement, summer job, final year project, right now we are working very hard to deploy students to the industry. Through this they develop a range of skills, it's a kind of path (AC-8).

So it may be that the development of appropriate personal attributes is as much a function of time and experience as education and training:

> When they [students] are actually in the work place then they realise these [skills and attributes] are useful ... they fully appreciate especially after they work for a few years (AC-5).

> I would encourage the students to take extra curriculum courses as this kind of characteristic cannot be taught during formal education (AC-6).

Another interviewee also places the development of personal attributes in a broad social context:

> From the lecturer's point of view we deliver all this information, the problem is how they receive it. Also that the social environment, the influence is so much bigger than a whole hour in the classroom or their time on campus, also the family, I think the family is still a very important role in character building. ... In the old days your father, your lecturer never tell you to think positive about yourself, you have to struggle by yourself because when you struggle by yourself you have to think positive and this is the motivation that push you forward (AC-7).

The use of alumni was also raised:

> We invite back past graduates ... we ask them to come back and share experience with them so these are one of the opportunities to let them know these attributes are important for them to have (AC-2).

And teachers can draw on their own work experience:

> I always teach our students all of these four things [being adaptable, being committed, having common sense, being safety conscious]. Mainly I like to talk from my experience to the students and let them know the importance of these. I like to give them more examples of maybe some past case to students (AC-4).

Others expressed the benefit to students of seeing good attitudes in their teachers, in effect that staff should act as good role models:

> I say to my students 'my on-time rate is 99%, is sometimes out of my control'. You have to be a role model, you can't preach unless you do the things (AC-1).

> Well, we need to set a good example (AC-6).

Another issue identified is the difficulty of actually influencing behaviour as well as merely raising awareness of the desirability of certain attributes:

> Now in fact we can have some modules that highlight the importance of these attributes to them, so they are aware these important attributes they need to have in order to survive in their work after graduation. But in fact this only highlight to them, it doesn't mean they will necessarily to take them, this is one of the points, ... unlike a skill, skill can be checked by means of examination assessment, but this cannot (AC-2).

It may be that an indirect approach to the development of attributes is more appropriate:

> I think as a course leader it [developing students' skills and attitudes] is my job, but we have to do it indirectly and not just – this is a lesson to teach you about integrity, to teach you about common sense. We try to integrate into different modules and then normally I, my colleagues, just make sure the students can take the pressure, they are honest, they have common sense (AC-5).

However, some lecturers saw their job being broadened under pressure from industry to improve students' personal attributes. This is not always welcome, for example:

> Last month we had a panel from industry being interviewed on our behalf. It was pretty clear our graduates are good with the technical skills and some other things are pretty good but we've got to put more resources into ... [encouraging] integrity, being strong. OK, so what are we here, are we social workers? (AC-1).

Clearly there are difficulties with emphasising personal attributes as a curriculum element. However, it may be possible for course leaders to at least specify for students which attributes are likely to be valued when they work in the engineering industry. Role modelling or even exhortation may not transfer these attributes to students. Work experience may indeed encourage them to at least think about the way they present themselves to others in a work context and the consequent outcomes. Employers' expectations of graduating students may also need to be managed if teachers are unable, or unwilling, to take on the 'social work' role that the development of certain attributes implies. It does appear, however that student groups who participated in this study have 'picked up' messages about personal attributes and that consequently this is a valid element of the engineering curriculum that should be discussed in Course Teams.

6.3 Student groups' views of skills and attributes

This section draws on data from the student groups' card sort activity in which they were presented with both sets of skill and attribute cards. Interestingly they do not distinguish between skills and attributes in terms of their major importance/relevance to engineering technicians. In the majority of cases personal attributes are more highly placed than skills at the top of their 'top five' lists (see tables 6.17 and 6.18).

	AC-G1	AC-G2	AC-G3	AC-G4
'Top five' most important skills or attributes	Being safety conscious	Having common sense	Problem solving skills	Being safety conscious
	Being committed	Honesty/integrity	Teamwork skills	Communication skills
	Being motivated	Technical skills	Being committed	Teamwork skills
	Being reliable	Creative thinking skills	Technical skills	Being committed
	Communication skills	Teamwork skills	Being safety conscious	Honesty/integrity
	AC-G5	**AC-G6**	**AC-G7**	**AC-G8**
'Top five' most important skills or attributes	Being committed	Being motivated	Communication skills	Communication skills
	Being motivated	Being committed	Teamwork skills	Teamwork skills
	Honesty/integrity	Learning skills	Being committed	Planning and organising skills
	Loyalty	Technical skills	Being safety conscious	Professional presentation
	Problem solving skills	Being adaptable	Technology skills	Problem solving skills

Table 6.17: 'Asian College' student groups' 'top five' most important skills or attributes

At 'Asian College' five groups place personal attributes at the top of their 'most important' lists, three groups place skills at the top. However overall skills and personal attributes are quite evenly balanced (twenty-one attributes, nineteen skills).

	NC-G1	NC-G2	NC-G3	NC-G4
'Top five' most important skills or attributes	Being safety conscious	Being adaptable	Being safety conscious	Common sense
	Being committed	Learning skills	Communication skills	Dealing with pressure
	Technical skills	Being safety conscious	Being motivated	Technical skills
	Being reliable	Information literacy	Technical skills	Numeracy skills
	Being motivated	Being committed	Teamwork skills	Planning and organising skills
	NC-G5	**NC-G6**	**NC-G7**	
'Top five' most important skills or attributes	Dealing with pressure	Problem solving skills	Being committed	
	Being committed	Work/life balance	Dealing with pressure	
	Problem solving skills	Critical thinking skills	Problem solving skills	
	Numeracy skills	Creative thinking skills	Teamwork skills	
	Being reliable	Communication skills	Communication skills	

Table 6.18: 'Northern College' student groups' 'top five' most important skills or attributes

At 'Northern College' six groups place personal attributes at the top of their 'most important' lists and only one places a skill at the top. Personal attributes and skills are evenly balanced at seventeen and eighteen respectively.

This situation is difficult to explain and there is no literature to draw on. It may be that students are drawing on their knowledge of, or experience of, the engineering industry directly. Alternatively they may be picking up messages from their teachers, either explicitly or implicitly, about what is required of them if they are to succeed as engineering technicians when they leave. What is clear is that the development of key skills does not appear to these student groups to be a higher priority than the demonstration of what they perceive to be very important personal attributes.

6.4 Conclusions

The development of personal attributes is something that respondents see as relevant; it is clearly an important element of the cubic curriculum. Taking the data overall, being committed (to the department and to engineering) comes out as the most important personal attribute for engineering technicians. Honesty/integrity, being motivated and being reliable are also very highly valued (equal second) followed by being safety conscious. The least valued personal attributes are having aesthetic appreciation and being intuitive.

Table 6.19 summarises the departmental perceptions of personal attributes of 'Asian College' staff, 'Asian College' students, 'Northern College' staff and 'Northern College' students. These are presented 'top down' with the UK-SPEC Engineering Technician Standard attributes shown in blue and other personal attributes in black.

Oh (1991) identifies four Confucian virtues: commitment, reliability, honesty and loyalty. Three of these (being committed, being reliable and honesty/integrity) are valued highly by both staff and student groups in the Hong Kong case and also by staff in the English case. These three groups also agree that loyalty is of lesser importance. Student groups in the English case do not follow this pattern. It may be that the Confucian virtues are more highly developed in the Hong Kong context than elsewhere, hence the consensus among staff and students. However, given that the English staff also rate similar attributes highly, it appears that adults in other cultural contexts value them.

'Asian College' Staff	'Asian College' students	'Northern College' staff	'Northern College' students
Being committed Honesty and integrity Being reliable/ Being safety conscious/ Being adaptable Being motivated/ Dealing with pressure Having common sense/ Loyalty Feeling positive/ Professional presentation/ Sense of humour/ Work life balance Cultural sensitivity/ Being intuitive/ Aesthetic appreciation	Being committed Honesty and integrity Being reliable/ Dealing with pressure Being motivated/ Being safety conscious/ Having common sense Loyalty Being adaptable/ Professional presentation Cultural sensitivity Feeling positive/ Sense of humour/ Work life balance/ Being intuitive/ Aesthetic appreciation	Being committed/ Honesty and integrity/ Being motivated Being reliable/ Having common sense/ Being adaptable/ Cultural sensitivity Dealing with pressure/ Loyalty/ Feeling positive Being safety conscious/ Professional presentation/ Sense of humour Work life balance/ Being intuitive/ Aesthetic appreciation	Being safety conscious Being committed/ Being motivated Being reliable Cultural sensitivity Dealing with pressure/ Having common sense/ Feeling positive Honesty and integrity/ Sense of humour/ Work life balance Being adaptable/ Loyalty/ Being intuitive/ Professional presentation/ Aesthetic appreciation
Note: Attributes in blue are specified in UK-Spec for Engineering Technicians.			

Table 6.19: Hierarchical list of views of personal attributes

It is possible to identify those personal attributes which are seen as 'key' in the two case study departments. It appears that at 'Asian College' there is consensus among staff and students that being committed (to the course and to being an engineer), being honest and acting with integrity, and being reliable are the most important attributes. Staff also agree that being safety conscious and being adaptable are very important, while students feel that dealing with pressure is particularly important (see Figure 6.1)

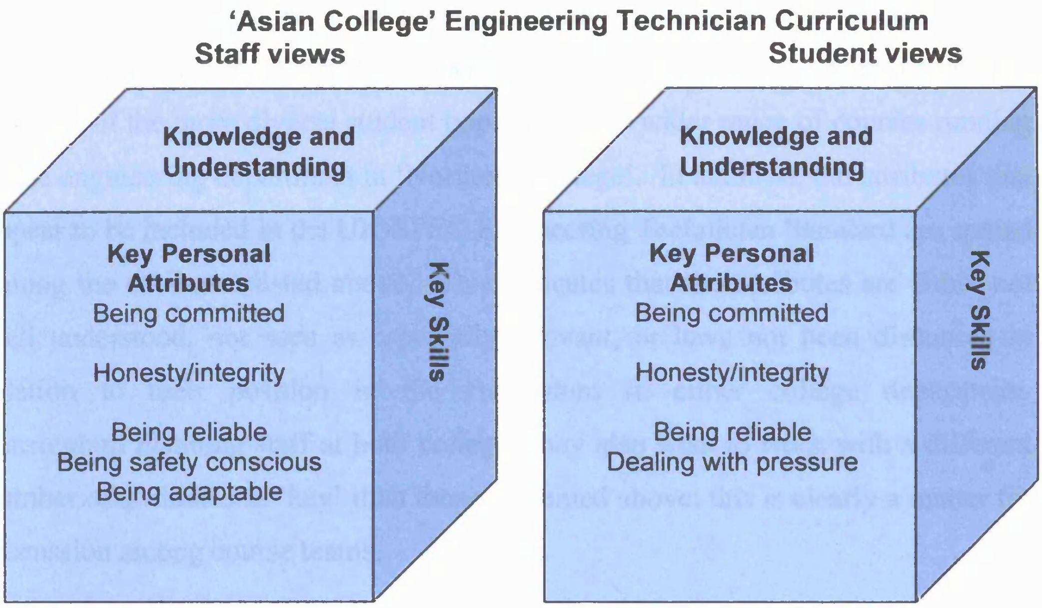


Figure 6.1: Most important personal attributes for engineering technicians at 'Asian College'

At 'Northern College' there is consensus about three very important personal attributes; being committed (to the course and to being an engineer), being motivated (to get things done, to do well) and being reliable. Staff also value being honest and acting with integrity (which comes quite well down the students' list) along with having common sense, being adaptable and cultural /cross-cultural sensitivity. Safety consciousness is first on the students' list of very important attributes (see Figure 6.2).

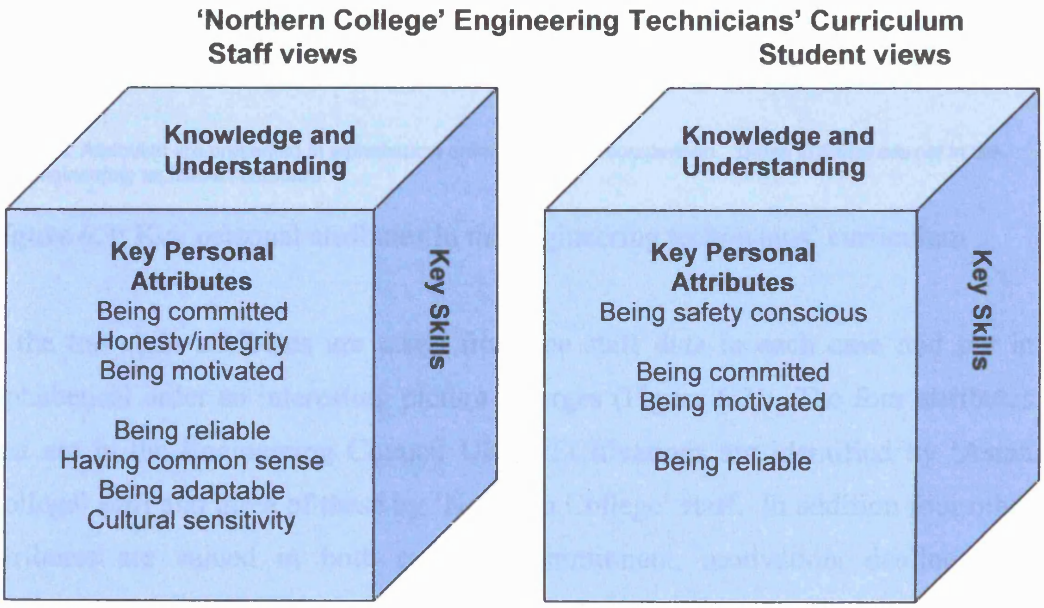
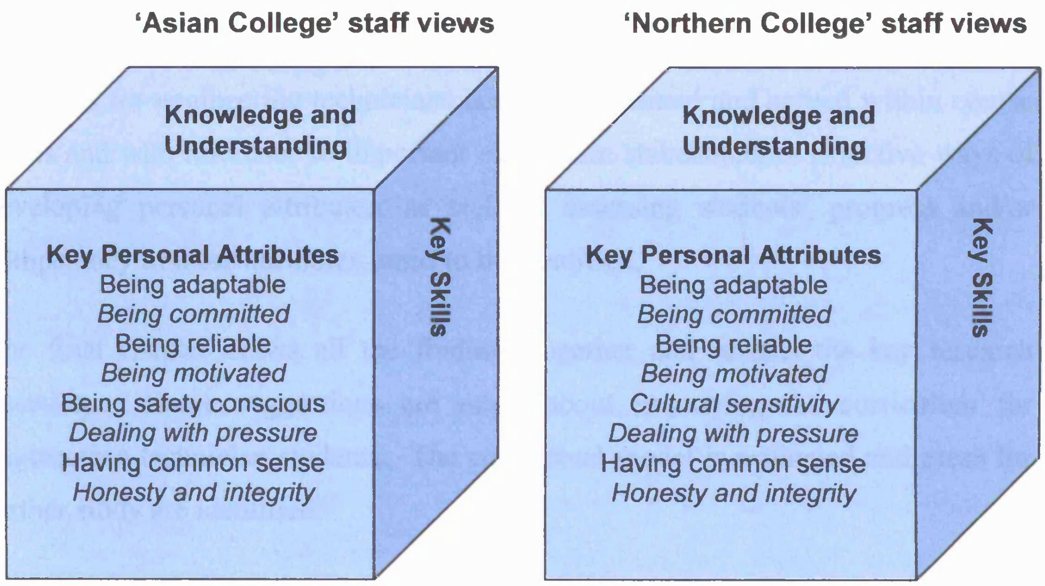


Figure 6.2: Most important personal attributes for engineering technicians at 'Northern College'

So there appears less agreement among staff and students about the most important personal attributes at 'Northern College' than at 'Asian College'. Perhaps this is a function of the more diverse student population and wider range of courses running in the engineering department at 'Northern College'. In addition, the attributes that appear to be included in the UK-SPEC Engineering Technician Standard are spread among the attributes listed above. This indicates that the attributes are either not well understood, not seen as especially relevant, or have not been discussed in relation to their position in the curriculum in either college department. Curriculum planning staff at both colleges may also wish to work with a different number of attributes as 'key' than those presented above; this is clearly a matter for discussion among course teams.



Note: Attributes are presented in alphabetical order for ease of comparison. *Those in Italics* are not in the Engineering technician standard.

Figure 6.3: Key personal attributes in the engineering technicians' curriculum

If the top eight attributes are taken from the staff data in each case and put in alphabetical order an interesting picture emerges (Figure 6.3). The four attributes that are in the Engineering Council UK-SPECifications are identified by 'Asian College' staff and three of these by 'Northern College' staff. In addition four other attributes are valued in both college (commitment, motivation, dealing with pressure, honesty/integrity). It consequently appears that these reflect the requirements of being a *student* engineering technician and are common to both cultural contexts. However cultural sensitivity is a relevant personal attribute in the English college but not in the ethnically homogeneous Hong Kong college.

In 'Asian College' staff appear more concerned about the development of students' personal attributes than their counterparts at 'Northern College'. Although they raise a number of concerns about how difficult it is to do, they also have some suggestions for developing students' personal attributes through role modelling good behaviour and exposing students to the workplace. However it may be that appropriate attributes develop as a result of work experience rather than being significantly influenced while at college.

Thus it appears that personal attributes are an integral part of the cubic curriculum for engineering students, but that more work is needed on this element. Specific attributes for engineering technicians need to be defined and agreed within course teams and with reference to important curriculum stakeholders. Effective ways of developing personal attributes, as well as assessing students' progress and/or competency in these attributes, need to be identified.

The final chapter draws all the findings together and revisits the key research questions. Some suggestions are made about improving the curriculum for engineering technician students. The conceptual model is evaluated and areas for further study are identified.

7. Conclusions and Recommendations

Gaining a qualification at a Further Education college is an important step for many young people who intend to work as engineering technicians. The type of knowledge, skills and attributes that they require when entering the workplace is both varied and wide-ranging. Those who are involved in designing and running engineering technician courses are aware of a range of issues including globalisation, the rapid pace of change, additional societal demands regarding engineering education, decreasing student enrolment on engineering courses and new ICT-based teaching and learning technologies (De la Harpe et. al., 2000). They must also be conscious of the international interest in employability that emanates from employers and that significantly influences education policies worldwide. Authors such Hassall et. al., (2005) in the UK and Siu (2003) and Heskett (2003) in Hong Kong, describe the increasing expectations that the engineering industry has of students in respect of their knowledge and understanding, skills and personal attributes.

This study has investigated how the key skills curriculum operates, and how key skills and personal attributes for engineering technicians are perceived and valued in two different contexts. Three research questions were posed:

1. How are key skills viewed and valued in the engineering technician curriculum in two further education colleges in two countries (England and Hong Kong)?
2. How are personal attributes viewed and valued in the engineering technician curriculum in these two colleges?
3. What are the main issues that those responsible for the curriculum in the two departments should consider if they wish to improve the effective development of their engineering technician students' key skills and personal attributes?

These questions are answered below, drawing on the data presented in previous chapters, the contribution of the research evaluated, and finally areas for future research are identified.

7.1 Demand for employable engineering technicians

In the case study colleges in both Hong Kong and England, technician education and training at diploma and higher diploma level aims to produce graduates who are employable. Although employability is a complex construct (Knight and Yorke, 2002), the literature review evidences a widespread agreement in North America, Europe and the Asia-Pacific region that vocational curricula should equip students with a range of knowledge, skills and attributes that will allow them to get jobs in the engineering industry and to progress their careers.

In understanding how key skills and personal attributes are viewed and valued in any department it is necessary to consider the context within which curriculum decisions are taken. The views of individual lecturers may reflect the views of their colleagues, their course leaders, their department heads, the institutional policies and practices and national initiatives and priorities. This study is based on the view that stakeholder pressure drives curriculum change and that curriculum priorities are influenced by powerful stakeholders. If influential curriculum stakeholders are 'pushing' employability as an issue, it is likely to be acted on.

Influential curriculum stakeholders

The study investigated participants' views about influential curriculum stakeholders in order to establish if the development of students' key skills was an educational priority.

In the two case study departments clear differences were perceived by department heads, course leaders and lecturers about stakeholder influences on curriculum. External stakeholders were held to be more influential than internal stakeholders in both cases, but different external stakeholders were emphasised in the two contexts. While heads of department particularly identified the role of funding bodies in curriculum decisions, other staff identified local employers (particularly in Hong Kong) and accreditation/qualification bodies (particularly in England) and their respective governments as significantly influencing curriculum content. In fact all these external stakeholders have strong employability agendas in both England and Hong Kong. It is perhaps surprising that professional bodies were not mentioned by study participants in England. The Engineering Technician Standard is being addressed through the Sector Skills Councils, including SEMTA (Sector Skills Council for Science, Engineering and Manufacturing Technologies) in the expectation that "educators will tailor their programmes to deliver the essential learning and skills" (Engineering Council, 2005, p2) required of engineering technicians in the UK. However, requirements of the professional bodies are likely to be reflected by accreditation/qualification bodies (BTEC/Edexcel) and built into their specifications.

In England The Leitch Review of Skills (Leitch, 2006) and Foster's review (2005) of FE colleges both clearly evidence a need to develop individuals' knowledge base and also their skills, which the government is clearly acting on with its overt skills agenda in the '14-19' education policies. This is being operationalised through the accreditation/qualification bodies and encouraged by the funding bodies. In Hong Kong the government is actively reforming the educational system and plays a significant role in funding vocational education (the 'subvention' system). In Hong Kong employers can express their views of the characteristics and knowledge base they require of vocational students directly through the VTC, via the Training Boards and through Industry Panels linked to specific courses in individual institutions.

These stakeholders (government, funding bodies, accreditation/qualifications bodies and employers) significantly influence the organisation culture of the case study colleges. It is important that curriculum managers respond appropriately to these groups' views when planning future alterations to the curriculum. However, it is noted that there remains a gap for curriculum managers between the 'big picture' of demand for improved generic skills and the detailed understanding of which skills are required for any given occupational group and level.

7.2 Key skills for engineering technicians

This study has shown that in both cultural contexts, key skills are seen as a set of transferable skills central to academic, vocational and personal development. Furthermore some skills are seen as more important than others for engineering technician students. In this study, and taking the data overall, communication emerges as the most important skill, followed by teamwork skills and problem solving skills. Learning skills rank third followed by self management skills, technical skills and numeracy skills. The least important/relevant skills are shown to be initiative and enterprise skills and business management skills.

Taking the two colleges separately, however, reveals a mixed picture of which skills are most highly valued. It shows that the Hong Kong staff and student groups who participated in this study hold views that match the UK-SPEC Engineering Technician Standard requirements (Engineering Council, UK, 2005) more closely than respondents in England. This may be a reflection of both the high levels of employer engagement undertaken by the Hong Kong case study department and the curriculum flexibility that they are permitted. In the Hong Kong case five skills are identified as most important for engineering technicians: communication, teamwork, problem solving, learning and self management. However all eight of the skills identified from the UK-SPEC Engineering Technician specification are prioritised by staff members which indicates that the Engineering Technician Standard is both applicable to, and relevant to, the Hong Kong context.

In England there is consensus about three 'very important' skills for engineering technicians: communication, numeracy and problem solving. In addition information literacy is highly rated among staff and technical skills and critical thinking among student groups. It is noted that communication, numeracy and ICT (information and communication technology) are the key skills qualifications and that these may, in fact, be inhibiting the development of vocationally relevant skills for engineering technician students. Also, completion rates for the key skills qualifications are low, staff think that students find them burdensome and largely irrelevant to their chosen career, and staff find them bureaucratic to administer and have serious concerns about generic skills transfer. As a consequence students may be getting 'mixed messages' about key skills: that the qualifications are not worthwhile but that employability skills are vitally important. Staff may also feel that government policy on key skills, and college policies pushed by funding pressure to deliver key skills qualifications, mean that they cannot concentrate on developing in students those skills that employers both want and need.

In identifying which skills are 'key', staff views in each of the case situations are particularly significant because they are involved in establishing both the 'intended' and the 'delivered' curriculum (Lofthouse, 1994). Therefore in the Hong Kong case if the 'key skills' are taken to be those that staff value most highly, the following list emerges: firstly communication skills, secondly teamwork skills and then (equally ranked third) problem solving skills, learning skills, self management skills. Furthermore it appears that student groups' view the same five skills in the 'received' curriculum (Lofthouse, 1994) as being very important which indicates a high level of curriculum coherence.

In the English case the list of 'key skills' valued most highly by staff is: firstly communication skills, then jointly ranked second numeracy skills along with information literacy skills, thirdly learning skills. It is noted that student groups identify six 'most important' skills of which three are in the list above, so curriculum coherence is perhaps less strong than is the case in Hong Kong.

However it is also clear from the research that if a longer list of skills are taken as 'key' than those presented above, there is a match with the Engineering Council UK-SPECifications in both case situations. The eight skills in the specifications are (in alphabetical order) communication, critical thinking, learning, problem solving, planning and organising, self management, teamwork and technical skills. This indicates that staff in both engineering departments hold realistic views of what industry requires of engineering technicians. Furthermore it suggests that key skills are sector specific.

It may be that using the term 'employability skills' rather than 'key skills' would benefit both departments, in terms of clarity when promoting their importance to students. This is particularly relevant in England to be better able to distinguish the broader range of skills for engineering technicians from the key skills qualifications.

7.3 Personal attributes for engineering technicians

Turning to the personal attributes investigated in this study, it is noted that staff in the English case study appear less concerned about the development of personal attributes than their Hong Kong counterparts, perhaps as the key skills qualification framework they work with is narrowly focussed on skills. While both sets of staff see their role as including pastoral care, Hong Kong staff in particular view student development as a partnership placed in its broad societal context. In this study and taking the data overall, being committed (to the course and to engineering) is the most important personal attribute for engineering technicians, along with honesty/integrity, being motivated, being reliable and being safety conscious. The least valued personal attributes are having aesthetic appreciation and being intuitive.

It is noted that the attributes which appear to be included in the UK-SPEC Engineering Technician Standard are not closely matched by the data from either case study department. Five attributes are identified from the UK-SPEC Engineering Technician Standard: (in alphabetical order) being adaptable, being reliable, being safety conscious, having common sense and professional presentation. Of these, reliability and safety consciousness feature strongly but professional presentation is very low ranked, perhaps being seen as less significant in an educational context than at work. Having common sense and being adaptable are mid-ranked attributes. The UK-SPEC Engineering Technician Standard attributes may not be well understood, seen as not especially relevant, or have not been discussed in relation to their position in the curriculum in either college department.

Taking the two cases separately, however, reveals a mixed picture of which personal attributes are most highly valued. In the Hong Kong case there is consensus among participating staff and student groups that being committed, honesty/integrity and being reliable are the most important attributes and it is noted that these are three of the four Confucian virtues identified by Oh (1991). Staff also agree that being safety conscious and being adaptable are very important whilst students feel that dealing with pressure is particularly important. In the

English case there is consensus that being committed, being motivated and being reliable are the most important personal attributes. Staff also value honesty/integrity, having common sense and cultural/cross-cultural sensitivity whilst student groups value being safety conscious.

Looking purely at the staff views (the 'intended' and 'delivered' curriculum) reveals that the list of most highly valued 'key' personal attributes among staff in the Hong Kong case is: firstly, being committed; secondly, honesty and integrity, and then a third group of being reliable, being safety conscious and being adaptable. Student groups identify four personal attributes as being most important and three of these match the staff views, so curriculum coherence about personal attributes appears to be strong.

In the English case the list of 'key personal attributes' valued most highly by staff fall into two groups: being committed, honesty and integrity, being motivated (in the first group) and being reliable, having common sense, being adaptable and cultural sensitivity (in the second group). It is noted that student groups identify three of these, so as with skills, curriculum coherence appears less strong than is the case in Hong Kong.

However the research shows that if the personal attributes in the top half of the prioritised lists are examined, four of the five attributes found in the Engineering Council UK (2005) specifications are identified in both case situations. These are being adaptable, being reliable, being safety conscious and having common sense. In addition four other personal attributes are valued in both contexts that appear to relate to being a *student* engineering technician. These are being committed, being motivated, dealing with pressure and honesty and integrity. This indicates that staff in both engineering departments hold similar and realistic views of what industry requires of engineering technicians, as well as what they require from students while they are at college. Separating these two groups, 'personal attributes for employability' and 'personal attributes for student life', would be beneficial to promote their importance to students.

The 'softening' of skill to include personal attributes: key skills frameworks and definitions

In the case departments in both Hong Kong and England, respondents agree that the development of key skills and personal attributes is an integral part of the teaching and learning experience. Key skills and personal attributes therefore comprise part of both the 'offered curriculum' and the 'curriculum in action' (Lofthouse, 1994) in both departments. In this study personal attributes tend to be more 'hidden' in the curriculum and appear to be developed less explicitly than knowledge and skills.

This research explored the extent to which study participants in the two contexts hold common perceptions of how to define key skills. Curriculum designers, managers and teachers work within their respective national frameworks as well as the institutional policies prescribed for them.

The notion of key skills which has emerged in Britain is narrowly focussed and containing an instrumental set of generic skills/competencies. In the UK there are six key skills qualifications and Foley (1999) suggests that this qualification-based approach evidences a highly codified system of measuring competence and skills. It might consequently be expected that English FE staff would see key skills as part of this externally imposed generic qualifications framework rather than as an integral dimension of the engineering curriculum. However, this present study clearly shows that the head of department, course leaders and lecturers in the English department predominantly define key skills broadly as 'vocational preparation'; this is in line with Bolton's research (2000) with FE lecturers. In addition, staff also see key skills as being valuable for other purposes, particularly 'developing workplace attitudes'.

In Hong Kong there is no formal policy on key skills or generic skills running through the VET sector. However it appears that both 'generic skills' and 'values and attitudes' are being planned into school-level curricula indicating that these dimensions of the curriculum are increasingly being valued and promoted (Hong Kong Education Commission, 2002). It might consequently be expected that staff in Hong Kong may have limited awareness of what key skills are. However, this research shows that the case study department belongs to an institution that has been actively promoting the development of students' key skills and personal attributes alongside the knowledge and understanding dimension of the curriculum, using a broad and holistic framework 'Key skills for the 21st Century'. In the Hong Kong department the head of department, course leaders, key skills specialists and lecturers predominantly define key skills as 'lifelong learning'. This both accords with the institutional definition of key skills and also echoes the Education Reform publications (Hong Kong Education Commission, 2000; 2002; 2004, 2006). It also fits with the 'cultivating' concept based in Confucianism (Lee, 1996) and a Chinese way of teaching which is holistic and which contains a strong moral dimension set within a broad and long term context (Watkins and Biggs, 2001). The development of 'workplace attitudes' is also seen as important.

In both cases the inclusion of a common secondary definition of key skills is interesting. What constitutes 'workplace attitudes' is unclear, but this 'softening' of skill to include personality traits is in line with research done by Keep and Mayhew (1999) and further supports the importance of researching personal attributes alongside key skills in order to fully investigate engineering technicians' employability. The major personal attributes identified by study participants were discussed above and certainly provide insight into what might constitute appropriate 'workplace attitudes' for engineering technicians.

Although 'lifelong learning' and 'vocational preparation' appear quite different in orientation, as described above, the actual skills identified by study participants are remarkably similar, both within each case and with reference to the Engineering Technician Specification (Engineering Council UK, 2005). It therefore appears that being a professional engineer and teaching engineering to technician level students in both cultural contexts, under quite different key skills systems nationally and institutionally, does not appear to affect the skills and attributes that staff consider 'key'. Whether this is a legacy of the colonial education system many Hong Kong staff experienced, or as a result of the internationalisation of the engineering discipline is unknown.

It is clear that in this study, interviewees in both case study departments define key skills in terms of both skills and attributes. However they feel more comfortable with skills than with attributes being formal curriculum elements. Participating student groups in both cases do not distinguish between skills and attributes when asked to prioritise the most important items for success as an engineering technician. Both skills and personal attributes feature in their 'top 5' lists. If personal attributes are not being actively taught, then clearly they are picking up messages about valuable attributes from their teachers, from work experience they may have, or indirectly in some other way. However, given the lower levels of curriculum coherence concerning personal attributes than about skills, this is an aspect of the curriculum that might usefully be addressed by course teams.

Taken together, the staff and student groups' views reinforce the need to manage the whole cubic vocational curriculum effectively in order to develop engineering technician students' employability alongside their subject knowledge.

7.4 Improving the curriculum for engineering technicians

At departmental level there are practical things that might be done to improve the curriculum for engineering technician students, but these changes must be appropriate for the college and national context within which the department operates.

Munday and Farriday (1999) recommend a whole college approach to key skills with the creation of working groups involving staff at all levels. They also recommend the development of effective cross-college structures managed by a Key Skills Coordinator. Colleges should identify clear roles and responsibilities within the structure, and develop effective key skills teams within curriculum areas.

In this study it is clear that the English case department operates within an institution that takes a whole college approach to the key skills qualifications and which runs a Key Skills department that coordinates key skills teams. The situation in the Hong Kong case is less well developed, and although there are key skills policies, it is at the discretion of individual departments what further development work (if any) is undertaken. The foundation level key skills modules are run by key skills specialists but the SAO is external to the departmental structure and does not have a wider coordination role. The staff development and staff support role is the remit of the TLC, where a very few key skills specialists are available.

In addition it is worthwhile reproducing ten critical success factors that are advocated for managing key skills:

1. Promoting a positive agenda
2. Implementing an effective curriculum model
3. Establishing clearly defined roles and responsibilities
4. Co-ordinating activity within teams and across the centre
5. Delivering effective teaching and learning
6. Establishing clear assessment procedures
7. Using resources effectively and efficiently
8. Embedding quality assurance
9. Delivering appropriate staff development
10. Reviewing and planning ahead

Key Skills Support Programme (2003).

Staff at both case study colleges might usefully check that these critical success factors are in place.

Both departments might find it beneficial to think about which student key skills and personal attributes they particularly see as relevant to engineering technician education and training, and to ensure that opportunities to develop these are an explicit part of their courses. Staff might productively consider the conceptual model developed for this study. The concept of a cubic curriculum could encourage broad ranging discussion about engineering technician education and training. A review of the data presented above and in previous chapters should stimulate discussion among course teams, either to reinforce existing provision or to identify gaps that might usefully be plugged. The review might usefully check if the views expressed by respondents match those held by others in the department and accurately reflect the requirements and expectations of industry.

Figure 7.1 relates to 'Asian College'. Staff might consider adding more skills to their list such as creative thinking and information literacy when finalising their intended curriculum. They might also debate if it is worthwhile dividing the personal attributes into those primarily for student life, and those particularly highly valued by employers.

'Asian College' intended curriculum

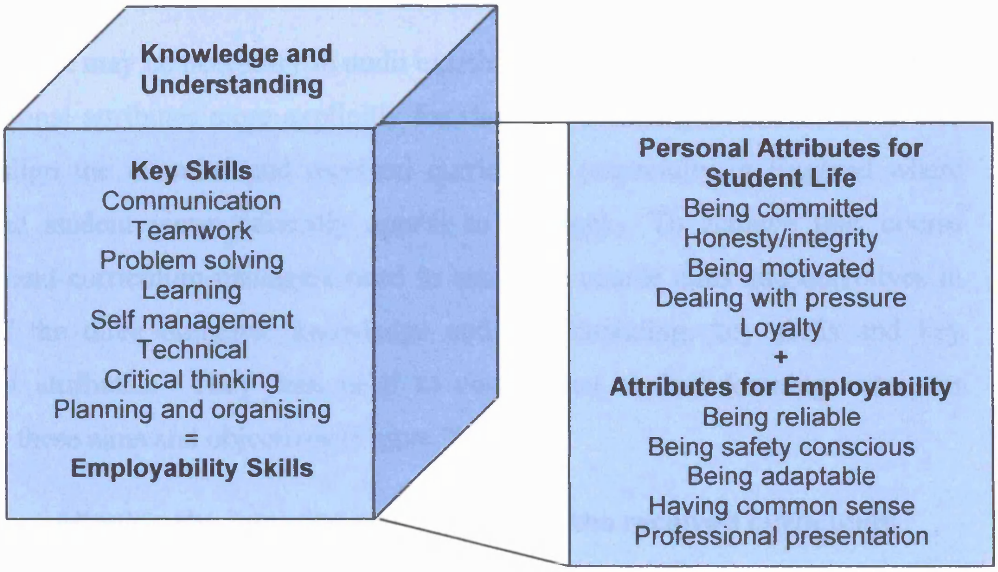


Figure 7.1: 'Asian College' intended cubic curriculum.

Figure 7.2 relates to the intended cubic curriculum at 'Northern College'. Staff here might wish to identify separately the key skills qualifications and list of employability skills as well as splitting personal attributes into two categories.

'Northern College' intended curriculum

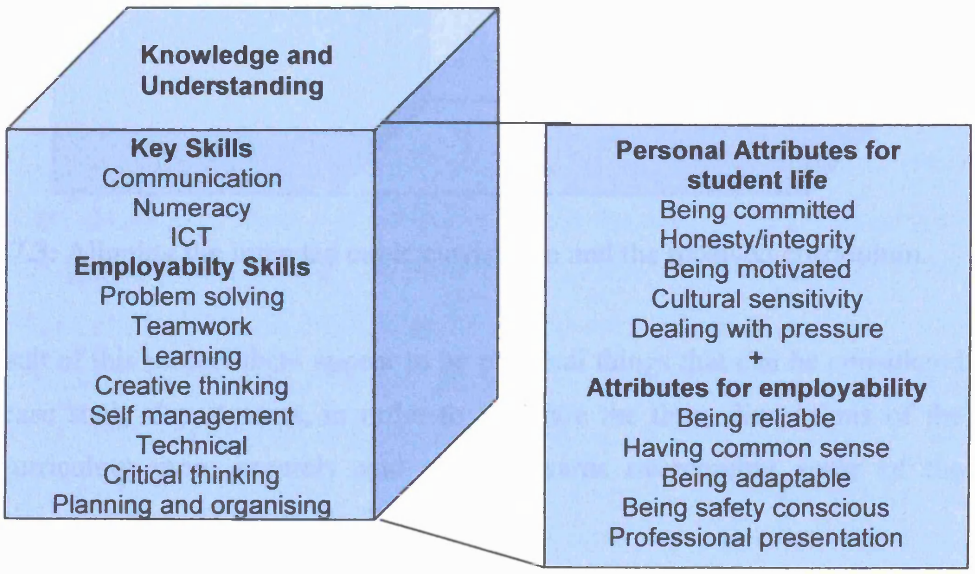


Figure 7.2: 'Northern College intended curriculum

Furthermore course teams might consider how many skills and attributes (and which ones) are 'key' and consequently decide how best to manage their development. The card sorting activity developed for this study would be a practical way for course team members to prioritise skills and attributes; the addition of a card for foreign language skills might usefully be inserted (along with blank cards for any other skills or attributes that participants wish to add).

In addition it may be necessary to audit existing curricula, signpost important skills and personal attributes more explicitly for staff and students, and consider how to better align the intended and received curriculum (especially in England where staff and student views currently appear to diverge). To achieve this, course leaders and curriculum managers need to articulate course aims and objectives in each of the three domains: knowledge and understanding, key skills and key personal attributes. They then need to ensure that student learning outcomes achieve these aims and objectives (Figure 7.3).

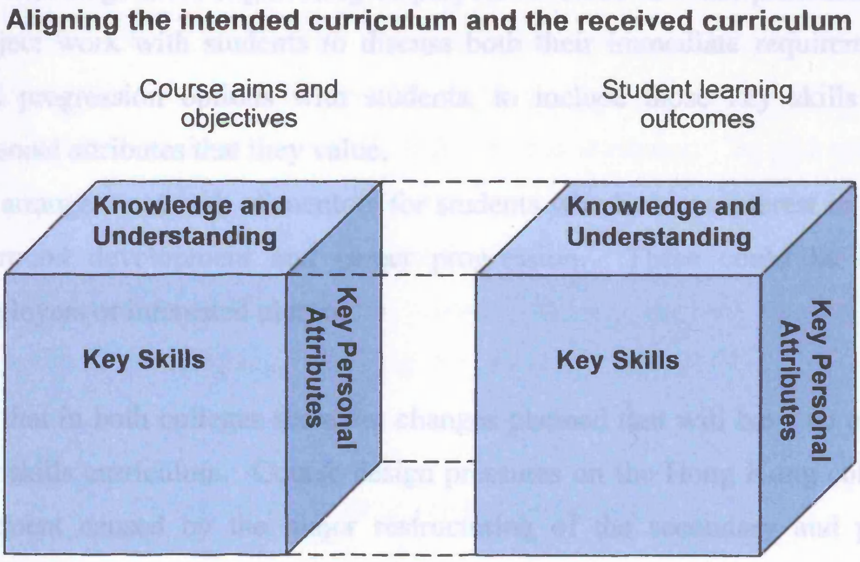


Figure 7.3: Aligning the intended cubic curriculum and the received curriculum.

As a result of this project there appear to be practical things that can be considered in the case study departments, in order to integrate the three dimensions of the cubic curriculum more securely and move towards overcoming some of the difficulties identified in Chapter 4. These are:

1. To actively integrate more key skills development into mainstream subjects.
2. To focus on learning skills and/or employability skills during induction and review times in any given course.
3. To identify ways for part-time students to access information about key skills, reflect on their current levels of skill, and help them find opportunities to develop their skills further.
4. To actively look for, and fund, opportunities for students to develop their skills and personal attributes beyond the boundaries of the engineering department.
5. In England to focus more on the development of skills and personal attributes on a one-to-one basis with students during scheduled Personal Development Planning (PDP) sessions or times with personal tutors.
6. In Hong Kong to require students to update their Career Portfolios (started in Year 1 with the Student Affairs Officers) on a regular basis (certainly annually, preferably each semester).
7. To encourage local engineering employers involved in work placement or project work with students to discuss both their immediate requirements and progression options with students, to include those key skills and personal attributes that they value.
8. To arrange a network of mentors for students who have an interest in their all-round development and career progression. These could be local employers or interested alumni.

It is noted that in both colleges there are changes planned that will have an effect on the key skills curriculum. Course design pressures on the Hong Kong college and department caused by the major restructuring of the secondary and post-compulsory education systems will probably reduce the number of specialist key skills modules from two to one. The compulsory foundation level key skills module may be redesigned and there may be an attempt to integrate key skills into some curriculum elements for final year students as they prepare to leave college and enter the workplace. The English college will be affected by changes to the key skills qualifications planned by government. In 2007/8 'functional skills' qualifications, developed by the QCA are to be introduced and funded at the same rate as key skills and it is expected that functional skills will replace existing provide reinforcing messages about the value of industry-specific skills and attributes. (Hodkinson and Bloomer, 2000) found that, for many learners, their dispositions changed over the time they were at college. This has interesting implications for FE teachers, who perhaps need to recognise their influence on the young people they teach, and the wider messages these learners pick up from the Department and College they attend.

It was noted in Section 2.5 that there are a various sources of information available to those who wish to improve the management of the key skills curriculum. The major sources are the Learning and Skills Network (http://www.lsneducation.org.uk/programmes/portal.aspx?ProgID=1), the Key Skills Support Network (http://www.keyskillssupport.net/) and, to a lesser extent, the Welsh Joint Education Committee (http://www.wjec.co.uk/index.php?subject=30&level=110). It is beyond the scope of this project to synthesise all the advice given in these very comprehensive websites. However, as the final key research question relates to curriculum improvement it is pertinent to identify the main issues that those responsible for curriculum management in the two engineering departments should consider if they wish to improve effective development of their students' key skills and personal attributes. To address this question, a checklist has been developed that contains questions for curriculum managers to consider with their course teams. The checklist (Table 7.1) is based around a cyclical curriculum management process (planning; delivering; assessing; evaluating, reviewing and forward planning) proposed by McNeill (2006).

Curriculum management checklist	
Curriculum Planning	
☐	Do we know the internal stakeholders views on which key skills and personal attributes our students require? We might consult the following: Senior Managers, Head of Department, Key Skills Specialist staff within the college, students, others
☐	Do we know the external stakeholders views on which key skills and personal attributes our students require? We might consult the following: Government agencies (policy documents), accreditation and qualifications bodies', professional bodies, employers (national and local), our alumni, others
☐	Have we a developed and agreed a rationale for key skills and personal attributes that fits with college policy?

☐	Have we established a team of people who will be responsible for key skills and personal attributes within the department?
☐	Have we mapped and signposted key skills and personal attributes in our curriculum?
☐	Have we devised a promotion plan so that staff and students are likely to feel positive about, maybe even enthusiastic about, skills and attributes?
☐	Have sufficient time and funds been set aside for staff development?
☐	Have we ensured that key skills and personal attributes are included in staff induction and appraisal?
☐	Are there resources for high quality, accessible teaching and learning materials?
☐	Have we made the necessary links with people external to our department (e.g. key skills specialists, local employers, alumni) that we will need to call on to help with key skills delivery, development and assessment?
☐	Have we developed methods of sharing expertise between key skills specialists and other teachers?
☐	Is quality assurance embedded? Have we set quality standards and targets?
Curriculum Delivery	
☐	Have we planned an induction programme so that students are aware of what key skills are, which key skills their vocational area particularly requires of them and what personal attributes are considered important for progress by their teachers and employers?
☐	Have we made arrangements for initial and diagnostic assessment?
☐	Have we promoted effective and learning and teaching so that key skills and personal attributes are adequately covered?
☐	Have we assured the quality of assignment briefs such that key skills and personal attributes are included?
☐	Are the assessment opportunities that we provide well timed?
☐	Have we established a system of formative assessment so that students' consciously develop their key skills and personal attributes?
☐	Do we help students to develop the skills of self-evaluation and personal development (e.g. reflective writing and journaling, personal progress planning) without this becoming too 'public' and uncomfortable for them?
☐	Are we able to offer students industry-based experiences or industry-hosted projects that enrich the curriculum and allow for the development of skills and personal attributes as well as knowledge?
☐	Have we established an effective system for tracking learners' progress?
Assessment	
☐	Have we arranged a suitable (and valid) method of assessment?
☐	Do students understand the purpose of assessment? Are students clear about, and comfortable using, the assessment criteria?
☐	Have we arranged for internal verification (and external assessment if the course regulations require it)?
☐	Have we arranged for standards to be monitored?

☐	Have we established a formal mechanism for accurate record keeping so that student achievements are documented?
☐	How and when do we review progress with each student?
Evaluation, reviewing, and forward planning	
☐	Have we agreed when to meet to evaluate and review our progress?
☐	When will we conduct a survey to get student feedback about the way key skills are delivered, practised and assessed?
☐	Do we modify teaching approaches and activities in the light of student feedback?
☐	Do we need feedback from any other stakeholders in order to further improve our key skills curriculum?
☐	Do we need to give feedback to any stakeholders about our students' key skills (e.g. Senior managers, local employers) before we start our next round of curriculum planning?
☐	Are we adequately finding and funding opportunities for students to practice and build their skills?
☐	Have we developed mechanisms to keep up-to-date with local and national initiatives and issues that relate to key skills?
☐	As part of our quality assurance procedures have we undertaken evidence-based self-assessment to determine strengths and weaknesses of our provision? Have we developed improvement plans?
☐	Have we costed a development plan?

Table 7.1: Curriculum management checklist

7.5 Evaluating the contribution of the research

It is possible to contribute in a small way to the field of educational research when undertaking a small-scale project such as the one described here. FE is less well researched than either schools or HE, and engineering (perhaps through being mostly populated by men with a preference for quantitative methods) does not appear to have the subject of much qualitative research or any substantial research into students' key skills. The research undertaken at 'Asian College' and 'Northern College' although modest in scope, was undertaken carefully and with a genuine interest in fairly representing the views and values of those who participated. It is hoped that the case study descriptions will be of interest to curriculum managers in other engineering departments who are actively wishing to improve their students' key skills. The base-line data and data collection tools provided here may enable managers to investigate the views and values of their own curriculum stakeholders in relation to the key skills and personal attributes that make such a difference to their students' employment prospects and life goals.

The conceptual model developed for the research provides a helpful visual tool for understanding the complex topic of curriculum management and the 'cubic' framework adapted from Wragg (1997) and Carter (1985) offers a means for considering the constituent parts of the vocational curriculum holistically. This development reinforces the cubic curriculum model by highlighting key skills and personal attributes without undermining the centrality of knowledge and understanding to a vocational curriculum. It offers opportunities to reflect upon how the three dimensions 'mesh' together to improve curriculum: this is of particular importance in a context where key skills are negatively viewed as a disjoined element of the vocational curriculum. The model offered in Figure 2.4 clearly identifies a number of internal and external stakeholders in the engineering curriculum. Although developed for the project with its focus on engineering students, there is no reason why it should not be used in other vocational areas.

7.6 Areas for further research

As with any piece of research, many issues arise and there are many topics that appear worthy of further investigation. Mostly these have to be sidelined in order to keep the immediate study focused on answering the original research questions. However, the following would make interesting research projects.

- More detailed work within the VET institution in Hong Kong exploring the key skills module run by the SAO and its interface with academic disciplines.
- A more detailed longitudinal study with students in Hong Kong and England, (perhaps with some quantitative elements) looking at self-assessed key skills on entry and on exit from a course, perhaps with an exploration of the effectiveness of reflective writing and journaling for engineering students.
- A more in-depth study of 'professionalism', the attitudes and the personal attributes that develop over time in a given vocational field. Perhaps an exploration of Asian and Western approaches to what it means to be a professional engineer.
- Within the FE sector, taking a different academic discipline (in Hong Kong and England) in order to see if their skills and attributes are different from those of engineers.

- To study students taking degree level qualifications in engineering at University in Hong Kong and England and to see if their skills and attributes are different from students intending to be engineering technicians.
- To focus purely on England and to compare a wider range of Higher and Further Education institutions who are training students to be engineering technicians and to see how similarly or differently they view key skills.
- To undertake further cross-cultural work but in different countries, for example Australia (which appears to have an advanced interest in employability) and to compare it with Hong Kong or the UK.

On a broader conceptual level one source of tension whilst undertaking this particular project was the need to maintain a close focus on the detail of key skills and personal attributes whilst recognising it is a very complex area. There appears to be a fundamental issue in better developing students' skills and attributes which revolves around ensuring coherence between policy and practice. There has been little research activity in this area, but it is logical that a number of strategic elements must be united if key skills curriculum is to be managed effectively. Drummond et al. (1999) suggest that a supportive culture, a supportive context and an ongoing focus on the production of coherent outcomes underpin change management. A supportive organisational culture sends strong messages to departments and individual teachers that employability, key skills and personal attributes are valued. There should be evidence of established policies and procedures to evaluate, develop and assess those skills and attributes that are 'key' in each identified employment sector. In a supportive context adequate training and resources are provided to enable teachers and support staff (including key skills specialist support staff) to work effectively with students (and probably to a lesser extent, employers and other stakeholders). If the outcomes are coherent then the provision will capture all students and allow them to develop a range of skills and personal attributes that are relevant to study, employment and life in a progressive way.

The generic conceptual model presented below may be of interest to those wishing to do further research in this area. At the core is the cubic curriculum; knowledge and understanding, key skills and personal attributes, clearly articulated for specific vocational areas and levels of study. Surrounding this is the cyclical operational curriculum management process; curriculum planning, curriculum delivery, assessment, evaluation, review and forward planning. In addition there is a strategic level; an organisation culture and context which support the development of key skills and personal attributes to achieve a coherent set of outcomes that satisfy curriculum stakeholders.

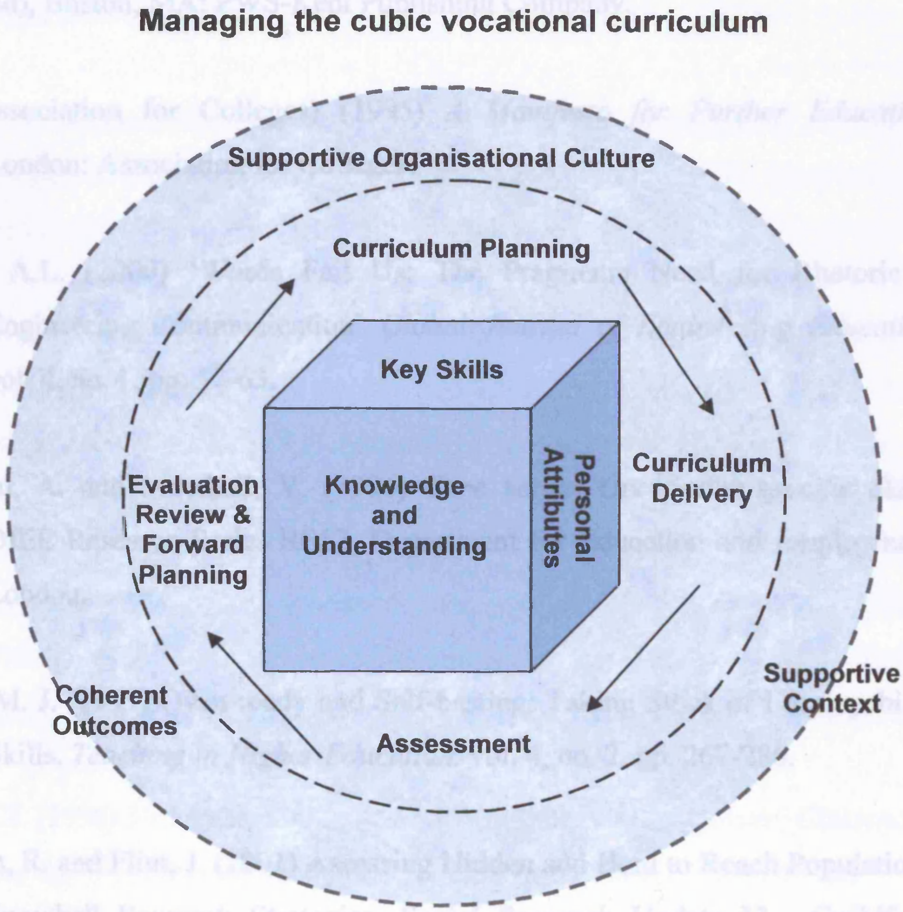


Figure 7.4: Managing the cubic vocational curriculum: an holistic model

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Appendix A: Personal ethical checklist

At the early planning stage	
☐	Am I familiar with the BERA Ethical Guidelines for Educational Research (2004) and the BERA paper; Good Practice in Educational Research Writing?
☐	Am I familiar with the University of Leicester's requirements?
☐	Have I identified where ethical issues may arise in my research?
☐	Am I able to articulate the values I bring to my research?
☐	Whose purpose will be served by my research?
☐	Have I a clear purpose and strategy in mind?
☐	Have I thought through the issues of reliability and validity (trustworthiness) in respect of my research?
☐	Have I drafted a thesis proposal and discussed it with my tutor?
Before fieldwork begins	
☐	Have I submitted a thesis proposal and had it approved?
☐	Have I identified whose consent is needed (and obtained it)?
☐	Have I explained fully the purpose of my research and its implications to those who will be involved?
☐	Have I promised confidentiality and/or anonymity and explained what that means to my participants?
☐	Do I need to let participants read (and comment on?) parts of my research?
☐	Have I gathered together all the equipment I may need and learned how to use it?
☐	Am I able to consult my tutor to discuss ethical dilemmas that may arise during the project?
During fieldwork	
☐	Have I ensured that participation in my research will be made as easy and pleasant as possible?
☐	Have I checked whether participants are comfortable speaking English?
☐	Have I gathered the secondary material (course documentation, instructional materials and student work) as specified in my proposal?
☐	Have I been flexible and open-minded about the data gathered?
☐	Have I done my best to obtain valid and reliable (trustworthy) data?
☐	Have I obtained any additional data arising from the process of doing the fieldwork ethically (with the approval of those involved or affected)?
☐	Have I kept an accurate project log to ensure I have a clear audit trail as well as a record of my ongoing thoughts about what is happening?
Analysis and reporting	
☐	Have I analysed my data systematically and fairly, considering alternative interpretations?
☐	Have I given written or verbal feedback to all interested parties? Have I considered different kinds of reports for different groups?
☐	Have I acknowledged all those who helped me?
☐	Has my study been conducted carefully, thoughtfully and correctly and does this come through in the way my thesis is written?
☐	Is my conscience clear? Can I defend those ethical decisions I have made, if called on to do so?

Adapted from Watt (1995) with additional material from Miles and Huberman (1994) Denscombe (1998), Cohen, Manion and Morrison (2001).

Appendix B: Letter requesting permission for research

[Name of Department Head, address]

28th November 2005

Dear [insert name]

Please find enclosed two documents that relate to my proposed research into the management of key skills in the engineering curriculum.

1. A letter from the University of Leicester Doctorate of Education Programme Board approving my thesis proposal.

2. A project overview. This is a shortened version of the proposal submitted to the doctoral board. It identifies my research aims and objectives, key research questions and data gathering requirements. It also provides a description of how data will be used. The help of college personnel and students is much appreciated and on page 3 you will find an indication of what is proposed.

If you wish to know more about the Ed.D Course, you may go to http://www.le.ac.uk/education/ Specific information about the doctoral thesis and how it fits with the course structure can be found on http://www.le.ac.uk/education/courses/doecd_modules.html I am on the Educational Leadership and Management strand.

As indicated in the project overview, I would like to come to [insert college] to do the bulk of the data collection work in Jan/Feb 2006. At this point I just need your formal agreement that I may use your department as a case study and your suggestion as to the most suitable date for the first visit.

I really appreciate your help and look forward to meeting you.

Best wishes,

Michele Webster.
Encs.

Appendix C: Research questions, data sources and data collection methods

Q1. How are key skills viewed and valued in the engineering curriculum in two further education colleges in two countries (England and Hong Kong)?	
Subsidiary questions	**Source and data collection methods used**
To what extent does governmental policy influence the key skills curriculum?	Secondary sources: Government/Education Departments websites, reports and documentation. Books, academic journal articles, newspaper articles/commentary. Websites, reports and documentation from National/regional bodies involved with Key skills/generic skills
How do the professional bodies view key skills? What is their perspective on professional competence and employability for engineering technicians?	Secondary sources: Literature survey and review of websites/documentation of professional (engineering) bodies.
Are there Institutional priorities for the key skills curriculum? Which key skills framework is being used? What policies are in place? Is a key skills curriculum model prescribed or do departments have flexibility to choose their own approach?	Secondary sources such as institutional strategy/policy documents, annual reports, website.
How does the Head of Department view key skills? What constitutes workplace readiness/employability for students? What key skills curriculum model is used? What are the curriculum priorities and planned changes (including new courses and impending revalidations) and are these designed to promote skills development?	Semi-structured interview with Department Heads including card-sort activities*. Also looking at departmental documentation (prospectus, course handbook, information given to prospective students via the website. *One to define key skills and one to identify those skills which are most important.
Which individuals or groups have formal (or informal) input into developing students' key skills? How do they view their role in the existing key skills curriculum? How do course leaders, teachers and key skills specialists view key skills; which are their 'most important' skills? Are key skills mapped across the curriculum? How are key skills taught, assessed and accredited? What preparation/training have these people had to teach, monitor and evaluate students' key skills?	Semi-structured interviews including card-sort activities* with teachers, Course Leaders and internal Key Skills specialists. *One to define key skills and one to identify those skills which are most important.

How do students view key skills? Which skills do they identify as 'very important' and which as 'not important/relevant'?	Card-sort activity with small groups of students.
Taking the above views together, which skills are 'key'? How similar/different are the two case study situations?	Analysis of departmental information and interview data generated above.
Q.2 How are personal attributes viewed and valued in the engineering curriculum in these colleges?	
Subsidiary questions	**Data collection methods and data source**
How do the professional bodies view personal attributes?	Secondary sources: Literature survey and review of websites/documentation of professional (engineering) bodies.
How do the Head of Department, course leaders, teachers and key skills specialists view personal attributes? Do they see developing students' personal attributes as part of their role?	Semi-structured interviews including card-sort activities with department Heads, teachers, Course Leaders and internal Key Skills specialists.
How do students view personal attributes? Which personal attributes do they identify as 'very important' and which as 'not important/relevant'?	Card-sort activity with small groups of students.
Taking the above views together, which attributes are 'key'? How similar/different are the two case study situations?	Analysis of departmental information and interview data generated above.
Q.3 What are the main issues that those responsible for the curriculum in the two departments should consider if they wish to improve the effective development of their students' key skills and personal attributes?	
Subsidiary questions	**Source and data collection methods used**
What advice is there about what constitutes good practice in relation to the key skills curriculum?	Secondary sources: literature on good practice in managing the key skills curriculum.
In each of the cases, how does what they do compare with the 'good practice' advice noted above? What gaps are there? What might they do to fill those gaps?	Analysis of departmental information and interview data generated above.

Appendix D: Interview consent form

CONSENT TO PARTICIPATE IN INTERVIEW

Managing Key Skills in the Engineering Curriculum: A Cross-cultural Comparative Study of Two Further Education Institutions in Hong Kong and England

You have been invited to participate in a research study conducted by Michele Webster, a student of the University of Leicester. The purpose of the study is to explore key skills curriculum management issues that may be common to both England and Hong Kong. The results of this study will be included in Michele Webster's Doctoral thesis. You were selected as a possible participant in this study because your views about key skills were seen as interesting, relevant and significant. Participation is voluntary. If you do not wish to be involved, or if you wish to withdraw from the project at any time there are no negative consequences for you.

You should read the information below, and ask questions about anything you do not understand, before deciding whether or not to participate.

- This interview is voluntary. You have the right not to answer any question, and to stop the interview at any time. I expect that the interview will take about 45 minutes.

- I would like to record this interview on audio cassette so that I can use it for reference while proceeding with this study. If you grant permission for this conversation to be recorded on cassette, you may revoke permission at any time.

- Unless you give permission to use your job title and/or use quotations from you in any publication that may result from this research, what you tell me will be confidential. I intend to anonymise the data so no names will be used.

- After the interview I will send you a copy of the interview transcript or interview notes as soon as I can. This will enable you to verify what we have discussed and also to give me permission to use the material.

- This project will be completed by September 2006. All interview recordings will be stored in a secure place until 1 year after that date. The tapes will then be destroyed.

Are you happy to participate?

If you have any questions about the project you may contact Michele Webster by email at michele@mwebster.fsnet.co.uk or by telephone in the UK 01904 490230, or from Hong Kong 0044 1904 490230.

Please sign below if you agree to participate in the study. You will be given a copy of this form.

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in the study. I have been given a copy of this form.

[ ] I give permission for this interview to be recorded on audio cassette.

I give permission for the following information to be included in publications resulting from the study:

[ ] My job title [ ] Direct quotations from the interview

Participant's Name:_______________________________________

Job Title:____

Signature: _____________________________________ Date: __________

Signature of Investigator: __________________________ Date: __________

If I have any additional questions or need clarification, how and when is it best to contact you?

____

Appendix E: Interview questions: Lecturers/course leaders

General Questions about the Department

1. How long have you worked in this department and what is your background?
2. What do you do? How is your work structured?
3. How many engineering students (FT and PT) do you teach this academic year? What are they like?
4. Thinking back over the last 3-5 years what have been the main changes in your department/your job?

Stakeholder Priorities

5. Do you think any of the following stakeholders significantly influence the curriculum of the engineering course(s) you teach on:

   a) government,

   b) professional bodies,

   c) local employers,

   d) accreditation/qualification bodies,

   e) college directorate,

   f) local or overseas universities,

   g) secondary schools,

   h) students,

   i) any other stakeholders?
6. What do you see as being the 2-3 main strategic objectives for your college?

Departmental (Curriculum) Priorities

7. What major changes (if any) are you involved with? (new courses, revalidations, new modules, module revisions …)
8. Do your students do any personal development planning (monitoring and reflecting on their own learning *or* recording-reflecting-action planning *or* profiling their progress)? If they do, how does it work? Is it formally assessed or credited?

General Questions about Key Skills

9. When (approximately) did you become aware of key skills (core skills, generic skills, employability skills)?
10. Do you think that key skills/generic/employability skills should (in principle) be integrated into modules you teach, taught as stand-alone modules/topics or not taught at all?
11. Could you give me your definition of key skills?[1]
12. During the last year, how much time have you spent discussing students key skills/generic skills/employability with:
    a. your senior colleagues (including your Head of Department)
    b. your colleagues (teaching staff)
    c. anyone else?
13. During the last 2 years have you had any training in developing and assessing students key skills/generic skills/employability skills?
14. Which skills and attributes do you see as being the most important for engineers (engineering technicians) in the 21st century?[2]

Close

15. Is there anything you would like to add?
16. Do you have any questions or comments for me?
17. Would you prefer to receive a full transcript or a set of summary notes for checking?

[1] Five definition choices will be provided – or you may provide your own definition.
[2] Fourteen skills and sixteen personal attributes will be provided – you may add others.

Appendix E Interview questions: Head of department

General Questions about the Department

1. How long have you been HoD and what is your background?
2. How many staff do you have working in the department? How is the department structured?
3. Is engineering popular? Is there competition for places and which courses are they mostly interested in?
4. How many students (FT and PT) are enrolled this academic year?
5. Do you keep graduate employment (destination) statistics? What kind of jobs do your students go on to do?
6. Do you have an industry advisory panel and if so, what is its function?
7. Thinking back over the last 3-5 years what have been the main changes in your department?

External Stakeholder Priorities

8. In what ways is the government influencing engineering education?
9. In what ways are professional bodies influencing engineering education?
10. What do local employers expect/want from your engineering graduates?
11. In what ways do accreditation/qualification bodies influence engineering education?
12. Are there any other external stakeholders (universities, secondary schools, students, funding bodies …) whose views on your courses/curricula are influential?

Institutional Priorities

13. What do you see as being the 2-3 main strategic objectives for your college?
14. Where (if at all) do key skills appear in college strategic plans or policy documents?
15. Who (if any) are key skills advocates/champions?

Departmental (Curriculum) Priorities

16. What major changes (if any) are you planning? (new courses, revalidations, new modules …)

17. If we look at the engineering curriculum as comprising the development of students:
    a. knowledge and understanding
    b. personal attributes
    c. key skills

    How would you evaluate the relative importance of each element?
18. During the last year, how much time have you spent discussing students key skills/generic skills/employability with
    a. your senior colleagues
    b. other department Heads
    c. industrial partners
    d. professional bodies
    e. your course leaders
    f. anyone else?
19. Do you think that key skills/generic skills should (in principle) be integrated into your courses or are best taught as a stand-alone module/topic?
20. In the last 2 years, what departmental resources have been put aside for key skills development activity (staff development, teaching material development, other tangible resources)? Next year?
21. In new courses and those under development, will key skills be more or less significant than on existing courses?

General Questions about Key Skills

22. How familiar are you with key skills (core skills, generic skills, employability skills)?
23. When (approximately) did you become aware of key skills? How?
24. Could you give me your definition of key skills?[3]
25. Which key skills and attributes do you see as being most important for engineers (engineering technicians) in the 21st century?[4]

---

[3] Five definitions will be provided – or you may provide your own definition.
[4] Fourteen skills and sixteen personal attributes will be provided – you may add others.

Appendix E Interview questions: Key skills specialists

General Questions

1. How long have you worked as [insert job title] and what is your background?
2. What do you do? How is your work structured?
3. What are the students like that you work with?
4. Do you work with engineering students? How many are you working with this academic year?
5. Thinking back over the last 3-5 years what have been the main changes in your department/your job?

Key Skills Courses

6. Can you explain how the key skills [in HK and life skills] programmes work?
7. Who participates? Is it compulsory for all students?
8. Do you teach 'mixed' groups (i.e students from different academic disciplines) or groups of students from the same course/academic discipline?
9. Are courses generic or are they tailored to specific academic disciplines?
10. How do you assess the learning outcomes?
11. What do students get at the end of these programmes (if anything)?
12. Do you think that students like the key skills programmes/modules? How well do they do?

General Questions about Key Skills

13. When (approximately) did you become aware of key skills (core skills, generic skills, employability skills)?
14. Do you think that key skills/generic/employability skills should (in principle) be integrated into modules you teach, taught as stand-alone modules/topics or not taught at all?
15. Could you give me your definition of key skills?[5]

---

[5] Five definition choices will be provided – or you may provide your own definition.

16. During the last year, how much time have you spent discussing students key skills/generic skills/employability with:

    a. your senior colleagues (including your Head of Department)
    b. your colleagues (teaching staff)
    c. anyone else?

17. During the last 2 years have you had any training in developing and assessing students key skills/generic skills/employability skills?
18. Which skills and attributes do you see as being the most important for engineers (engineering technicians) in the 21st century?[6]

Close

19. Is there anything you would like to add?
20. Do you have any questions or comments for me?
21. Would you prefer to receive a full transcript or a set of summary notes for checking?

[6] Fourteen skills and sixteen personal attributes will be provided – you may add others.

Appendix F: Cards – definitions of key skills

Key skills = remedial skills Students have been inadequately taught at school. They need to boost their skills (such as numeracy) in order to cope with the course. B-1	**Key skills = vocational preparation** Students need to be equipped with skills (such as communication, applying IT) required by employers so that they can get good jobs. B-2
Key skills = developing workplace attitudes Students need to develop attitudes such as punctuality, reliability, cooperation and other 'work skills' because potential employers look for these alongside students' paper qualifications. B-3	**Key skills = study skills** Students need to be equipped with a set of techniques that will help them be successful at college (such as information literacy, report-writing, presentation skills). B-4

Key skills = lifelong learning skills Students use skills every day of their lives in all aspects of their lives. They are part of a continuum that begins at school, continues through college and on into higher education, work and life. B-5	**Key skills =** B-6

Appendix G: Bilingual cards – key skills and personal attributes

Communication skills 溝通技能 S-2	**Team work skills** 團隊合作技能 S-12
Problem solving skills 解難技能 S-10	**Initiative and enterprise skills** 主動及企業技能 S-6

Planning and organising skills 組織及計劃技能 S-9	**Self management skills** 自我管理技能 S-11
Learning skills 學習技能 S-7	**Technology skills** 科技技能 S-14

Numeracy skills 數字運用技能 S-8	**Information literacy skills** 資訊知識技能 S-5
Technical skills 技術使用技能 S-13	**Business management skills** 商業管理技能 S-1

Creative thinking skills

創意思維技能

S-3

Critical thinking skills

批判思考技能

S-4

Having a sense of loyalty (to the class and the Engineering department) 忠誠 A-10	**Being committed (to the course and to being an engineer)** 承擔及責任感 A-5
Feeling Positive about yourself 正面的自我形象 A-13	**Having a sense of humour** 幽默感 A-16

Being honest and acting with integrity

誠信

A-8

Having a balanced attitude to work(study) and home/social life

平衡家庭與工作生活的能力

A-4

Being reliable

可靠性

A-14

Being able to deal with pressure

應付壓力能力

A-1

Being able to present yourself in a professional manner 個人表達(信心及專業) A-12	**Being motivated (to get things done, to do well)** 幹勁 / 積極性 A-11
Having common sense 常識 A-6	**Being adaptable** 適應能力 A-2

Being safety conscious 危機感/ 安全意識 A-16	**Being sensitive to other people and other cultures** 對不同文化的敏感性/觸覺 A-7
Being able to appreciate the aesthetic value of things 審美能力 A-3	**Being Intuitive** 直覺 A-9

Appendix H: Key skills and personal attributes card sort – student group briefing sheet

Your Task: To express your groups view about what makes an engineering student successful.

Time allowed: 20 minutes

1. Lay out the header cards, 'Is very important' 'Is important', 'Is not important/not relevant'.
2. Take the skill (blue) and attribute (green) cards. For each one decide (as a group) how important it is for success as an engineering student. Place each card under the appropriate header. You can take the cards in any order. If you get stuck (you can't decide where to put a card or your group can't agree) don't worry – put the card to the bottom of the pile and move on to the next.
3. When you have placed all the cards think about whether there is anything missing! If you think that there are other things that are important for success as an engineering student, please feel free to add them (write on the blank cards provided).
4. Now look at all the cards in the 'very important' pile and, if you can, separate out your 'top 3'.
5. When you are finished I need to record what you have done – Leave the cards laid out on the table - PLEASE DON'T MIX THEM UP!

Thanks!

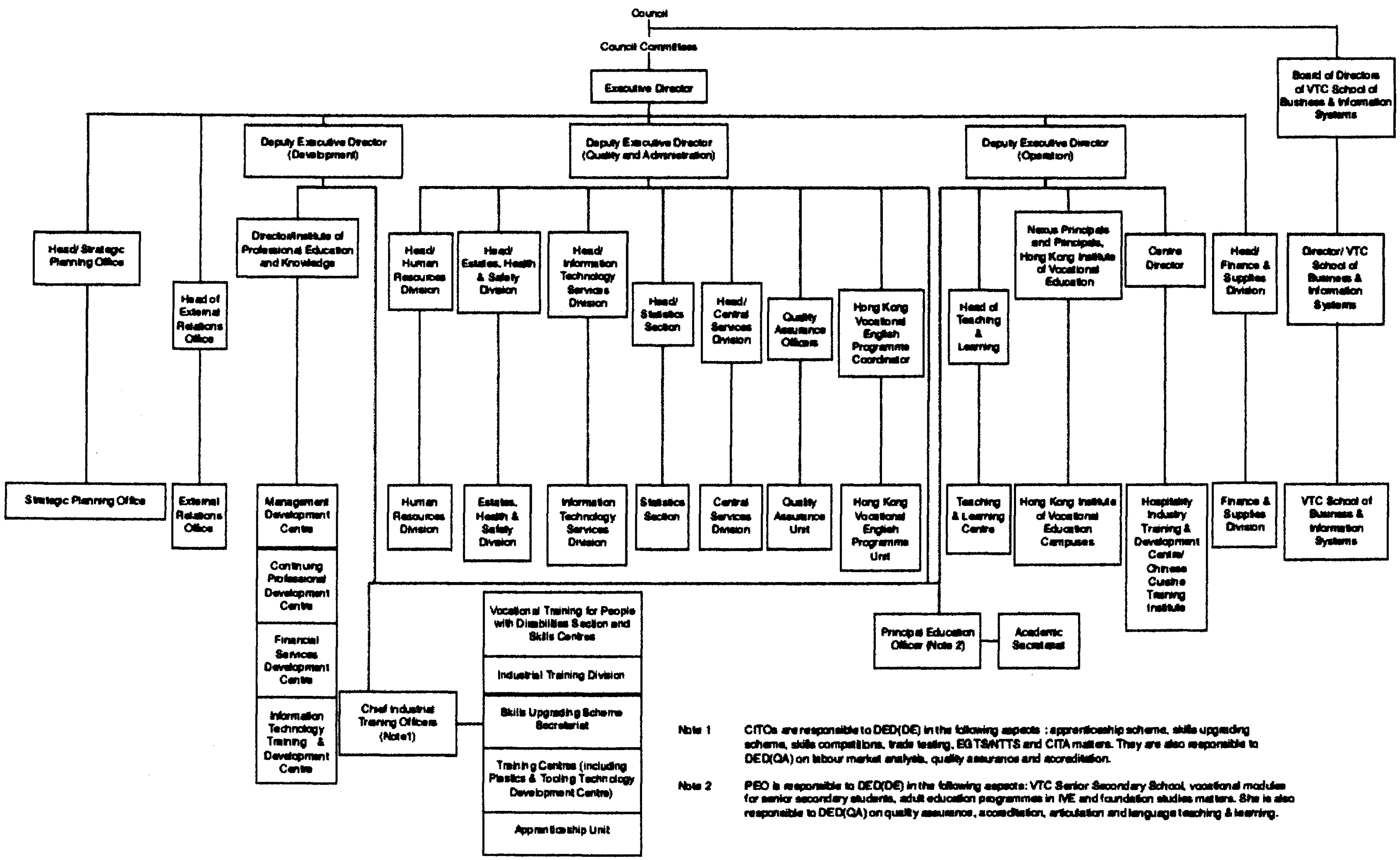
If you want to know more about the research project or you want to tell me more about your views of what makes a successful engineering student, you can contact me on [personal email address included]

Appendix I: Coding List

Curriculum Management Issue		
CMI:	Culture	CMI:CUL
CMI:	Context	CMI:CON
CMI:	Coherent Outcomes	CMI:COH
Key Skills Delivery Model		
KSM:	Stand alone	KSM:SA
KSM:	Mixed	KSM:M
KSM:	Integrated	KSM:I
Key Skills Course		
KSC:	Student Affairs Officer 15-hour module (institutional module – Hong Kong)	KSC:SMOD
KSC:	Key Skills for Lifelong Learning (institutional module – Hong Kong)	KSC:LLL
KSC:	Communication (UK qualification)	KSC:COM
KSC:	Information Technology (UK qualification)	KSC:IT
KSC:	Application of Number (UK qualification)	KSC:NUM
KSC:	Working with Others (UK qualification)	KSC:WWO
KSC:	Problem Solving (UK qualification)	KSC:PS
KSC:	Improving Own Learning and Performance (UK qualification)	KSC:ILP
Departmental Information		
DI:	Courses (general information)	DI:C
DI:	Foundation Degree	DI:C:FD
DI:	Higher National Diploma (first diploma)	DI:C:HND
DI:	National Certificate	DI:C:NC
DI:	Modern Apprenticeship	DI:C:MA
DI:	Bridging Programme	DI:C:B
DI:	Projects	DI:PRO
Stakeholder		
ST:	Government	ST:GOV
ST:	Professional bodies	ST:PRO
ST:	Local employers	ST:EMP
ST:	accreditation/qualification bodies	ST:AQ
ST:	college directorate	ST:COL
ST:	Local or overseas universities	ST:UNI
ST:	Secondary schools	ST:SCH
ST:	Students	ST:ST
ST:	Other stakeholder	ST:X
Key Skills Definition		
KSD:	Bolton 1 (remedial skills)	KS:B1
	Bolton 2 (vocational preparation)	KS:B2
	Bolton 3 (workplace attitudes)	KS:B3
	Bolton 4 (study skills)	KS:B4
	Bolton 5 (lifelong learning)	KS:B5

	Bolton 6 (own definition)	KS:B6
Key Skill		
KS:	Business management skills S-1	KS:BUS
KS:	Communication skills S-2	KS:COM
KS:	Creative thinking skills S-3	KS:CRE
KS:	Critical thinking skills S-4	KS:CRIT
KS:	Information literacy skills S-5	KS:INFO
KS:	Initiative and enterprise skills S-6	KS:INENT
KS:	Learning skills S-7	KS:LEAR
KS:	Numeracy skills S-8	KS:NUM
KS:	Planning and organising skills S-9	KS:PL
KS:	Problem solving skills S-10	KS:PROB
KS:	Self management skills S-11	KS:SELF
KS:	Teamwork skills S-12	KS:TEA
KS:	Technical skills S-13	KS:TECI
KS:	Technology skills S-14	KS:TECNO
KS:	Additional key skill (not in list)	KS:X
Personal Attribute		
PA:	Being able to deal with pressure A-1	PA:PRE
PA:	Being adaptable A-2	PA:ADAP
PA:	Being able to appreciate the aesthetic value of things A-3	PA:AVAL
PA:	Having a balanced attitude to work (study) and home/social life A-4	PA:BAL
PA:	Being committed (to the course and to being an engineer) A-5	PA:COM
PA:	Having common sense A-6	PA:CSEN
PA:	Being sensitive to other cultures A-7	PA:CUL
PA:	Being honest and acting with integrity A-8	PA:HON
PA:	Being intuitive A-9	PA:INT
PA:	Having a sense of loyalty (to the class and to the engineering department) A-10	PA:LOY
PA:	Being motivated (to get things done, to do well) A-11	PA:MOT
PA:	Being able to present yourself in a professional manner A-12	PA:PRO
PA:	Feeling positive about yourself A-13	PA:POS
PA:	Being reliable A-14	PA:REL
PA:	Being safety conscious A-15	PA:SAF
PA:	Having a sense of humour A-16	PA: SENH
PA:	Additional personal attribute (not in list)	PA:X

Appendix J: Management structure 'Asian College'

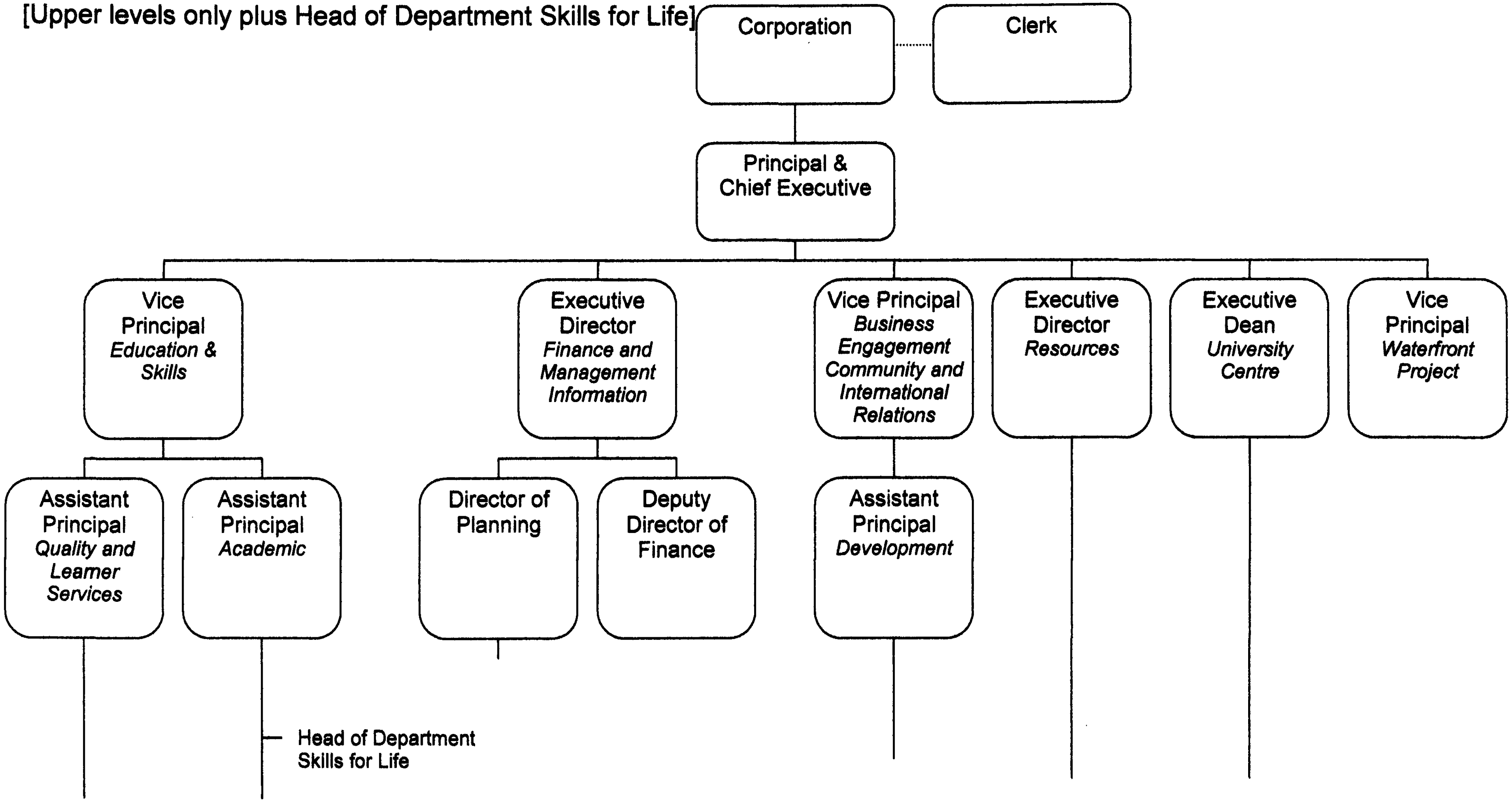


Note 1 CITOs are responsible to DED(DE) in the following aspects : apprenticeship scheme, skills upgrading scheme, skills competitions, trade testing, EGTS/NTTS and CITA matters. They are also responsible to DED(QA) on labour market analysis, quality assurance and accreditation.

Note 2 PEO is responsible to DED(DE) in the following aspects: VTC Senior Secondary School, vocational modules for senior secondary students, adult education programmes in IVE and foundation studies matters. She is also responsible to DED(QA) on quality assurance, accreditation, articulation and language teaching & learning.

Appendix K: Management structure 'Northern College' (Feb 2006)

[Upper levels only plus Head of Department Skills for Life]



Appendix L: Key Skills for the 21st Century at 'Asian College'

Key Skills for the 21st Century

Key skills are the skills you need to progress in life, take charge of your own learning and enter, stay in, and succeed in the world of work - whether you work on your own or as part of a team.

These skills can also be applied and used beyond the workplace in a range of daily activities.

Fundamental Skills

The skills needed as a base for further development

You will be better prepared to progress in the world of work when you can:

❐ Communicate

- ✓ read and understand information presented in a variety of forms (e.g., words, graphs, charts, diagrams)
- ✓ write and speak so others pay attention and understand
- ✓ listen and ask questions to understand and appreciate the points of view of others
- ✓ share information using a range of information and communications technologies (e.g., voice, e-mail, computers)
- ✓ use relevant scientific, technological and mathematical knowledge and skills to explain or clarify ideas

❐ Manage Information

- ✓ locate, gather and organise information using appropriate technology and information systems
- ✓ access, analyse and apply knowledge and skills from various disciplines (e.g., the arts, languages, science, technology, mathematics, social sciences, and the humanities)

❐ Use Numbers

- ✓ decide what needs to be measured or calculated
- ✓ observe and record data using appropriate methods, tools and technology
- ✓ make estimates and verify calculations

❐ Think & Solve Problems

- ✓ assess situations and identify problems
- ✓ seek different points of view and evaluate them based on facts
- ✓ recognise the human, interpersonal, technical, scientific and mathematical dimensions of a problem
- ✓ identify the root cause of a problem
- ✓ be creative and innovative in exploring possible solutions
- ✓ readily use science, technology and mathematics as ways to think, gain and share knowledge, solve problems and make decisions
- ✓ evaluate solutions to make recommendations or decisions
- ✓ implement solutions
- ✓ check to see if a solution works, and act on opportunities for improvement

Personal Management Skills

The personal skills, attitudes and behaviours that drive one's potential for growth

You will be able to offer yourself greater possibilities for achievement when you can:

❐ Demonstrate Positive Attitudes & Behaviours

- ✓ feel good about yourself and be confident
- ✓ deal with people, problems and situations with honesty, integrity and personal ethics
- ✓ recognise your own and other people's good efforts
- ✓ take care of your personal health
- ✓ show interest, initiative and effort

❐ Be Responsible

- ✓ set goals and priorities balancing work and personal life
- ✓ plan and manage time, money and other resources to achieve goals
- ✓ assess, weigh and manage risk
- ✓ be accountable for your actions and the actions of your group
- ✓ be socially responsible and contribute to your community

❐ Be Adaptable

- ✓ work independently or as part of a team
- ✓ carry out multiple tasks or projects
- ✓ be innovative and resourceful: identify and suggest alternative ways to achieve goals and get the job done
- ✓ be open and respond constructively to change
- ✓ learn from your mistakes and accept feedback
- ✓ cope with uncertainty

❐ Learn Continuously

- ✓ be willing to continuously learn and grow
- ✓ assess personal strengths and areas for development
- ✓ set your own learning goals
- ✓ identify and access learning sources and opportunities
- ✓ plan for and achieve learning goals

❐ Work Safely

- ✓ be aware of personal and group health and safety practices and procedures, and act in accordance with these

Teamwork Skills

The skills and attributes needed to contribute productively

You will be better prepared to add value to the outcomes of a task, project or team when you can:

❐ Work with Others

- ✓ understand and work within the dynamics of a group
- ✓ ensure that a team's purpose and objectives are clear
- ✓ be flexible: respect, be open to and supportive of the thoughts, opinions and contributions of others in a group
- ✓ recognise and respect people's diversity, individual differences and perspectives
- ✓ accept and provide feedback in a constructive and considerate manner
- ✓ contribute to a team by sharing information and expertise
- ✓ lead or support when appropriate, motivating a group for high performance
- ✓ understand the role of conflict in a group to reach solutions
- ✓ manage and resolve conflict when appropriate

❐ Participate in Projects & Tasks

- ✓ plan, design or carry out a project or task from start to finish with well-defined objectives and outcomes
- ✓ develop a plan, seek feedback, test, revise and implement
- ✓ work to agreed quality standards and specifications
- ✓ select and use appropriate tools and technology for a task or project
- ✓ adapt to changing requirements and information
- ✓ continuously monitor the success of a project or task and identify ways to improve

Teaching & Learning Centre

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Source: Used with permission. Conference Board of Canada. Employability Skills 2000+

Appendix L: Key Skills for the 21st Century at 'Asian College'

二十一世紀關鍵技能

無論您是獨立行事或參與群體工作，這些技能都將是您日後晉身社會的基石，
使您在工作上得以伸展和提升，受用不盡。

基本技能

掌握下列各項，以備日後工作有更佳發展

❐ 溝通（傳意）

- ✓ 能閱讀和理解用不同方式（例如：文字、圖表等）表達的資料
- ✓ 透過講、寫，能令人留意和明白
- ✓ 聆聽和發問，並能理解和分辨不同觀點
- ✓ 利用各項資訊及通訊科技（例如：電話、電郵、電腦等）分享資訊
- ✓ 利用各種科學、技術、數學知識及技能，講解自己的觀點

❐ 資訊管理

- ✓ 利用適當科技和資訊系統找尋、收集和整理資訊
- ✓ 存取、分析和應用不同範疇（例如：文科、語言、科學、技術、數學、社會科學、人文學等）的知識及技能

❐ 數字運用

- ✓ 決定需要量度和計算的項目
- ✓ 採用適當的方法、工具及技術，觀察和記錄數據
- ✓ 編製預算，核實計算結果

❐ 思考和解決問題

- ✓ 評估情況，找出問題所在
- ✓ 徵詢不同意見，並按事實衡量意見
- ✓ 認清問題涉及的人際、技術、科學、數學等層面
- ✓ 找出問題癥結
- ✓ 尋求解決方法時勇於創新
- ✓ 運用科學、技術和數學知識，思考、擷取和分享知識，解決問題，並作出決定
- ✓ 評估各項解決方案，以提出建議及決定
- ✓ 實施解決方案
- ✓ 查證解決方法是否有效，並適時改進

個人管理技巧

掌握以下各項，能增加個人成功機會；並推動個人在技巧、態度及行為上的發展潛能

❐ 展示正面的態度及行為

- ✓ 自信，自我感覺良好
- ✓ 以真誠、正直的態度待人處事
- ✓ 欣賞自己和別人的努力
- ✓ 保持身體健康
- ✓ 積極進取，事事關心

❐ 有責任感

- ✓ 為工作及個人生活設定目標及優先次序，保持平衡
- ✓ 計劃和善用時間、金錢及其他資源，以達到目標
- ✓ 評估、衡量和管理風險
- ✓ 對自己和所屬團隊的行為負責
- ✓ 有社會責任，對所屬社區作出貢獻

❐ 適應力強

- ✓ 能獨立工作或與人合作
- ✓ 能同時負責多項工作
- ✓ 有創意、靈活，並能尋求方法完成工作
- ✓ 對改變持開放態度，並積極回應
- ✓ 從錯誤中學習，接納別人提出的意見
- ✓ 善於應變

❐ 持續學習

- ✓ 願意不斷學習和成長
- ✓ 評估個人能力及有待發展的地方
- ✓ 設定個人學習目標
- ✓ 找尋和利用資源及學習機會
- ✓ 訂立計劃，達成學習目標

❐ 工作安全

- ✓ 注意個人及同事健康及安全，並採取所需措施

團隊工作技巧

掌握以下各項，能進一步提升工作成效或團隊表現

❐ 群體工作

- ✓ 了解團隊成員的互動合作關係，並能與人合作
- ✓ 確保團隊的意向及目標清晰
- ✓ 對團隊其他成員的想法、意見及提議，持尊重、開放和支持的態度
- ✓ 接納和尊重各人性格、能力、看法等的差異
- ✓ 以正面和體諒的態度，接受或提出意見
- ✓ 與團隊其他成員分享資訊及專業知識
- ✓ 在適當時候帶領、支持、推動團隊提升工作表現
- ✓ 理解衝突在團隊中所起的作用，從而找到解決方法
- ✓ 在適當時候妥善處理和解決衝突

❐ 參與工作項目及任務

- ✓ 設定清晰目標，由開始策劃、設計，到完成整個工作項目或任務，並達至預期成果
- ✓ 就計劃的發展徵求意見，進行試驗、修改，然後推行
- ✓ 致力達至既定質素標準及規格
- ✓ 選用適合該項目或任務的工具及技術
- ✓ 應工作要求和資訊轉變，作出調節
- ✓ 持續監察工作進程，並加以改善

Teaching &
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本單張內容取材自 *Employability Skills 2000+*，並獲 *The Conference Board of Canada* 批准轉載。

Appendix M: Key skills module outline - SAO 'Asian College'

Key Skills

(15 hours class contact)

Module Aims

This module aims to provide students with a framework and general approach to identify, acquire and apply the Key Skills they need to progress in life, take charge of their own learning, and enter, stay in, and succeed in the world of work.

Assessment Scheme

Continuous Assessment 100%

Key Content areas

A. Introduction of Key Skills (5 hours)
   - What Key Skills are
   - Why Key Skills are important
   - Proving one's Key Skills through a portfolio
   - Key Skills from an employer's perspective

B. Approaches to developing one's Key Skills (3 hours)

C. Key Skills in practice (4 hours)
   - Students are required to participate in campus activities/ community services to acquire proof of developing their Key Skills in each of the domains (Fundamental Skills, Personal Management Skills and Teamwork Skills)

D. Consolidation and review (3 hours)
   - Students are required to compile their Key Skills Career Portfolios and present them to class with feedback/advice from peers, teachers, and/or other stakeholders (mentors, employers, et. al.)

Appendix N: Key Skills Standards in the UK 2004

The Curriculum and Qualifications Authority (QCA) have published the following detailed standards which are available from:
http://www.qca.org.uk/downloads/9730_aon_standards_combined.pdf
The summaries of what each key skill involves given below are drawn from the Edexcel Key Skills User Guide which can be accessed on:
http://www.edexcel.org.uk/VirtualContent/80175/X009312_Key_Skills_User_Guide__SM_edited.pdf

Application of number (Levels 1-4)

http://www.qca.org.uk/downloads/9730_aon_standards_combined.pdf
Application of number key skill involves interpreting information to do with numbers, doing calculations and presenting findings. It covers the type of skills that you might use when:

- taking measurements
- interpreting information from graphs and diagrams
- calculating amounts and sizes
- using charts to explain the results of calculations
- analysing and interpreting complex information.

Communication (Levels 1-4)

http://www.qca.org.uk/downloads/9729_com_standards_combined.pdf
The key skill of communication involves speaking, listening, reading and writing. It covers the type of skills that you might use when:

- taking part in discussions at work
- using a diagram to explain something while giving a talk
- reading material for a project
- filling in a form or writing an essay
- analysing and interpreting complex information for a report.

Information and communication technology (Levels 1-4)

http://www.qca.org.uk/downloads/9728_ict_standards_combined.pdf
The key skill of information communication technology involves using a computer to find, explore, develop and present information, including text, numbers and images. It covers the type of skills that you might need when using a computer to:

- find information for a project
- work out ways to tackle a problem
- create charts and graphs
- write a letter or report.

Improving own learning and performance (Levels 1-4)

http://www.qca.org.uk/downloads/9727_ilp_standards_combined.pdf
The key skills of improving own learning and performance involve managing your own personal learning and career development. It covers the type of activity that you might use when:

- setting targets to improve your performance at work or in your learning
- organising your approach
- succeeding on a course
- reviewing your progress.

Problem solving (Levels 1-4)

http://www.qca.org.uk/downloads/ps_standards_combined.pdf
The key skill of problem solving involves recognising problems and doing something about them. It covers the type of activity that you might use when:

- working out how to tackle a problem at work, in your studies or personal life
- using different methods to find a solution
- checking to see if your methods have worked.

Working with others (Levels 1-4)

http://www.qca.org.uk/downloads/9725_wwo_standards_combined.pdf
The working with others key skill involves working in a team when planning and carrying out activities. It covers the type of activities that you might use when:

- doing a group project on a course
- helping someone to carry out a task at work
- working in a team to organise an event for your local community.

Personal skills development (Level 5 only)

http://www.qca.org.uk/downloads/5362_per_skill_dev_lvl_5.pdf
This unit is about building on your current capabilities and applying your skills in an integrated way, in order to manage dynamically complex work, i.e. work in which action in one activity is likely to change other aspects of your work in ways that may be difficult to predict or control. You will have to demonstrate your skills in communication, problem solving and working with others through:

- exploring work demands
- planning the work
- managing the work and monitoring progress
- evaluating performance and presenting the outcomes.

You will show you can improve your own learning and performance in skills that are key to meeting personal and organisational objectives.

Key skills and the national qualifications framework

The key skills levels broadly relate to other qualifications in the national qualifications framework, for example:

- Level 1 relates to GCSE grades D to G; it therefore equates to Level 1 NVQs and Level 1 BTECs
- Level 2 relates to GCSE grades A* to C; it therefore equates to Level 2 NVQs and Level 2 BTECs
- Level 3 relates to Advanced GCE (A level), NVQs at level 3 and BTEC Nationals
- Level 4 relates to higher level work.

Appendix O: Key Skills for Lifelong Progress I module outline 'Asian College'

Key Skills for Life Long Progress I

(15 hours class contact)

Module Aims

This module aims to orientate students at an early stage of their study and college life, and to develop skills that enable individuals to improve the quality of their learning, work and performance. The module focuses on the specific skills and techniques instead of the use of English.

By the end of the module, it is expected that students can:

1. adapt to the new campus life and studies;
2. know each other and be aware of being one team to the outside world;
3. understand the basic techniques of WebCT;
4. understand the techniques in information search in the IT era and to develop the habit to keep abreast of the current information and public affairs;
5. understand the importance of time management, and how to apply the concepts in the study and work.

Teaching and Learning Strategies

The module content is designed to facilitate student learning through a student-centred approach through which students can develop themselves to be independent learners. The introduction on the use of WebCT enable students to use this facility throughout their studies. Leaning is facilitated through group activities and projects that provide opportunities for students to develop fundamental skills, to work collaboratively and to apply what they have learnt in diverse contexts, problems and case studies. The emphasis is placed on the concepts and techniques in the respective skill and not the use of language.

Assessment Scheme

Continuous Assessment 100%

Key Content areas

1. Introduction to the Course, College life and career
2. Get to know each other
3. Information skills (library, internet, email, learning styles, reading critically, study and examination skills)
4. Time management skills

Appendix P: Key Skills for Lifelong Progress II module outline 'Asian College'

Key Skills for Life Long Progress II

(15 hours class contact)

Module Aims

This module aims to orientate students at an early stage of their study and college life, and to develop skills that enable individuals to improve the quality of their learning, work and performance. The module focuses on the specific skills and techniques instead of the use of English.

By the end of the module, it is expected that students can:

1. understand the techniques of problem solving and thinking processes;
2. understand the basic techniques of communications and team work;
3. understand what are the skill sets for the trade and the employers expectations;
4. understand the importance of developing a professional portfolio;
5. understand the elements of a meeting and be able to plan and hold a meeting and to produce the relevant documents.

Teaching and Learning Strategies

The module content is designed to facilitate student learning through a student-centred approach through which students can develop themselves to be independent learners. Leaning is facilitated through group activities and projects that provide opportunities for students to develop fundamental skills, to work collaboratively and to apply what they have learnt in diverse contexts, problems and case studies.

Assessment Scheme

Continuous Assessment 100%

Key Content areas

1. Think and solve problems (problem solving processes, thinking skills, tools and techniques: Mind mapping, six thinking hats, flowcharting and brainstorming)
2. Communication skills (body language, keys to effective listening, assertiveness)
3. Teamworking skills (techniques, leadership, motivation)
4. Effective meetings (preparation, agendas and minutes)
5. Professional development. Note: Covered in stream selection forums and talks by industrialists (skill set for specific trades, expectation of potential employers, mental preparation for jobs and challenges)
6. Development of a professional portfolio