THE DEVELOPMENT OF GENERIC COMPETENCES IN MALAYSIAN CIVIL ENGINEERING PROGRAMMES: A CASE STUDY

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DEDICATION

"ALHAMDULILLAH"

This thesis is dedicated to my lovely husband (Adnan), my children (Nurbatrisyia, Danish and Darwisy) who were always with me in what ever situation. Thanks a lot for your patience and support.

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Abstract

This study focuses on generic competences that have been considered to be lacking in graduates from Malaysian polytechnics specifically their problem solving, critical thinking, communication skills, and team building. The argument concerning generic competences has focused upon teachers' pedagogical approaches and their relation to students' learning. There is therefore a need to explore innovative learning environments which will help students to improve their attitudes and skills as well as their learning achievements, with regard to these generic competences. The creation of a hybrid teaching approach was proposed in order to consider whether this would enhance students' generic competences, as well as to enhance their academic achievements. This study is significant and original in that it aimed to establish an alternative pedagogical approach in teaching engineering subjects at polytechnics and assesses its validity. The approach was based on the combination and integration of collaborative learning and metacognitive strategies to produce a hybrid system (HybCoMet Strategy). A central objective of this study was to investigate the effectiveness of the instructional module using the HybCoMet Strategy compared to the more traditional approaches. The study used both quantitative and qualitative approaches in order to obtain the data including: questionnaires distributed to students, pre and post-test quasi-experiments design, diary methods and semi structured interviews with lecturers. The quantitative data was used to support the qualitative data in order to triangulate the study. The First Semester Students in Civil Engineering Courses from three polytechnics and lecturers who were teaching the selected engineering subject were selected as a sample. Findings from this study show that the pattern of teaching and learning processes in the majority of polytechnics under investigation were more traditionally focused with an emphasis on teacher-centred approaches. By introducing the HybCoMet Strategy, students considered that the hybrid classroom helped to establish an atmosphere in which they felt more valued and more comfortable. Above all, it helped students to think critically; solve complex problems; write and speak effectively; have respect for others; be able to adapt to change and be ready to engage in lifelong learning. The HybCoMet Strategy, it is considered, can challenge students in their learning so that, in employment, they will be able to transfer this learning to workplace environments.

Keywords: Traditional teaching approaches, generic competences, collaborative learning, metacognitive strategies, HybCoMet Strategy.

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LIST OF ABBREVIATIONS

7MP	The Seventh Malaysian Plan
ADDIE	Analysis, Design, Develop, Implement and Evaluate
ADTEC	Advanced Technology Centres
ANOVA	Analysis of Variance
ASEAN	Assocation of Southeast Asian Nations
AQF	Australian Qualifications Framework
CIAST	Centre for Instructor and Advanced Skills Training
DPCCE	Department of Polytechnic and College Community Education
EFA	Education for All
GCE	General Certificate of Education
HOT	Higher Order Thinking
HybCoMet	Hybrid of Collaborative and Metacognitive
IKBN	*Institut Kemahiran Belia Negara* (National Youth Institution)
ILO	International Labour Office
LCD	Liquid Crystal Display
LOT	Lower Order Thinking
MDG2	Millennium Development Goals
MOE	Ministry of Education
MOHE	Ministry of Higher Education
MQF	Malaysian Qualification Framework
NCVER	National Centre for Vocational Education Research
NEP	National Education Philosophy
OHP	Overhead Projector
PA	Academic Advisor
PBL	Problem-Based Learning
PCA	Principal Component Analysis
PMR	*Penilaian Menengah Rendah* (Lower Secondary Evaluation)
Q & A	Question and Answer

RN	*Rukun Negara*
SD	Standard Deviation
SMT	*Sekolah Menengah Teknik* (Technical school)
SMV	*Sekolah Menengah Vokasional* (Vocational school)
SPM/MCE	*Sijil Pelajaran Malaysia* (Malaysian Certificate of Education)
SPSS	Statistical Packages for Social Science
STAM	*Sijil Tinggi Agama Malaysia* (Higher Malaysian Certificate for Religious Education)
STPM	*Sijil Tinggi Pelajaran Malaysia* (Malaysia Higher School Certificate Examination)
TVE	Technical and Vocational Educational (programmes)
TVET	Technical Vocational Education and Training (sector)
UEL	University of East London
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEVOC	International Centre for Technical and Vocational Education and Training
UNDP	United Nations Development Programme
UPSR	*Ujian Penilaian Sekolah Rendah* (Primary School Achievement Test)
UTHM	University Tun Hussein Onn Malaysia

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW OF THE STUDY: THE MALAYSIAN CONTEXT AND THE NEED FOR 'HYBRIDITY'

Malaysia is rapidly moving towards becoming an economically developed nation, with 'Vision 2020' highlighting the principal industrial and developmental aims that the government wishes to achieve by 2020. With a vision of becoming an industrialised nation by 2020 it is considered that Malaysia must be prepared to develop a well-educated, skilled and competitive workforce (Mustapha and Abdullah, 2001). From the perspective of education, this entails educating a highly-skilled and multi-skilled workforce, consisting of individuals who will have global mobility and who should be highly competitive, flexible, independent and critical thinkers who are able to use their knowledge as a commodity to survive within a context of intense global competition (Sipon, 2003).

Vision 2020 was proposed by former Prime Minister, Mahathir Mohamad, for future development in the country. The vision highlighted nine key challenges through which Malaysia would achieve the status of an industrialised and developed country. These challenges were expressed in terms of economy, national unity, social cohesion, social justice, political stability, system of government, quality of life, social and spiritual values, national pride and confidence (Mohd Kassim, 1992).

In line with this vision, the Malaysian Ministry of Education (MOE) aims to develop an education system that is of high quality and has a world-class ranking (Sipon, 2003).

Accordingly, the MOE has always been concerned with both the quality and quantity of technical and vocational education (TVE), in order to produce more "knowledge workers" (Sipon, 2003, p. vi).

In its efforts to train sufficient numbers of young Malaysians to meet the challenges of 2020, a nationwide system of postsecondary education and training establishments (known as polytechnics) has been established. However, Malaysia now needs to further explore and understand an approach to teaching that will actively promote a learning environment which will help students improve not only their learning achievements but also their generic skills and attitudes. As discussed below, generic as well as narrow competences are increasingly important for economic development. Therefore a more expansive education system is needed with the students taking responsibility for their own learning in order to achieve a more generically skilled workforce capable of adapting to changing technologies and work demands (Abu Hassan and Navi Bax, 2003).

Studies show that the current teaching approach in Malaysia, in general is essentially teacher-centred, using rote and fact-based learning (Tilestone, 2000; Meng, 2003; Yusof, 2003; Cheung and Wong, 2006). The teacher is in control of the classroom and decides what and how much information is disseminated to the students, thus aiming to influence the values, behaviour and beliefs of the students. The students themselves are often viewed as simply passive recipients of the information and knowledge delivered to them by the sole authority - the teacher - in a narrow, banking education model (Orlich *et al*., cited in Neo, 2003). From my own professional experience, education in Malaysia always used to be, and remains, a relatively simple affair - the teacher taught, the students studied, and outcomes were assessed at a final examination. Yusof (2004), in his study on how to improve teaching and learning, indicates that the majority of students in technical schools fail to see much meaning in what they are asked to learn, and many teachers are beginning to see limitations in their current mode of teaching.

Students at any level of education should find their learning meaningful, seeing education as a continuing process in their lives that can prepare them for future needs. For example, Meng (2003) states that, with the vast changes in technology acquisition, skills knowledge is becoming much more important than the acquisition of content knowledge, adding that the traditional way of teaching and learning, i.e. rigid and expository teaching and passive learning, may no longer be effective in meeting the demands of students with “higher analytical and cognitive skills” (p. 31). As such, fundamental changes must be made to the teaching and learning process, in order to improve the teaching to students and subsequently increase their learning outcomes. A variety of approaches is available which may be useful in upgrading students’ understanding of learning concepts, and ultimately make the learning activities more meaningful to them (Tilestone, 2000). This particular research focuses upon the creation of a *hybrid* learning environment which provides the means to improve learning and enhance students’ generic competences (particularly those of problem-solving, critical thinking, communication skills and team building) that will be critically needed in the Malaysian workplace of the 21st century (Yusof, 2010).

The concept of ‘hybridity’ is particularly important to this study. Outside of the biological metaphor, in engineering terms an example of ‘hybridity’ is that of hybrid cars that are powered by a combination of electricity and a motorised engine. The conception of hybridity presented in this thesis is not dissimilar, being a combination of two or more substances (i.e. methods and materials, or learning technologies) with the aim to produce a more effective output (being generic skills). However, in the educational field, the term refers to a deeper meaning, as it focuses upon humans, not objects. In the education field, ‘hybrid’ refers to instructional strategies that incorporate several teaching methods/methodologies into the classroom learning process.

This study introduces and describes a hybrid education system which integrates collaborative learning and metacognitive strategies. This hybrid of collaborative and metacognitive strategies (termed ‘HybCoMet’) provides integrated learning of theoretical knowledge with practical skills, while incorporating social and generic skills, with the aim of promoting the active involvement of students and thus creating learners who are more independent. It is a vocational learning innovation that arises through my own professional practice. The strategy will be implemented and evaluated in the context of concept learning in technical and vocational education, focusing on engineering subjects at the polytechnic level. The aim of the study is not only to design and develop a hybrid instructional approach but to evaluate whether such a hybrid system helps to enhance students' generic competences as well as their achievements and attitudes towards learning. The study will compare this new hybrid system with an existing teaching approach - that of the traditional teaching system employed at polytechnics. This is an original approach which has more general applications for learning in technical and vocational subjects.

The study sample consisted of first semester students studying Civil Engineering courses from three polytechnics. From this study sample, experimental and control groups were determined by stratified purposive random selection to create a quasi-experimental setting. The study was constructed utilising both a qualitative and quantitative approach, in order to obtain a comprehensive data set. The methods included a survey with two set of questionnaires, pre- and post-tests, evaluation of the students' diaries and semi-structured interviews with the lecturers.

This chapter begins by presenting my personal professional experience (where I reflect on my own personal practice), whilst teaching in a vocational classroom, which became the genesis of the development of this research study. The next part of this chapter then briefly explains the current situation which is often found in classroom learning environments in Malaysia, looking at the current teaching and learning process and the need to seek an alternative to these current teaching strategies. An overview of the job demand for skilled workers is then presented, along with how the education system currently does not fulfil this demand and thus why there is a need to revise the current approach to teaching in order to meet these requirements.

The development of the hybrid system is presented along with how it might be considered as an effective alternative to help overcome this problem. Finally, the aims and objectives of the study are presented, along with definitions of specific terms used and the overall structure of the thesis.

1.2 PERSONAL PERSPECTIVE AND EXPERIENCE

> *"Learning is not finding out what other people already know, but is solving our own problems for our own purposes, by questioning, thinking, and testing until the solution is a new part of our life"* (Charles, cited in Meng, 2003, p.30).

After several years of teaching the technical subject; Water Supply Resources and Sanitary Systems, a course offered at the University of Tun Hussein Onn, Malaysia, I began to suspect that certain factors hindered my students' performance. Students would attend a 50 minute lesson for every session in a week. The course content was delivered by lectures as the primary teaching method, with formative assessments consisting of assignments, projects, paper based assessment; quizzes, tests and final examinations at the end of the semester.

While I thoroughly enjoy lecturing my students, and my students have reported that they enjoyed my teaching sessions, I have questioned whether the way I taught them (dominated by lecturing methodologies) actually helped my students learn the course content and to develop generic skills. In particular I wondered whether this learning actually led to the development of generic competences rather than narrow competences. Students attended the lecture room, sat in their seats, took and copied notes that were displayed on the white screen, and gave the impression that they understood what I was saying. Despite the use of interactive instructional strategies such as small group discussions, presentation sessions and quizzes during the learning process, for me it was still being presented in a traditional lecture format where learning was largely a passive endeavour.

At the end of the semester, following the examinations, I could see that the results were not as positive as I had hoped for. Only a few students scored an “A” - the majority scored a “B” and the remainder mainly obtained a “C”. The students failed to effectively reach the *wider* goals of learning; basically, they just learned enough to be able to obtain a pass mark in their examinations. Consequently, I felt this learning environment needed to be changed. The quotation at the beginning of this section, inspired me to look reflexively at my own teaching problems, to find solutions for my own teaching purposes and to question myself as to “what needs to be changed?”, “have the objectives been met?”, “what are the students’ reactions?” and “was the content clear and did it enhance learning and necessary skills?”. These questions motivated me to look at alternative pedagogical approaches to the course which would promote more active learning, contribute to students’ higher achievements in learning the subject and enhance the generic competences that will be necessary for their successful life when leaving the university.

This forced me to think and consider the adoption of new innovative approaches to enable learning to be carried out in a more effective and meaningful way, which could possibly replace the current (more rigid) teaching practices.

1.3 STATEMENT OF THE PROBLEM

According to Juri *et al.*, (2006), in an era of globalisation and rapid technology changes, lifelong learning is a necessity for all. Therefore, the Technical Vocational Education and Training (TVET) sector should develop and upgrade its potential for providing workers who are not only knowledgeable, but also who are skilful and adaptive to the demands of the job.

This is supported by Sipon (2003), who believes that one of the main challenges for TVET is to provide graduates who are able to demonstrate professional competences as well as possessing an academic qualification.

In simple terms, a qualification is a grade on a piece of paper, while competence is what is demonstrated in the workplace. I will, of course, consider the distinction between various types of competence at length in this thesis.

Malaysian polytechnics, as one group of TVET institutions, are actively utilising specific strategies to prepare their graduates for employment situations that call for qualified and competent employees, with a proper attitude to work. It is recognised to an increasing degree that a well-rounded educated individual also needs to have cultivated the correct attitudes to work, as well as possessing the competences to perform particular tasks in the workplace. To fulfil this need for competent workers, Sipon (2003) suggests that technical content should be included with "competencies in planning, design and communication, methods of problem solving, teamwork and social networking" (p. 4). Hence, theoretical knowledge and practice, as well as learning and working, have to be integrated. The more traditional ways of teaching and learning, that separates theoretical knowledge from practical aspects, should merge these two aspects.

Cheung and Wong (2006) show that the traditional method of teaching and learning has always been academically oriented with a focus on further education, but little focus on students' further career aspirations. There is a need, therefore, to narrow the gap between the education system and the workplace, and the aim should be to help students understand and face a variety of issues and challenges they will meet in their future working lives.

Teachers and students of polytechnic programmes are diverse with different backgrounds, academic achievements, skills and expectations. As such, the polytechnic curriculum should, arguably, incorporate competency elements appropriate to their students' learning needs and designed to promote lifelong learning to ensure the students are able to fulfil the demand of the workplace.

Kasa (2006) suggests that instructional strategies and materials should be designed to help students learn in "appropriate stages through development of simple to complex skills, [and from] low factual recall to higher level intellectual skills"(p. 2). This suggestion is supported by Sipon (2003) in that to develop a professionally competent worker, curriculum content for any TVET programme must encompass "the knowledge, skills and attitudinal aspects of the individual student" (p. 5). Kasa (2006) adds that the curriculum should be designed to meet the demands of industries, as well as employers and labour markets. This distinction is important as a focus on the broader skills required by an industrial sector (rather than by an individual employer or by a temporary demand for labour) provides a more expansive view of learning.

Many research studies consider that employers would like to see an employee who has both work skills and personal qualities, who is a "team player, respectful of others and [has] good communication skills" (Sipon, 2003, p. 5).

The importance of generic skills and work attitudes should be emphasised, as well as "analytical reasoning, lateral thinking, practical orientation, interpersonal sensitivity, motivation, planning, decision making, leadership and emotional sensitivity" (Cheung and Wong, 2006, p. 101). Amongst employers, there is criticism that young people lack the skills necessary for the workplace, and many employers complain that the school system does not prepare youth for employment (Zemsky, 1994). Both UK and US studies, for example, show that the present vocational education system is inadequate to train students effectively for workplace demands (Brown, 1998; Disler, cited in Mustapha and Greenan, 2002). School and institutional courses should be designed to be more career-oriented to help students acquire the necessary skills for the workplace.

Close to the Malaysian context, implementing a career-oriented curriculum in Hong Kong, for example, showed that interpersonal skills and the ability to communicate were the most desired skills required by employers, both locally and worldwide (Cheung and Wong, 2006).

Nevertheless, such skills were found to be sorely lacking in today's graduates (Yusof, 2004), where students in technical education found it difficult to acquire the required amount of knowledge effectively and therefore did not achieve higher order cognitive abilities. They were also seen to lack important generic skills, such as communication, thinking and interpersonal skills. Mustapha and Greenan (2002) also report that technical and vocational graduates were not the only ones who faced the problem of inadequate acquisition of these skills - graduates from non-technical vocational programmes also faced similar problems. Both groups were dissatisfied regarding their motivation and entrepreneurial skills. Chung (2001) states that young school leavers, without skills, professional qualifications or work experience, will hold negative views about their future careers.

This clearly suggests that employability and the use of those skills should be integrated into all educational programmes of study in any country, but most particularly for technical and vocational education which is expected to produce an educated, skilled and motivated workforce in the near future (Mustapha and Greenan, 2002).

Related to this, current teaching practices are too focused on students' academic achievements. Much research has been conducted on the forms teaching and learning which focuses on improving test scores, but there is only limited research concerning students' attitudes, self-esteem and social development (Wiener, 1986; Gokhale, 1995; Walker, 1997) and much of the research that has been conducted relates to non-technical disciplines (Idrus, 1993; McMurray and Dunlop, 1999; Simoff, 2001; Neo, 2003; Rajagopal, 2006). Thus, there is the need for more in-depth study on teaching and learning aimed at producing not only excellent students but also (generically) competent graduates at polytechnic level, focusing on the technical disciplines. The teaching and learning process within the Malaysian technical education system needs to improve to provide a more effective structure of learning in response to the changing needs of the modern workforce.

This may mean the reform of current practices and, in some cases, replacing them with new approaches to teach that will create a learning environment in which the student is comfortable, yet intellectually challenged.

Even less research has been conducted on the design and content of the curriculum with relation to generic competences (Sipon, 2003; Kasa, 2006). Curriculum content cannot be delivered, nor the aim of the curriculum achieved, without appropriate pedagogical approaches, instructional delivery methods and materials.
Hence, this study will focus upon the creation of hybrid teaching strategies as an alternative pedagogical approach to the existing curriculum of a technical subject in Malaysian polytechnics.

It is believed that the hybrid approach could enhance the development of the competences needed as well as improving learning in response to workplace needs for a more active, effective and systematic structure of learning. This hybrid approach will aim to create a learning environment which will expand the students' learning experiences and capabilities from individual insight to collective intelligence. Again, this is in line with Vision 2020, which aims to enhance students' intellectual development, growth and academic performance (Mohd Kassim, 1992), which will then contribute to the country's need for skilled and educated manpower.

1.4 AIM AND OBJECTIVES OF THE STUDY

The purpose of this study is to achieve the following research aim and objectives.

1.4.1 Aim

To investigate the effectiveness of a hybrid teaching approach that integrates collaborative learning and metacognitive strategies compared to more traditional approaches, in order to provide a more systematic and effective structure of teaching aimed at helping students improve their generic competences and attitudes when learning civil engineering course at polytechnic level, in Malaysia.

1.4.2 Objectives

The objectives of this study are to:

1. analyse and evaluate current teaching approaches in civil engineering programmes in Malaysian polytechnics.
2. determine the effectiveness of a hybrid teaching approach compared to the more 'traditional' approaches.
3. identify how a hybrid learning environment may help students to improve their generic competences and learning attitudes.

1.5 SIGNIFICANCE OF THE STUDY

Malaysia aims to become a fully industrialised country and regional hub of educational excellence by 2020. Therefore, as suggested by Sipon (2003), it is essential to produce a competent workforce based on the requirements of the labour market. Accordingly, educational and training programmes (especially at polytechnic and community college levels) need to be planned and managed using a systematic approach to fulfil workplace demands. This has implications beyond Malaysia as many ASEAN countries, of which Malaysia is a member, are currently faced with a reassessment of how education should be delivered to meet the needs of a changing economic order that will demand more skilled and knowledgeable workers, with such workers having lifelong learning skills, displaying skills flexibility and showing self-motivation in a more autonomous and team-orientated working environment (Maier and Warren, 2000).

This study is therefore important as a means to establish an alternative pedagogical approach to teaching technical subjects at polytechnic level. The approach is expected to help students improve their learning and to achieve a deeper understanding of their subjects.

It will also emphasize the positive impacts of a wide range of generic competences that are critically needed in today's workplace, specifically in the areas of communication, problem-solving, critical thinking and team building. Finally, the hybrid instructional module that has been developed and will be tested is expected to provide a comprehensive both an academic reference point and guidance to academics and will be of significant benefit to those interested in technical and vocational education (Yusof, 2010).

An innovative feature of this study is the creation of a pedagogical approach using the hybrid system for teaching an engineering subject. So far, the majority of hybrid systems have been applied to teaching the sciences (i.e.: Levin, and Levin, 2002), digital technology (i.e.: Deniman *et al.*, 2004) and computing (i.e.: Meiszner and Moustaka, 2008). Furthermore, these systems have previously been delivered in asynchronous learning modes, and not synchronous, as will be presented in this study. Therefore, this study is significant in that it provides the basis for a more effective and systematic structure for the teaching and learning process at polytechnic level, with the aim to fulfil current demands as well as the potential demands for the workforce of the near future.

1.6 KEY CONCEPTS IN THIS STUDY

This thesis starts by critically reviewing the current approaches to teaching and learning that are widely applied in both the general and technical education systems in Malaysia. The scope of the study is then narrowed down to the particular elements of the hybrid system that will be focused upon (metacognitive strategies and collaborative learning) and how using a hybrid of these elements could offer the potential prospect for improving the teaching and learning environment.

1.6.1 The Teaching Approach

A teaching approach refers to how a curricular subject is managed, planned, resourced and taught within the school context; being seen as a continuous system (Beverton *et al*., 2005). It guides the type of support and direction that the teacher receives from subject co-ordinators and the emphasis given to a subject within a school's policies and development planning. We all have preferred learning styles and effective teachers attempt to match their teaching approaches to the learning styles of their students.

The 'traditional' approach can be described as a common method often used in the classroom that does not take into account differences in learning styles. Traditional teaching commonly focuses on a number of elements including lectures, case studies, and, to a lesser extent, team projects (Tilestone, 2000). In this approach, learning is conducted in a synchronous environment, meaning that the students must be in the same place at the same time in order to learn. Students derive motivation mainly from the teacher and sometimes from the other students (*ibid*). The current concern with assessment based upon factual knowledge and understanding has led to a preference for 'chalk and talk' approaches that underpin teacher accountability and promote pedagogic 'tidiness', with learners covering the same material at the same pace. These approaches also simplify the relationship between the teacher and those taught, because the teacher controls the learning process and the students simply become passive recipients of this process (Bernstein, cited in Glover and Law, 2002). Instruction is often delivered in a rigid, expository and passive manner (Meng, 2003). It needs to be stressed that the way a person learns, what an individual can learn, and how they learn it, is strongly influenced by the model of teaching and learning that is available to them.

In summary, the 'traditional approach' is one which is didactic and teacher centered.
This approach is frequently connected with high stakes exam and a centralised curriculum.

As is discussed in chapter 2, in the post-colonial context, Malaysian education became increasingly centralised due to policy drivers for strong state formation and rapid industrialisation. This is a fairly recent development in Malaysian education history. Therefore, a ‘traditional’ approach to education is not necessarily associated with distant historical periods but rather with rigid and didactic methods of transmission.

1.6.2 Collaborative Learning

The concept of collaborative learning, being the grouping and pairing of students for the purpose of achieving an academic goal, has been widely researched and advocated throughout the professional literature. Collaborative learning is a method of teaching and learning in which studentswork together to explore a significant question or create a meaningful project. The term ‘collaborative learning’ refers to an instructional method, whereby students at various performance levels work together in groups towards a common goal (Gokhale, 1995). At a general level, collaborative learning involves students working together as part of a cooperative effort to understand the material or complete a task. When cooperative groups are guided by clear objectives, students engage in numerous activities that improve their understanding of the subject (Idrus, 1993). The collaborative learning medium provides students with the opportunity to analyse, synthesize and evaluate ideas cooperatively (Gokhale, 1995), fostering the development of critical thinking through discussion, clarification of ideas and evaluation of others’ ideas, all of which have been found to be effective in gaining factual knowledge. Collaborative learning offers an extremely valuable approach for encouraging active and student-centred learning within the classroom (Walker, 1997).

In this study, collaborative learning is defined as students who work with their peers to enhance learning and to encourage problem solving, communication, decision-making skills and team effort. Students thus share their expertise in all aspects of the curriculum, effective learning and in appropriate group instruction.

1.6.3 Metacognitive Strategies

Metacognitive refers to an organising cognitive principle through which individual cognitive processes are controlled. Metacognitive components that consist of self awareness, monitoring and evaluating, might enhance a student's ability to be a better problem solver. They are mental operations, which direct the cognitive function of a person and support problem solvers during the solution process, improving their ability to achieve the goal (Mevarech and Kapa, 1996). Mazzoni and Nelson (2000) refer to the term 'metacognition' as being the knowledge concerning one's own cognitive processes and products or anything related to them. However, Flavell (1979) prefers the definition of 'metacognition' as one's knowledge concerning one's own cognitive processes and awareness of a learning problem, which is involved in the processes of planning, monitoring and evaluation of a specific problem solution.

The benefits of the metacognitive teaching approach lies in the ability to transfer responsibility for monitoring learning from the teachers to the students, and in promoting positive self-perception and motivation among the students (Phelps, Graham and Kerr, 2004). A metacognitive system also facilitates the planning, reflection and self-evaluation of the students, making them less dependent on the teacher's guidance. It assists students to become more aware of their current attitudes towards the learning goal. In this study, metacognitive strategies refer to the actual processes and strategies that guide the student in how to think about a particular problem, what the student knows about his or her cognition and, above all, the student's ability to control these cognitions.

1.6.4 The Hybrid Approach and its Relevance to the Study

Although collaborative learning is not a new topic, the idea of an integrated metacognitive system reinforces the importance of peer interaction for cognitive development. The metacognitive element's support to collaborative learning makes it potentially possible for students to internalise external knowledge, problem solving and critical thinking skills, and to convert these into tools for intellectual functioning (McMurray and Dunlop, 1999).

Therefore, in this study, metacognitive skills will become one of the key components in this hybrid approach, because the application of metacognititve skills is believed to help students enhance their higher levels of cognitive thinking whilst working as a group (Haller *et al.,* 1988). Students are capable of performing at higher intellectual levels when asked to work in a collaborative situation rather than when asked to work individually. Group diversity in terms of knowledge and experience contributes positively to the learning process. Students can share strengths and also develop their weaker skills. They also develop their interpersonal skills and learn to deal with conflict, which enables them to realise their full potential to be part of a competent and qualified workforce. It is hoped to inculcate this learning mode into students' educational environments to prepare them for real-life situations, where collaborative working and learning is more the norm than the exception.

The hybrid system was chosen as an alternative approach in this study, because the learning of new concepts and the application of already-known concepts will take place primarily within the course and it will incorporate characteristics of both traditional and hybrid classroom settings. Deniman *et al.,* (2004) suggested some of the particular benefits of a hybrid classroom setting, which helps to:

- establish an atmosphere in which learners feel comfortable;
- encourages learners to consider that learning needs to focus on factors that contribute to solving significant problems or achieving significant results;
- provides a meaningful context for learning fundamental concepts; and
- helps learners to think critically, solve complex problems, act in a principled manner, read, write and speak effectively, have respect for others, be able to adapt to change and to engage in lifelong learning.

The integration of metacognitive components might additionally enhance students' abilities to be better problem solvers. It is fundamentally a mental operation which directs the cognitive functions of a person and supports learning conceptualisation (Mevarech and Kapa, 1996), which can help students in the problem solving process and improve their ability to achieve learning goals. The integration of these approaches might also be effective in pointing teachers towards individual learning objectives.

It is hoped that the strategy could assist students to become more aware of their current attitudes towards learning. An understanding of the development of metacognition may help define useful learning and recall strategies, which could best be applied in engineering subjects. Also, the integration of collaborative learning and metacognitive strategies not only could help students achieve their learning goals, but also helps to inculcate this learning mode into the students' other educational environments. This would therefore better prepare them for real-life situations and provide opportunities for their optimal intellectual and academic development, as well as provide generic competences to students. This has the wider aim of providing a workforce of the standard required by the workplace and job market.

1.6.5 Generic Competences

Competence is one of the major concerns in this study. Competence, as defined by Daelmans *et al*., (2005), is the ability of a professional to handle complex situations or problems using professional knowledge, skills and attitudes in an integrative way. On the other hand, generic skills are conceptualised as being skills applicable to different situations after initial teaching/learning and capable of slight adaptation to suit the varying needs of the new situation (Cornford, 2005).

Generic competence is aimed more at identifying the *common* abilities that explain variations in performance that can be applied to different professional groups and which are dependent on the workplace context (Mulder *et al*., 2007).

In this study, generic competences are concerned with the meaningful objectives and content of learning that will engender the personal development of students and position them within the domain of knowledge that can best prepare them for learning, employment and future life.

The link between these concepts is shown in a conceptual framework (see Figure 1.1). This framework was constructed to provide a better understanding of the theories that are focused upon in this study. The conceptual framework helps to draw together the concepts, terms, definitions, models and theories of a particular literature base and disciplinary orientation, as in this case.

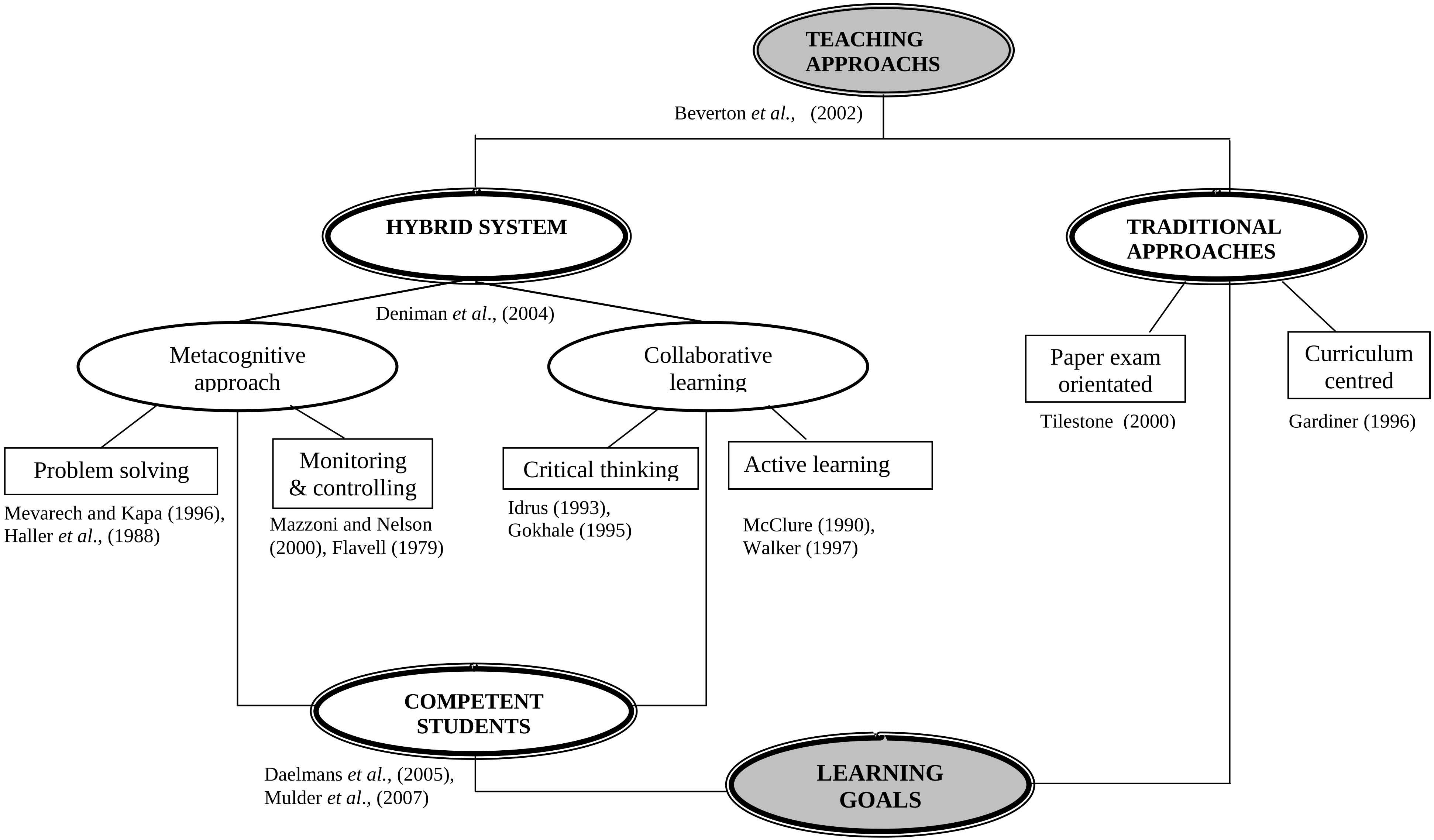

Figure 1.1: Conceptual Framework.

1.7 ORGANISATIONAL STRUCTURE OF THE THESIS

Chapter 2 situates the study within the social and cultural context of Malaysia. This includes a brief explanation of the Malaysian education system and also of the development of the education system starting with the pre-colonial, colonial and post-colonial periods through to more modern times. The background is important as it sets the backdrop for the development of the education system in Malaysia. In particular, the Technical and Vocational Educational (TVE) programmes and structures are focused upon and this includes education at polytechnic level. This chapter then discusses the problems faced at the teaching/learning interface in Malaysia, as some of these challenges can be country-specific. Several research studies which address this issue are included in this section, drawn from both the Malaysian and international perspective.

The concept and contextual issues of competency and its importance are then described along with the relationship of this concept to the TVET system. Competency has influenced both education practice and the labour market, including teaching strategies that are relevant to the TVE system. This part begins with a discussion of the neccessity for generic competences to fulfil employment demands, and then explores the different terms and definitions used to refer to competences as viewed by different countries. The particular considerations that are important in the design of the TVE programme in Malaysia are also highlighted. The discussion also considers the main issues related to preparing the nation's youth for future employment, not only in terms of their knowledge but also in terms of their generic competences.

The final part provides an overview of theoretical ideas about learning and teaching, and explores the different approaches that can be adopted when teaching, elaborating upon how the different theories of learning view the way people learn and how teaching approaches can affect learning.

Chapter 3 critically reviews the literature on collaborative learning and meta-cognitive approaches. This chapter is divided into three interrelated parts.
The first part explores the concept of teaching and learning, and discusses the mismatch between the pedagogical contents that have produced students who are perceived to possess inadequate competences.

The next two parts present the key concepts which are integrated in this study - collaborative learning and metacognitive strategies. The applicability of these concepts to different disciplines in the classroom is teased out in the context of relevant studies that have been conducted in Malaysia and similar studies that have been undertaken in other countries. The literature focuses on the application of those strategies to the development of generic competences.

Part three provides an explanation of the hybrid approach that is the focus of this study, highlighting the paucity of research in this area to date. Attention is given to the key characteristics of this approach and how it translates to actual classroom practice. The complete information on the development of the new alternative approach (HybCoMet Strategy), and how it can be used and brought to classroom teaching practice are explained in the final part. Through this analysis, the benefits of the hybrid approach, where collaborative learning and metacognitive strategies are integrated, are brought to the fore.

Chapter 4 describes the research design, methods and instruments employed in this study. The chapter is divided into two principal parts. The first part begins by explaining the research design and provides a rationale for the choice of case study with an embedded small scale quasi-experimental design. In this respect, the rationale for the use of both qualitative and quantitative approaches is provided.
This is followed by a discussion of the research sample; the selection of participants, case locations, the course subject/module, respondents and sampling procedures. Ethical issues in classroom research are also discussed in this part.

The second part describes how the methodologies of previous studies illuminate the full range of methodological choices that could be used in a study such as this. Details on the methods and instruments and procedures for data collection are then presented. The final section outlines the way in which triangulation will be used in this study, and also briefly considers how data will be analysed. This section also explores the researcher experience and "journey" to the field work during data collection process along with the administration of obtained data.

The focal theme in **Chapter 5** is on the data obtained from the interview sessions with lecturers from polytechnics in different areas of Malaysia. The discussion focuses on lecturers' reflections of their careers to date and their current teaching practice in a classroom learning session. This chapter also reviews the lecturers' perspectives about students and their learning behaviour at polytechnic level.

The data gathered also presents the respective lecturers' backgrounds as well as their teaching experiences. The principal source of information is from the interview transcripts. The transcripts have been analysed by thematic coding, and a discussion of resulting themes and concepts shows both the lecturers commitment to existing teaching frameworks and their desire for change. This part focuses on an analysis of the teaching approaches that are currently implemented at polytechnics and the issues surrounding the choice of these approaches. Lecturers' choices of teaching approaches, how to improve their teaching, and problems encountered while performing their jobs will be highlighted as well.

The final part of Chapter 5 analyses and evaluates the current teaching approaches used in Civil Engineering programmes in the three selected polytechnics, assessed from the students' perspectives using a questionnaire. The data collected from the survey provides basic information about students' perceptions of the course, the subject matter and the previous teaching approaches in learning engineering subjects.

This chapter then presents the results in succinct form. The analysis starts with the students' demographic and academic backgrounds, followed by an analysis of their experiences in learning at polytechnic level. The central units of analysis are the teaching methods and materials that are regularly applied by lecturers to deliver a subject. An evaluation of teaching strategies with regard to students' perspectives is presented in the third part of this chapter. The analysis focuses on how often a lecturer delivers a lesson using named strategies. The fourth section of this chapter describes students' reflections on their learning using specific strategies. The analysis focuses on their preferred learning techniques and how the institution's environment might help the learning process. This chapter looks at the students' opinion of how the strategy can be improved upon to help them to improve their specific skills.

Chapter 6 analyses the collated data in order to evaluate the effectiveness of the new strategy (HybCoMet) in helping students with their learning process after the intervention phase, focusing on the extent to which the core hybrid process of learning impacts on the students' learning. Of particular significance is how well students can work as a team and how they develop a team rapport between themselves, as well as how they relate to each other on a whole class basis. Of critical importance will be the need to identify students' attitudes and commitment towards learning and their generic competences. Another issue of interest will be to determine how students can work individually and independently, without relying too heavily on their lecturers.

The extent to which the HybCoMet Strategy might be able to help students in their learning, providing them with the means to improve their attitudes and generic competences, is also discussed. The aim of the analysis in this section is to evaluate how the new strategy helps students in moving towards independent learning, and to identify the students' levels of competency that are highlighted in this study (i.e. critical thinking, problem solving, communication and team building skills). Suggestions and comments on what the students liked and disliked about the new teaching approach are then presented, and suggestions on ways to improve the new approach, are presented in the final section. This chapter also presents the findings obtained from the pre- and post-treatment tests that were administered to both control and experimental groups, before and after the treatment process, and discusses the different levels of achievement using both traditional and HybCoMet Strategies.

This thesis closes with **Chapter 7**, which provides a discussion on the overall findings and a conclusion. The discussion focuses on the collected findings of the study, addressing the aim and objectives, as well as the research questions of this study. The discussion starts by reviewing other studies in this related area. This chapter also considers the implications of this research, including the policy implication that might be useful to the researcher, polytechnic lecturers, the Malaysian Ministry of Education, curriculum planners and other users and practitioners. The conclusion summarises and considers the extent to which this alternative new approach might be useful when adopted in a classroom environment in order to fulfil the demands for lifelong learning that necessary for the labour market.

CHAPTER 2

TECHNICAL AND VOCATIONAL EDUCATION (TVE) IN MALAYSIA: THE NEED FOR GENERIC COMPETENCES

2.1 INTRODUCTION

Over time, education is increasingly seen as being a contributor to economic growth, as Malaysia has moved towards becoming an industrialised country. In line with this, national development now focuses on economic growth, and the quality of the workforce has become one of the main debate. In Malaysia, it is considered that most employers would like to see an employee who has both generic competences and positive work attitudes / personal qualities (Sipon, 2003; Cheung and Wong, 2006). While the focus on generic competences has largely been related to definition and standards development, the implementation of these skills is seen as a teaching and learning issue (NCVER, 2003). TVE and training institutions are most often seen as the sectors that could contribute to the development of skills and competences and could provide the desired competencies that are demanded in the work place. However, literature on this topic has discovered that the graduates from this system hardly achieve the standard desired by industries (Mustapha & Greenan, 2002; Bakar & Hanafi, 2007). This problem has necessitated a serious rethink of the current pedagogical approaches employed in Malaysia with a view to seek out those approaches that could result in the attainment of appropriate standards. This chapter discusses how TVE programmes are designed to meet the challenges of national development. The discussion considers the main issues that relate to preparing the nation's youth for future employment, not only in terms of their knowledge but also their competences. It considers the need for generic competences and examines the significance of generic competences in terms of teaching and learning.

Acknowledging the historical embeddeness and reciprocal influence of structural and conceptual aspects of the Malaysian (in fact any) national education system, this chapter brings together two main perspectives on the Malaysian TVE system.

It opens by offering a historical overview over the development of Malaysian education policies, and the institutions shaped by these policies from pre- to post-colonial times. This structural and institutional perspective is then complemented by a discussion of conceptualisations of ‘competence’ and ‘learning’ as they play out in the Malaysian TVE context. Combining these two perspectives allows for an in-depth understanding of the conceptual, curricular and didactic challenges facing the system today and provides a necessary multi-dimensional contextualisation of the hybrid instructional approach, which is the focus of this study.

The first section of the chapter provides an overview of the social and cultural context of Malaysia. Section two focuses on the education system in Malaysia. It outlines the historical perspective and the genesis of the educational infrastructure in Malaysia. The historical background is important to the development of the education system in Malaysia, as this history is a catalyst for the direction, goals and philosophy of education in the nation and the development of the education system in Malaysia today which is moving the direction of the development towards industrialisation.

The third section explores the development of TVE in Malaysia and provides details on programmes and structures of education at polytechnic level. Concepts and definition of competences are explored in the fourth section and these are drawn from both local and international perspectives, and also draw upon some problems faced in relation to the way of teaching is delivered and the way of learning is conducted. This section discusses how different theories of learning view how people learn, and how teaching approaches affect the learning process. It also explores how the mismatch leads to the problem of insufficient competence among students. The discussion considers the main issues related to preparing the nation’s youth for future employment, not only in terms of their knowledge but also their generic competences. Standard generic attributes as the Malaysian Qualification Framework (MQF) are highlighted that need to be taken into account in designing any education programme.

The final section concludes by considering the need for generic competences and stresses the rationale for alternative pedagogical approaches to be designed to counteract the perennial problems that attend the teaching/learning interface in Malaysian TVE.

2.2 COUNTRY CONTEXT

Malaysia is best described as a "multi cultural, multi ethnic and multi religious society' (Wong and James, 2000, p. 209). Malaysia comprises thirteen states divided geographically into two parts, separated from each other by the South China Sea; Peninsular Malaysia (also known as West Malaysia) and East Malaysia (also known as Malaysian Borneo, comprising Sabah and Sarawak). Malaysia has a total landmass of 329,845 square kilometres (127,354 sq mi). Kuala Lumpur is the official capital and largest city of Malaysia, while Putrajaya is the federal administrative capital, the seat of the federal government. Malaysia is bordered by close neighbours, which are Indonesia, Singapore, Brunei and Thailand. It is near the equator and has a tropical climate with warm weather all year round. Figure 2.1 displays the location of each state in Malaysia.

Figure 2.1: Map of Malaysia (Source; www.malaysia-maps.com., 2007)

As reported in the ASEAN Statistical Yearbook 2008 (ASEAN Secretariat, 2009), the population in Malaysia in 2008 is estimated at 27,863 millions. In West Malaysia the majority of the population are Malay citizens who comprise 55.25% of the population, followed by 33.0% Chinese and 10.2% Indians (Wong and James, 2000).
There is a different structure in East Malaysia, where the population is made up of Dayaks and Kadazan, the native tribes, and the Chinese population, which exceeds that of the Malays (*ibid*, p. 209).

A diversity of ethnic groups has influenced the languages spoken in Malaysia. However, as a result of education policy, Bahasa Malaysia is the national language and the major means of communication among the different ethnic groups today, but English is widely spoken as are a number of Chinese dialects. Various other languages are spoken and East Malaysia features several other indigenous languages. According to Asmah cited by Wong and James (2000), no fewer than eighty languages are spoken in this country. Islam is the official religion but all other religions (i.e.: Hindu, Christian and Buddhism) are practised freely.

With such a diverse ethnic, linguistic and religious population in Malaysia, education is seen as a way of developing a single national identity. The education system in Malaysia, and in other South East Asian societies, is used as a unifying force for social cohesion and nation state formation, as discussed by Green (1997). National education systems play a role as a route to transforming what Wong and James, (2000) call a "heterogeneous traditional plural society" (p. 211) into one with a shared common national identity and shared economic goals.

2.3 THE MALAYSIAN EDUCATION SYSTEM

2.3.1 The Development of the Education System

The contemporary Malaysian educational system is heavily influenced by its previous "social, economic and political development" (UNESCO-UNEVOC, 1995, p.1). At this point it is useful to explain briefly the background of educational development in this country by tracing its history. Only through understanding the historical role of education we can understand the education needs of the current century (Green, 1997).

Education in Malaysia has gone through various stages: pre-colonial, colonial and post-colonial (*Pasca Merdeka*). One can see that rather than representing a break with the past, the emphasis on values education and skill formation was evident in earlier (pre-colonial) formations of the Malaysian education system.

In fact, it was only in the colonial period that the education system was not unified and orientated towards a common curriculum. However, the colonial period did usher in the importance of skill formation which remains a central objective to this day.

In the pre-colonial period (before 1824), education was generally non-formal in nature. Education was provided mainly by religious schools with an emphasis on Quranic teaching, spiritual knowledge and apprenticeship in agriculture (UNESCO-UNEVOC, 1995). *Pondok* and *madrasah* schools were set up by Islamic scholars to provide instruction in the broader fields of knowledge. Philosophy of education in this era was intended to produce respectable manners as well as skills for life. Religion played a major role in education of this era. The pre-colonial emphasis on education for well being, high moral standards and belief in God has been adapted in the National Education Philosophy (NEP) and in the current national curriculum through Islamic Studies and Moral Studies. We can therefore see some elements of the current orientation of the Malaysian education system, towards strong moral values, in the pre-colonial period.

During the colonial period (1941-1957), the increase in commercial enterprises and development, especially in the rubber and tin industries encouraged the immigration of Chinese and Indians to this country (UNESCO-UNEVOC, 1995). The school system then had four different language streams according to ethnic identity. The four streams were English medium schools, to fulfill the needs of British administrators, Malay schools for secular education, with Chinese and Tamil primary schools for the respective needs of their communities (UNESCO-UNEVOC, 1995). Each school had different objectives, curriculum, organization, standards and instruction methods (*ibid*). The administration of education in this era was in accordance with the colonial policy of "divide and rule" (Wong and James, 2000, p.211). This mean that all four ethnic groups had separate school systems, serving different purposes and different demographics (For example teaching may have been in Malay in a rural area, Indian in a rubber estate, Chinese in a mining area and English in a high income urban area).

Accordingly, this encouraged provision of education in the vernacular, and the education system was fragmented. Whilst the school system created social division, economically it helped stimulate the creation of the plantation system and commercialization of agriculture, the framework for the present-day transportation system, the introduction of English and an educational system, multiracialism and modern political institutions (*ibid).*

Since Malaysia gained its independence from Britain in 1957 (the post colonial period), the education system has been orientated towards the goal of state formation. The government controlled and standardized the entire educational system, and made a provision to make Malay the official national language, and ultimately the language of instruction in the educational system (Lee, 2004) to ensure a united, if multiracial, society (UNESCO-UNEVOC, 1995). This era also brought about a paradigm shift in the national education system with curricular reforms and the increasing use of educational technology that enhanced the quality of education (*ibid*). The orientation of education in this period was to rapidly narrow the inequalities that had arisen from the colonial education system and to consolidate ethnic divisions, with the introduction of Malay language, as one language to unite the different ethnicities, classes and religions. Green (1997) believed that the unification led to the development of mass education. However, the didactic and hierarchical structure of education inherited from the colonial period "has remained basically unchanged" (Lee, 2004, p. 9) and only at primary level has there been progress towards a less didactic system (MDG2 Full Report, 2004). This has been a rapid change. Since colonial dependency, the education system has been reviewed, revised and eventually reformed to create Malaysia's own national educational model that can be adapted to serve particular circumstances and needs.

The Malaysian government plays a crucial role in forming the regulatory policies that shape Malaysia's education system today. It has developed new education programmes and structures that are widely applied to date (Figure 2.3). The twin goals of social unity and economic development are evident in the Malaysia Millennium Development Goals, 2004 (UNDP, 2005).

According to this document, between 1960-70, education was utilized as a social tool to integrate and restructure the three different ethnic groups (Malay, Chinese and India). It continued to play the same role from 1971-1990 but was also aimed at increasing participation of all Malaysians in national development. Education expanded its role for human resource development in 1991-2000, to play a part in leading Malaysia towards becoming an industrially leading country as envisaged in the Vision 2020. From 2001 to 2010, education was also expected to serve "lifelong learning to raise the quality of life, enhancing access to tertiary education, and using knowledge based education as a tool for employment restructuring" (MDG2, Full Report, 2004, p. 75).

One of the current priorities focuses on improving the delivery system in line with technology change and creating knowledge based education system (*ibid*). In addition to improving the quality of education, the Malaysian government is also committed to improving the curriculum, especially at school level, to meet the changing needs of the economy. It must be noted that this occurs in the context of a particularly Malaysian model of development. It might be considered that it is difficult to impose what are seen as 'Western' models of education (for example, the imposition of generic skills) on East Asian economies. For example, Thelen (2004) considers that path dependencies in vocational education systems mean that 'policy borrowing' or 'impostion' of policy will fail. This is because the reform of vocational education system is a protracted process. However, Green (1997) considers that nation formation (in terms of European economies, but most recently for East Asian economies) is a strong driver for change in education systems even given historical trajectories. Rather than 'impositions' such 'Westernising' of curricular can be driven by strong nation state and industrial policy drivers.

2.3.2 The National Curriculum

Curriculum policies in Malaysia have a basis in the Education Act 1996 (Act 550, Laws of Malaysia) that sets out regulations and provisions which form the basis for resulting curriculum documents (A.Rahman and Ahmad, 1998). These regulations apply to all schools and higher level institutions. The philosophy of the national curriculum is, *"to contribute to the holistic development of the individual (mental, emotional, physical, spiritual) by imparting general knowledge and skills, fostering healthy attitudes and instilling accepted moral values"* (A.Rahman and Ahmad, 1998, p. 88).

It can be seen that the aim of curriculum development is alignment with the National Education Philosophy (NEP), which is to form Malaysian citizens who are balanced, united, trained and skilful. The NEP is regarded as a statement of vision by the Ministry of Education (MOE) in the pursuit of educational excellence. The National Education Philosophy (NEP), established in 1988, states that:

> *"Education in Malaysia is an on-going effort towards further developing the potential of individuals in a holistic and integrated manner, so as to produce citizens who are intellectually, spiritually, emotionally and physically balanced and harmonious based on a firm belief in and devotion to God. Such an effort is designed to produce Malaysian citizens who are knowledgeable and competent, who possess high moral standards, and who are well being as well as being able to contribute to the harmony and betterment of the family, the society and the nation at large."*
>
> (MOE, 2004, p. 4)

The NEP also forms the basis for the development of education with reference to the nation's goal to become an industrialized country by 2020. This takes into consideration religious and cultural values of the various ethnic groups, whilst emphasising the universalism of education, with a particular emphasis on the "mastering of knowledge and development of individual potentials to improve the standards and sustainability of quality of life" (The EFA Report, 2000). Hence, a unified curriculum is seen to be not only an instrument of nation formation but also of industrialization. In fact, in Malaysian education policy the two are synonymous. As quoted in UNESCO-UNEVOC (1995), "as Malaysia drives to move rigorously ahead, nothing is more fundamental than the education, training and the development of human resources" (p. 3).

The Curriculum Development Centre, an agency under the MOE, has the responsibility to initiate curriculum development for both primary and secondary schools. The core principle of the national curriculum is to promote unity (A.Rahman and Ahmad, 1998).

Therefore, a uniform curriculum is applied to all types of schools at both primary and secondary levels. Besides the provision of uniform content, the curriculum also stresses the use of national language, Bahasa Malaysia as a medium of instruction. Nevertheless, Tamil and Chinese people are allowed to use their native languages as medium of instruction.

Such a centralised curriculum requires students in every school to learn the same syllabuses and the same core subjects and sit for the same examination at the end of each level of education. Thus, the educator needs to teach and cover the entire syllabus from a centrally designed curriculum and disseminate the knowledge to students as they need to prepare for the national examination.

There are 4 compulsory examinations in Malaysia: UPSR (Primary School Achievement Test- at the end of grade 6 at primary education level), PMR (Lower Secondary Evaluation-at the end of lower secondary education level), SPM (Malaysian Certificate of Education, equivalent to GCE O level - at the end of upper secondary level) and STPM (Malaysia Higher School Certificate Examination, equivalent to GCE A level- at post secondary level). In addition to these examinations, there is also an exam conducted for the religious stream of education which is STAM (Higher Malaysian Certificate for Religious Education – at the end of post secondary level) (MOE 2004). Again, this centralized system is indicative of the desire of the Ministry of Education to achieve a national identity for Malaysian pupils, regardless of ethnicity. Such a system of high stakes an examination that determines future educational success tends to encourage rote teaching and learning (MDG 2, Full Report, 2004). Students need to sit for national examinations at the end of each level (UNESCO-UNEVOC, 1995), and they need to pass the examinations successfully to guarantee good opportunities in the next level.

Students are therefore drilled on the correct way of answering examination questions rather than in developing true understanding (Embi and Hwang, 2007). Even the Ministry of Education has realized that the current education system is “impractical, burdensome to teachers and students alike, heavily examination-oriented system and fails to reflect students’ capabilities” (NewsEdge, Mar 5, 2006, p.1).

Students who score a high mark in examination may not necessarily understand fundamental concepts and are unlikely to transfer knowledge to real life situations (MDG2, Full Report, 2004). In particular, at the higher education level, graduates who excel through the exam system have been often labelled as "lacking" the most important aspects required by industries, which are 'soft skills and competency' (Motsidi *et al.*, 2009, p. 219).

Compounding this problem, according to the Final Report of the Regional Seminar (2002), most ASEAN countries, including Malaysia have a curriculum that is overloaded (content heavy) with negative consequences for teaching and learning process. For example in the Philippines, the overloaded curriculum has been considered to delay the development of critical competences, as teachers give priority to covering the subject matter rather than to 'deep' learning (Final Report of the Regional Seminar, 2002). The overloaded curriculum has led teachers to employ a didactic pedagogical structure to help them cover all of the syllabus and complete the curriculum in a given time frame. It was also reported in the seminar that a lot of the content is focussed more on theory and that students 'lack applicable knowledge and practical activities association to actuality" (*ibid*, p. 41). As such the education system has been extremely successful in producing high academic performance but in reality students lack key competences and skills (Sipon, 2003).

Accordingly, appropriate schemes have been devised by the government "to gain the level of management expertise and technological know-how, and..(in which)…people were seen as critical development sources which need to be continuously harnessed" (UNESCO-UNEVOC, 1995, p. 3). Therefore, upgrading the education system has been a major part of government policy as a means to foster national unity and support economic growth.

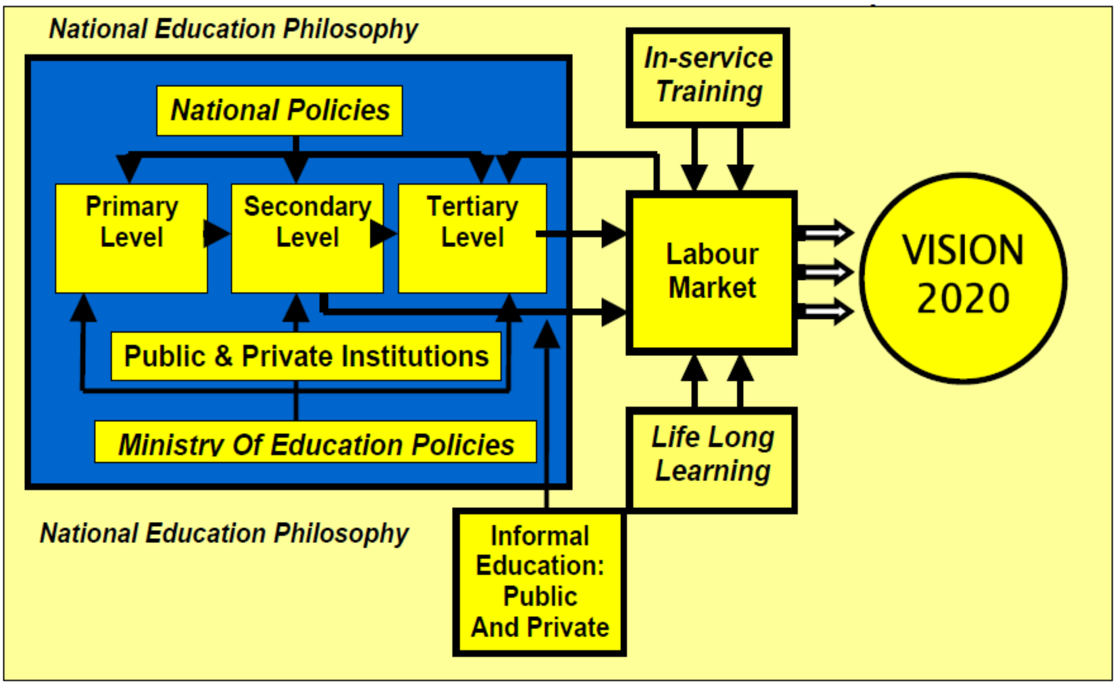

Figure 2.2: The relationship between national policies, the Education System and Development.(Source; MOE, 2004)

Figure 2.2 clearly shows that the philosophy of the national curriculum is supposed to influence each level of the education system which then provides a skilled workforce for the labour market gearing the development of the country towards industrialisation. One priority for the education system is forming a curriculum for the changing needs of the economy. Accordingly, the government has introduced new elements and concepts into the existing curriculum base to form a revised National Curriculum (MDG2 Full report, 2004) with a focus on the TVE system.

With industrialisation, TVE has played an important role (Lee, 2004). Since the 1960s Malaysia has moved to increase the proportion of TVE students in the education system. TVE was introduced in 1965 at secondary level with the intention of providing opportunities for vocational subjects to be taught alongside an academic secondary school curriculum. However, the specific demands of industry have forced the government to develop higher level TVE programmes that concentrate more on specific skills. This will be discussed in greater depth in the next section.

2.4 TECHNICAL AND VOCATIONAL EDUCATION (TVE).

As Malaysia moves ahead "nothing is more fundamental than the education, training and development of human resources…to raise the level of management expertise and technology know how to meet the serious shortage of skilled and middle level manpower. The talents, skills, creativity, characters and will of the people are the critical development resources which need to be continuously harnessed"

(UNESCO-UNEVOC, 1995, p. 3).

Malaysia is seen as needing a highly skilled workforce to support the growth of industrial and manufacturing sectors. As stated in the booklet of the Kementerian Pelajaran Malaysia (1975, p. iii), TVE plays a major role in "developing students' abilities, attitudes and appreciation for productive employment". The Malaysian government gives high priority to the development of the TVE system to enhance the skills of its workforce as required by industry (Bakar and Hanafi, 2007).

As can be seen in Figure 2.3, TVE is an integral part of total Malaysian education system at the post secondary and college level. This is different to other education systems, such as in the UK, where TVE is not as integrated. TVE orientation in Malaysia starts at the upper secondary level. The Malaysian Polytechnic system plays a large part in this system and continues to grow in order to meet the expected demand for skilled workers. The role and central goal of Malaysian Polytechnics is to provide competent, flexible, motivated and responsible citizens as a workforce for the nation with the possibility of further education and training (Bakar and Hanafi, 2007).

As reported in the UNESCO-UNEVOC Case studies-Malaysia (Bakri, 1996) the profile of the Malaysian economy has changed radically since independence in 1957. The economy, which was based mainly on agriculture and the production of tin ore, has moved and grown to become a more balanced economy with a growing manufacturing sector. The Malaysian labour force increased steadily from 9.6 million in 2000 to 11.3 million in 2005 and is expected to reach 12.4 million by the year 2010 (Bakar and Hanafi, 2007). Among other sectors, manufacturing sectors are expected to experience the largest increase in employment. It is estimated that it will comprise up to 30% of employment by 2010 (*ibid*). As the continuous expansion and technological needs of the manufacturing and industrial sector progresses, Malaysia needs a highly skilled workforce to support this growth and there is a corresponding demand for TVE to meet labour market needs.

The Government of Malaysia has noted the increasing importance of TVE and training due to the increasing demand of employment in these sectors. As such, efforts have been made to promote TVE and the changing nature of TVE programmes. The UNESCO-UNEVOC Report also mentions that TVE in Malaysia has progressed from very basic craft training of a narrow psychomotor nature to the highly cognitive nature of TVE today (Bakri, 1996). To be recognized as an economically developed country by 2020, Malaysia's future workforce has to be able to cope with the changing nature and demand of work. Above all, TVE is believed to provide the future workforce with employability skills as required by industries (Bakar and Hanafi, 2007) and is perceived as one of the crucial elements in enhancing economic productivity (Mustapha and Greenan, 2002).

2.4.1 Development of the Technical and Vocational Education and Training (TVET) System.

TVET programmes in Malaysia were first introduced in 1906 with the establishment of the School of Technical Training, Kuala Lumpur,.Since the introduction of this training school, more schools and institutions have been established to train and fulfill the needs of a skilled workforce in the country. The more vocationally based subjects have been introduced since 1956 alongside the main general secondary school system. However, little progress has been made in this direction (Lee, 2004). In 1960, education with a pronounced vocational content was proposed to help reduce the number of students leaving school at age fifteen, as they cannot perform in the Lower Certificate of Education (currently known as PMR) (*ibid*). However, this programme was only marginally implemented in 1965 at lower secondary school level with the introduction of four elective subjects. The elective subjects include Industrial Arts, Agricultural Science, Commerce and Home Science in addition to core subjects (i.e.: languages, mathematics and sciences) (Bakri, 1996).

To meet workforce demand, the Malaysian Government has additionally upgraded the vocational training system for industry (UNESCO-UNEVOC, 1995). The origins of this strategy were when the MOE launched its Technical Education Division in 1964 with the aim to build up upper level professionals and to offer TVE to lower levels including the technician and craftsman level (Kementerian Pelajaran Malaysia, 1975). TVE programmes have also been introduced at both primary and secondary level as well as in technical and vocational schools. At a primary level, pre-vocational subjects covering various aspects of manipulative skills have been introduced to students; they continue at lower secondary level with further exposure to simple vocational skills through a "Living Skills" subject (Bakri, 1996). At upper secondary level, two other types of school have been introduced, namely, *Sekolah Menengah Vokasional* (SMV) and *Sekolah Menengah Teknik*, (SMT) in addition to the ordinary academic schools. Students may enter any type of school after successful completion of form three (See Figure 2.3). SMV aims to provide manpower equipped with employable skills and knowledge at craftsmanship level (Kementerian Pelajaran Malaysia, 1975).

The SMV offers a course structure that covers the same core subjects as in other upper secondary academic schools (i.e.; languages, mathematics, sciences and social studies). In addition to these core subjects, the students are also required to select a group of vocational subjects including Engineering Trades, Agricultures, Commerce and Home Science (*ibid*). Conversely, the aim of SMT is to provide basic technical education, with a view towards the development of aptitude in engineering. In SMT, the subjects offered are more science-and mathematically based in nature and the technical subjects offered are less practical in nature. Students who study in this school are introduced to technical courses such as Mechanical, Civil and Electrical Engineering Studies, besides the ordinary core subjects. After successful completion of two years of study at this level, students may continue their study in polytechnics, technology institutes or other universities. The pathways for each education level are shown in Figure 2.3.

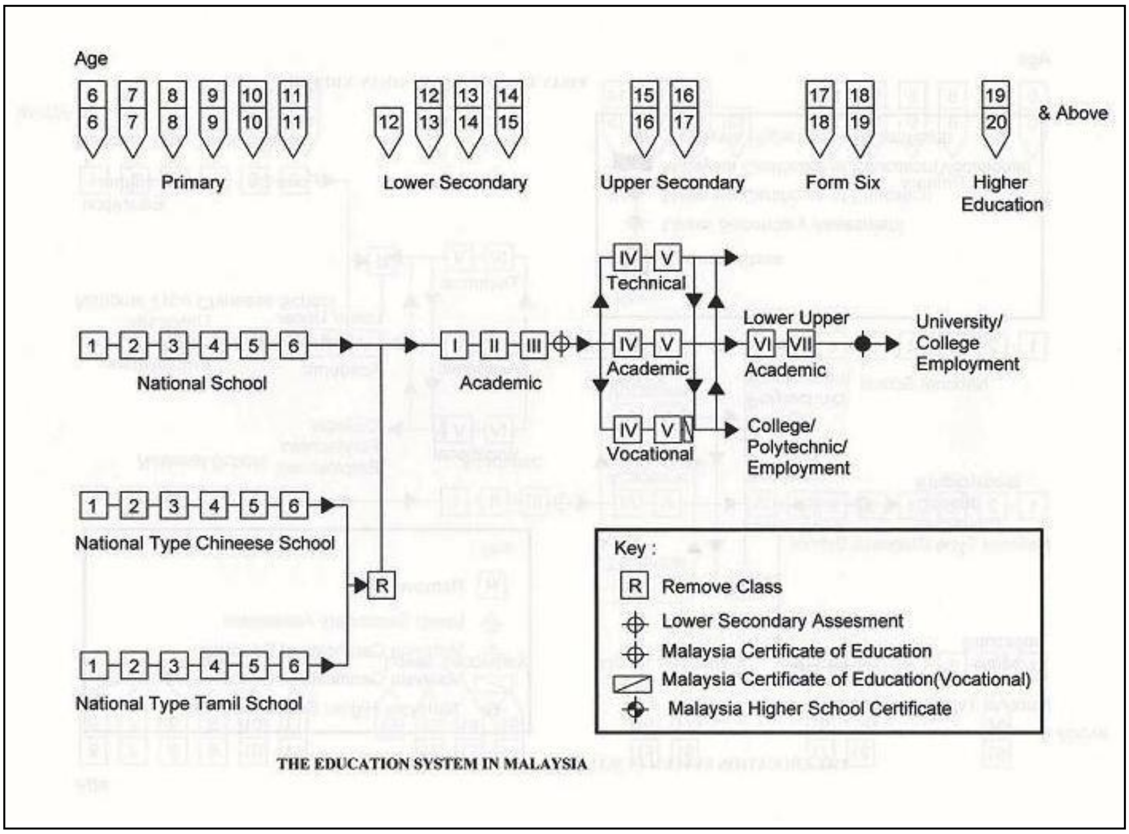

Figure 2.3 : The Education System in Malaysia (Source : Curriculum Development Centre, MOE**,** 2004)

In the early development of TVE, vocational education was relegated to the bottom of the educational hierarchy (Fok, 1996). Vocational education is often considered a “second class” education in the expectations of pupils and parents (Tilak, 2002, p.10).
It is also conceived as a system of education for students who have a lower level of academic achievement. However, with the continuous growth of various manufacturing sectors, and sophisticated increases in Malaysian industry today, TVE and training in this country have become an important element in education and this has begun to change perspectives on the need for, and nature of TVE (*ibid*). New challenges have begun to emerge to replace traditional practices. The Second Outline Perspective Plan 1991-2000 has indicated that during the decade of the nineties, ‘a productive and efficient labour force must be developed with strong ethical and moral values and commitment to excellence’ (Fok, 1996, p. 4). Malaysia can be prepared to face the challenges of the need to attain a high level of competence and skill, essentially through education and training, and TVE is believed to produce “exactly” this kind of manpower (Tilak, 2002, p.3).

As such, since the establishment of TVE and training in 1965, the Malaysian Government has extended its TVE and training programme throughout all levels of the system, from school, to further education levels, as well as to the university level. Over the last few years, there has been an exponential growth of TVE and training programmes with a massive increase in numbers of technical and vocational schools and further education institutions. According to MOE (2004) there were 89 Technical and Vocational schools established in Malaysia. The TVE and training programmes have been strengthened by establishing more polytechnics and community colleges, which aim to further provide and upgrade education and training facilities in various industrial skills at semi professional level (Education Development Plan for Malaysia 2001-2010). By 2008, there were 27 polytechnics and 36 community colleges, operating all over the country (MOHE 2008).

In addition, the Third Outline Perspective Plan 2001-2010 has outlined how to move programmes further into higher education by establishing the technical university and technical private institutions at higher education level as a platform to continuously upgrade the quality of the workforce (Education Development Plan for Malaysia 2001-2010). The plan aims to achieve a balance in producing skilled and semi skilled workers, and aims to increase the number of hands-on professionals to ensure 'the quality, relevance, and ability' (*ibid*, p. 10) of manpower of Malaysia. Recognizing the important role of youth in nation building, the MOE and MOHE have made plans to further improve the development of highly skilled and knowledgeable manpower.

Other skill training programmes are also conducted by various public and private skill training institutes to provide training in various fields with the aim of inculcating positive values and to provide skills development to contribute to nation building (The EFA Report, 2000). As presented in the EFA Report (2000), under the seventh Malaysia Plan (7MP), there are seven national youth skill training institutes (*Institut Kemahiran Belia Negara*, IKBN), run by the Ministry of Youth and Sports. Several institutes have been established in collaboration with foreign agencies under the Ministry of Entrepreneurial Development. They include the German Malaysian institute, British Malaysia Institute, and Malaysia France Institute.

In addition, this ministry also manages eleven *Institut Kemahiran Mara*, and 120 *Pusat Giat Mara* with the aim to provide basic skill training, especially for rural youth (The EFA Report, 2000). Under the 7MP, fourteen Industrial Training Institutes were established, and a Centre for Instructor and Advanced Skills Training (CIAST). Five Advanced Technology Centres (ADTEC) and Japan-Malaysia Technical institute have been also built under the Ministry of Human Resources (*ibid*). Figure 2.4 displays the mapping of TVE and training institutions at all level in Malaysian education system.

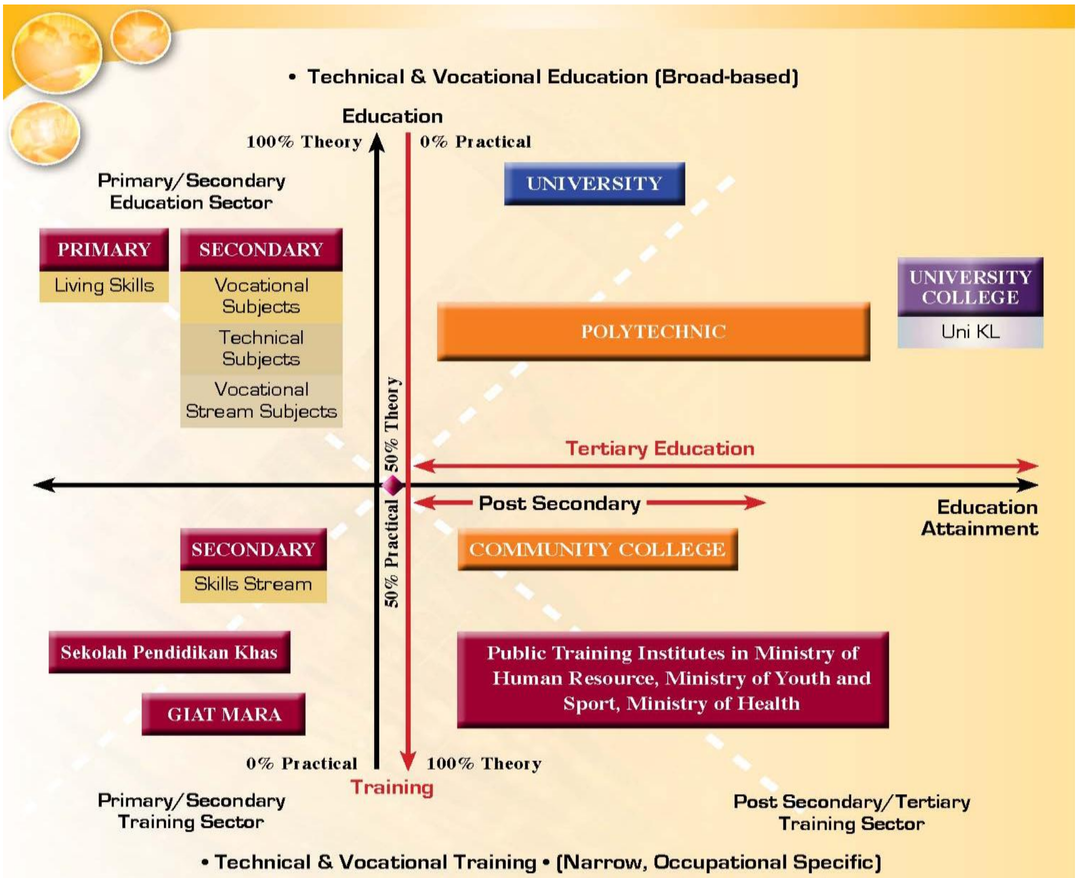

Figure 2.4: TVE and Training System Mapping (Source: DPCCE 2007 Polytechnic, MOHE Prospectus, 2007)

The establishment of these training intuitions indicate that TVET are now recognized as an integral part of the national education system and training effort. The Government puts their effort into ensuring steady improvements in TVE and training programmes as a platform to continuously upgrade the quality of the workforce as is considered neccessary for future national development. However, according to Tilak (2002), Malaysia has never considered TVE to be an important component of national education and can still not claim to have a 'fairly developed' TVE system (*ibid*, p. 6).

This claim is relative, though, and according to Kasa (2006) Malaysia had made significant improvement in its TVE compared to other ASEAN countries such as Korea, Hong Kong, Indonesia, and Laos which have experienced declines in the relative size of TVE over the years. The MOE and the MOHE have made plans to further improve the development of TVE at all levels, including polytechnics, to provide adequate skilled and manpower which is capable of meeting national needs as well as competing in the international arena (The EFA Report, 2000).

However, as reported in a UNESCO-UNEVOC report (Bakri, 1996), training institutions have been unable to meet an increased demand for skilled workers, corresponding to the growth in industrial activities due to various rigidities in generic skills. For example, as discussed in Chapter 1, team building, communication skills, being respectful of others and other personal qualities were desired by employers but were not necessarily being supplied. According to the Kementerian Pelajaran Malaysia (1975), TVE and training is constantly challenged by problems in determining the current and future needs of industry. Current TVE and training intuitions are not market driven; the skills required are not well monitored and the mechanisms to evaluate the relevance of skill outputs are inadequate (Bakri, 1996). Bakar and Hanafi (2007), in their study on assessing the employability skills of TVE students in Malaysia discovered that the graduates are hardly able to achieve the standard desired by industries, either in terms of job quality or in preparation for work. Employers are found not to be satisfied with graduates of TVE, predominantly in the aspect of personal qualities. One of the recommendations of the UNESCO-UNEVOC report includes the need to review of course design and curriculum, and wider dissemination of labour market information (Bakri, 1996).

In order to achieve this, close co-operation is needed between expert groups from governmental agencies, private enterprises, industries, employers and other users. According to Kasa (2006), this form of cooperation needs to seek information regarding job markets, needs analysis, industry restructuring, competencies required, and existing curricula. However, finding the employers'/ industries'/ representative for expert groups has proven difficult, and sometimes the representative from industry may not have the desired expertise. As such there is a problem in making TVE more efficient and relevant to employment needs.

Industrial change today demands new types of skills, which indirectly reduces old skills, which are no longer efficient in a TVE system that is unresponsive. Employers are looking for employability skills in the graduate who does not only possess qualification, but also personal management and teamwork skills which are said to form the foundation of a high quality workforce for the future (Kasa, 2006). Towards this end, the government has put an emphasis on equipping the nation' youth with "the right attitudes, knowledge and skills to ensure that they are able to contribute effectively" (MOE, 2004, p. 31) to the nation development. These attributes are also highlighted by the Education Planning and Research Division (2001, p. 1), to develop people through the Malaysian education system who:

i) can think critically and creatively,
ii) have the skill of problem solving,
iii) can create a new opportunity,
iv) are persistent, and
v) capable of facing the dynamic global environment.

With the growth of TVETinstitutions, there is a need to reinforce these attributes in the programme and curriculum. Many scholars and researchers have stressed the importance to include the relevant occupational elements in the curriculum (Sipon, 2003; MOE, 2004; Kasa ,2006), and employability skills are central to this debate. Rapid developments in Malaysia's economy also drive the demand. Changes in production processes, resulting from advanced growth in technology and industries, have led to an increased demand for highly qualified middle and lower level skilled personnel. TVE, it is believed, can produce exactly this kind of manpower, as contended by Tilak (2002). The Polytechnic as one of the TVE institutions is seen as a key tool in reinforcing the necessary skills.

2.4.2 Malaysian Polytechnics: Programmes and Structures

Polytechnic education in Malaysia was first introduced through the establishment of the first polytechnic, Polytechnic Ungku Omar, situated in Ipoh, Perak under the United Nations Development Plan in 1969 (MOHE, 2008). Many more polytechnics have been established with more programmes to cater for the demand for semi-professional workers in the field of engineering, commerce and hospitality.

At present, there are twenty seven polytechnics throughout the country, and more polytechnics are planned in the near future. The Government plans to establish 36 polytechnics by 2010 as reported in the National Report of Malaysia (MOE, 2004). The objective of the polytechnics is to provide broad-based industry-oriented technical education and training to post secondary school-leavers to impart the necessary competencies of technician and technical assistants in the various fields of engineering, and junior-and middle level executives in the commercial and services sectors (Sipon, 2003).

Polytechnics have been supervised and managed under the Department of Polytechnic and Community College Education (DPCCE) which has been established under the Ministry of Higher Education since March 2004 (DPCCE, 2007). The DPCCE is divided into two sectors; the Polytechnic Management Sector and the Community College Management Sector, with three sub-divisions under each sector, and one Research and Development Centre for both sectors.

Presently, there are 27 polytechnics in operation which offer a total of 75 courses in the fields of Engineering, Commerce, Hotel and Catering, Graphic and Industrial Design, and Apparel and Fashion Design. The programmes at the polytechnics are full time certificate (22 programmes) and diploma courses (47 programmes) with a total enrolment of 100,722 students until April 2008 (MOHE, 2008). These require a pass of SPM as an entry requirement and run over two years (four semesters). Students who consistently maintain a high standard may be considered for an additional othe year in order to obtain a Diploma (post polytechnic certificate) in their related field.

Besides full-time certificate and diploma courses, polytechnics also offer bridging programmes for graduates from Community Colleges who wish to further their studies and special skills certificates for students who completed their upper secondary education in a Special Education School or Special Education Integrated Programme. All polytechnic courses include an industrial attachment in the public or private sector for a period of six months during the third semester. This stimulates students' innovative capabilities and gives ample scope for developing practical skills (UNESCO-UNEVOC Report, 1995). The details of courses offered in every programme are shown in Appendix 2-A.

The diploma course in Civil Engineering is the focus of interest in this study. Of 27 polytechnics, 13 offered a Civil Engineering Programme. The curriculum and syllabus for this course are shown in Appendix 2-B.

TVE subjects in polytechnics differ from core academic subjects that traditionally have had a strong theoretical emphasis, as the content is more relevant to the world of work. TVE curriculum and teaching methodologies focus on students' interests in tasks that have direct relevance to real work practices (MOE, 2004). Careful management of curriculum development is required in order to achieve an effective and "sustainable curriculum" of polytechnics (Kasa, 2006, p.1).

As stated earlier in the chapter, the TVE curriculum is designed to meet the demands of industry and job markets. As such, while developing a curriculum, necessary skills for employment need to be taken into consideration and these should be of relevance to employers. It is argued that the delivery methods should be reformed from traditional 'paper and pencil test' to a modular assessment and a "competency based system to indicate favourable outcomes" (MOE, 2004, p. 12). Therefore, there is a need to incorporate the elements of competency into pedagogical contents at all education levels. Generic competences have been highlighted as being central tothe TVE programme, and consideration should be given to include these elements while designing and planning the TVE programme and curriculum. The success of the TVE system indirectly reflects the pedagogical approaches applied in teaching and learning.

2.5 GENERIC COMPETENCES: CONTEXTUAL ISSUES AND CONCEPTUAL PERSPECTIVES

2.5.1 The Need for Generic Competences

An implicit focus on competences in Malaysian education first began in 1906 with the introduction of the School of Technical Training with a TVE and training bias. Since then, TVE and Training have been continuously expanded to provide a skilled workforce in Malaysia. TVE has played a major role as an integral part of the national education and training system with equal importance and status to the general stream within secondary and tertiary education (Abu Hassan and Navi Bax, 2003). This is in line with the argument that TVE can play a key role in the struggle for equality of opportunities, in remedying school failure and in contributing to cultural, economic and social development (Bakri, 1996). While TVE has made significant progress to meet workforce demands (Bakar and Hanafi, 2007), further efforts need to be made to improve employability skills of students as required by employers as discussed in the previous sections. Teaching and learning strategies employed in TVE and training have not been able to equip students with adequate competencies to enter the job market as discussed.

According to the NCVER, (2003), there is a high demand for generic competences in the workplace. Employers seek to ensure business success by recruiting and training employees who have a variety of skills and personal attributes as well as technical skills. Those skills are important because jobs today require "flexibility, initiative and the ability" to undertake many different tasks including the needs to use "teamwork, problem solving, ability to make decisions, take responsibility and communicate effectively" (*ibid*, p. 2). A workplace survey conducted by Carnevale, Gainer and Meltzer (1990) has identified seven skill groups which are most required by employers as listed in Table 2.1.

Table 2.1 : The Seven Skill Groups.

1.	Influence	Organisational effectiveness and leadership.
2.	Group effectiveness	Interpersonal skills, teamwork, negotiation.
3.	Personnel Management	Self-esteem, motivation/goal setting, employability/ career development.
4.	Adaptability	Creative thinking and problem solving.
5.	Communication skills	Oral communication and listening.
6.	Competence	Reading, writing, computation.
7.	Foundation Skill	Learning to learn.

Source: Carnevale, Gainer and Meltzer (1990, p. 28)

Various studies have suggested that graduates from various education levels are not able to demonstrate the necessary skills while performing their job. A study by Bakar and Hanafi, (2007) affirmed that thinking skills and resource management skills possessed by students at a technical training institute in Malaysia are moderate. This has been supported by Mustapha & Greenan's (2002) study on the employability skills of vocational graduates. Their study found that educators and employers perceived critical thinking skills and problem solving skills as the worst areas of performance. The other items included in the questionnaire are how vocational graduates demonstrated; communication skills, social and interpersonal skills, technical skills, entrepreneurial skills, a good attitude toward work, self motivation, and preparedness to enter the job market. The study also revealed that students possessed communication skills at a lower rate than was desirable. Meanwhile a study by Martinez *et al.,* (2007) on the assessment of required competences for many types of employment, suggested that working independently and taking responsibility are the most required competences.
Whilst problem solving ability, oral communication skills, working under pressure, planning, coordinating, organizing, time management, analytical competences, negotiating, critical thinking, written communication skills and learning abilities are also part of requirements. Theyalso suggested that employees increasingly perceive working in a team as a required competence.

Proficiency in the broad range of competencies has become the main requirement for the modern worker (NCVER (2003).) and all education sectors, specifically the TVE system, have a role to play in providing sufficient competences to students. It should be noted, though, that despite geographical proximity there are distinct differences in policy regarding generic competences between Australia and Malaysia. In Australia, the Mayer report (Mayer, 1992) clearly specified that all young people should, as a core part of the curriculum, receive training in generic competences. These included 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. As Smith and Keating (1997) consider, the direction of Australian policy with regard to TVET and generic competence could have been, to some extent, facilitated by reforms to the qualifications system for TVE.

However, even in Australia (where there are key policy drivers towards the integration of generic competences into the education system) progress has been relatively slow with lack of recognition for generic skills (Clayton *et al*., 2003). This may be partly explained by the disjuncture between the ability of the Australian Qualifications Framework (AQF) to meet regional demand in what is, largely, a federal system of education (Keating, 2003).

At an industry level, though, transferability of qualifications (including to some degree, generic competences) between industries as part of a system of 'training packages' has led to increased degrees of equity for previously excluded groups in TVE (Clemens and Rushbrook, 2011). Although there have been moves towards competence based vocational education in Malaysia, the qualifications system is still orientated towards high stakes, examination system. Despite the fact that the drivers for generic competences in each system are very different, though, there is similar inertia in terms of the lack of recognition for generic skills in both systems despite attempts to introduce regional (Asia-Pacific) models of generic competence (ILO, 2010).

As the concept of competences is closely related with an emphasis on new directions in TVE programmes, it is worth looking at this conception in more depth before incorporating this concept in a teaching and learning process.

2.5.2 The Concept and Definition of Competences

During recent decades, the concept of competences has been used in the development of vocational education and training and higher education (Mulder *et al.*, 2007). Mulder *et al*., (2007) indicated that the first contribution to the academic field of competence dates back to the 1970s; however this is not the exact starting point for the use of the concept of competence. According to Mulder, (2006), the first use of the concept occurs in the work of Plato. The etymology of 'competence' points to the Greek *ikano*, a derivative of *iknoumai*, meaning 'to arrive'. The ancient Greek language had an equivalent for competence, which is *ikanotis*. It is translated as the quality of being *ikanos* (capable), to have the ability to achieve something, which is skill.

Competence also appeared in the Latin language in the form of 'competens', which was conceived of as "being able and allowed by law/regulation", and in the form of 'competentia' which was perceived as 'capability and permission' (Mulder, 2006, p. 2). This concept was recognized in English, French and Dutch by the sixteenth century in the terms 'competence' and 'competency' (*ibid*). According to Kunjiapu and Yasin, (2008), the terms bring a different meaning according to eachdifferent field and context to which they are applied. They have classified competences to show differences by scale of aggregation. For example: generic competences relating to skill components in a particular setting, occupational competence relating to the level of an occupation, task and job specific competence relating to the detail of task and job in a specific work system, and person specific competence that are important for training, assessment and evaluation purposes *(ibid*).

Definitions of the concept of competence differ according to national contexts. Daelmans *et al*., (2005) have defined competences as the ability of a professional to handle complex situations or problems using professional knowledge, skills and attitudes in an integrative way. On the other hand, generic skills are conceptualised as skills applicable to different situations after initial teaching/learning, adaptable to suit the varying needs of new situations (Cornford, 2005). Generic competence refers to the *common* abilities that explain variations in performance that can be applied to different professional groups and workplace contexts (Mulder *et al*., 2007). According to ILO (2009), generic competence is described as "the skills needed by all people as preparation for work and to make them attractive to employers" (p. iii).

Correspondingly, in Malaysia, the concept of competence has been used since the introduction of the first TVET programs in 1906 through the establishment of the School of Technical Training, Kuala Lumpur as previously mentioned. Several terms have been employed to refer to the concept of competence. Mustapha and Greenan (2002), for example, use the term employability skills in their writing, and the same term is also used by Bakar and Hanafi (2007). The term competence has been used by Sipon (2003) and Kunjiapu and Yasin (2008), and many other authors are using this term widely in their writing to refer to different types of skill that are needed for workplaces.

Similarly, in this study, the term generic competence is employed; referring to meaningful objectives and content of learning that will engender the personal development of students and position them within the domain of knowledge that can best prepare them for learning, employment and life. Generic competence in this study can best be defined as the ability to perform group work roles, of specific learning tasks, in a proper way to achieve the overall job function and reach set goals in order to be able to act in a real future working environment.

This study examines the generic competences required of graduates; pointing to an increased emphasis on personal attributes rather than technical skills, which consider oral communication, problem solving, critical thinking and team building skills.

2.5.3 Core Perspectives on Competences

The contexts to which the concepts of competence are applied can be categorized as "institutional, jurisdictional, organizational and personal" (Mulder, 2006, p. 2). In some countries they are specifically employment related, while in others greater emphasis has been placed on social relevance. Conceptualisations of competence differ from one country to other countries; some are more generic and common to all industries, while others are technical and specific to an industry sector.

This section explores some of the different terms used in generic competences. In some countries the terms core and key skills are employed, for example, in the UK, Singapore and Germany who created specific programmes to develop those skills in their workforce (ILO, 2009). In other countries, there is a focus on transferable skills (as in France and Switzerland), while the US and Australia tend to use key skills, employable skills and generic skills (NCVER, 2003). It is best to use the grounded experience of other countries when looking for generic skills model that might suit the needs of this study. In Australia, for example, the current policy for generic skills is focused on the role of key competencies identified by the Mayer Committee (Kearns, 2001). The Mayer Committee was set up by the Australian Education Council and Ministry of Vocational Education, Employment and Training. It proposed a set of seven key competencies which have been integrated in curricula of schools and vocational training institutions. The seven competencies are (Kearns, 2001, p.14):

i) collecting, analysing and organising information,
ii) communicating ideas and information,
iii) planning and organising activities,
iv) working with others and in teams,
v) using mathematical ideas and techniques,
vi) solving problems, and
vii) utilising technology.

These competencies are not a technical description of specific work but more akin to underpinning abilities that an individual applies when working effectively and efficiently. These types of skill have been comprehensively defined and implemented in the above stated countries and, to some extent, are also the focus of this study.

The Core Abilities and Liberal Studies Curriculum Development Committee also publishes their own set of non technical skills known as Core Abilities Skills. There are eight skills highlighted that are essential for success in work and life (MATC, 2005, p.1):

i) communication,
ii) critical thinking,
iii) ethics,
iv) global and cultural perspective,
v) mathematics, science and technology,
vi) self management, and
vii) social interaction.

However, for ASEAN countries, e.g. Singapore, the concept of competences is more specialised and technical in nature. It aims at helping individuals to better adapt to new job demands and challenges. Thus, the focus lies on occupational skills including initiative and enterprise, lifelong learning, global mindset, work related life skills and health and workplace safety (ILO, 2009, p.6). Taking a different perspective from Singapore, generic competences in Malaysia focus more on what might be called basic generic skills. There are seven elements of generic competences perceived necessary by corporations and industries namely: basic skills, thinking skills, resource management skills, interpersonal skills, system and technology skills, and personal quality skills (Bakar and Hanafi, 2007). The Ministry of Education of Malaysia has highlighted eight components of generic competences that should be obtained by students to actualize duties in employment and daily life. The components are quite similar to those provided by MATC, 2005. They are:

i. communication skills
ii. using technologykills
iii. planning and conducting activities skills
iv. work with others and in team skills
v. problem solving skills
vi. managing, selecting and analysing information skills
vii. using ideas and mathematic techniques skills
viii. understanding culture skills.

(Pusat Perkembangan Kurikulum, 2002)

2.5.4 The Malaysian Qualification Framework (MQF)

The concept of competence further extends through the Malaysian Qualification Framework (MQF) that corresponds to domains of learning outcomes. The MQF is a quality framework for the Malaysian education system that considers how generic competences are allied both to the national and international level. MQF is a ratified reference, containing information on each qualification, which is useful for students, parents, employers, the government, education providers, quality assurance agencies, accrediting agencies and industries, both within the country and abroad. (The Malaysian Qualifications Act, 2007).

The framework is useful as a benchmark to promote the understanding of standards and awarding systems of qualification in any level of the education system.

The elements of generic competence that are set out in the domains of learning outcomes in this framework (communication, team skill, problem solving skill), should be included in every learning programme including TVE systems, and should be mastered by all students.

Table 2.2 describes the domains of learning outcomes that are outlined in the MQF.

In this light, all education programmes in all disciplines, including TVE programmes are expected to design, develop and implement strategies according to a standard as outlined in the Malaysian Qualification Framework (MQF). As a consequence, the designed courses should seek to develop these competences in order to meet the needs of employment.

Table 2.2: MQF Domains of Learning Outcomes.

No.	Learning outcome	Descriptions
1	• Knowledge of discipline areas	- able to master and understand concepts and theories
2	• Practical skills	- able to apply concepts and theories and carry out a professional task effectively, ethically and safely
3	• Social skills and responsibilities	- enable to deal with people and organizations efficiently, conduct in an appropriate and civil manner, identify social issues and respond effectively
4	• Value, attitudes and professionalism	- respect for self and others; capacity to show sympathy, empathy and tolerance, and practice good time management
5	• Communication, leadership and team skills	- able to write, speak and listen effectively, responsible and having the vision to lead in solving tasks, able to work independently and in teams, posses multicultural and multiracial competencies.
6	• Problem solving and scientific skills	- encourage critical and lateral thinking and logical reasoning, produce new ideas based on existing knowledge and skills
7	• Information management and lifelong learning skills	- manage to use ICT , evaluate information critically and responsibly, and learn how to adopt a continuous professional development approach
8	• Managerial and entrepreneurial skills	-planning and implementing effectively making judgments and decisions having vision and direction in professional development

(source: The Malaysian Qualifications Act, 2007)

It is envisaged that the MQF will facilitate the development of flexible and innovative programmes of learning to meet a range of requirements from the educational system in public and private sectors, as well as workplace training and lifelong learning experiences (Syed 2003).

2.5.5 Competence and Workplace Learning

The literature, as discussed above, has shown that there are many terms used to classify generic competences and sets of skills components. Generally, most of the skill components have been adopted by many European and ASEAN countries in both academic and vocational school systems and industries as a means to meet the occupational demands of the work place (Wu, 2003). Once the appropriate set of generic competences is agreed, appropriate training programmes, as well as teaching and learning practices can be developed to facilitate them.

In recent years, strategies for workplace learning including competence based education/training have had growing influence in many levels of education system (Hyland, 1994). Competence based approaches appear useful especially in training institutions where students have to acquire a small number of specific job-related competences (Gronczi, 1996). This concept of learning is closely related to the use of models and simulations that were used extensively in the learning process (*ibid*). According to Wu (2003), the workplace oriented curriculum is necessary with regard to the quality of career and TVE and training and could foster the ability of competent workers. However, he added that the educational objective of solely providing narrowly skilled workers soon becomes inadequate. Hyland (1994), too, in his paper titled “Outcomes, competences and NVQs in Higher Education”, has critiqued narrow competences. In line with Raggat they can be seen as being “too occupationally specific” (cited by Hyland, 1994, p. 3) as students have to spent more of their time in a specific workplace, about three or four days a week, compared to only one or two days at vocational colleges (Erlt & Sloane, 2004).

Work based learning can help improve productivity (Kunjiapu & Yasin, 2008). However it must be noted that not all students can be persuaded to engage in it, and not all skills can be developed in working environments, especially the soft (generic) skills which are the main concern in this study. Graduates from this system (work based learning) might find it difficult to transfer their specific competences to different job sectors (Hyland, 1994). Thus, even when competence development needs to be promoted in the education system, ‘it must give pride of place to the development and fostering of knowledge and understanding of a broader, more liberal and less utilitarian kind’ (*ibid*, p. 5).

Work based learning, therefore, should not replace school based learning altogether. Instead, the two should complement each other (Kunjiapu & Yasin, 2008). This is because workplace based learning is suitable to develop technical or hard skills, whereas school based learning is necessary to enhance students’ soft skills. According to Ertl & Sloane, (2004), to formulate the curricula based on training, it should be “outcome-oriented” (with a focus on the task should be able to be performed); or “input-oriented” (with a focus on the processes which should be conducted) (p. 7). They added that the curricula should provide students with opportunities to integrate their academic and work knowledge, and school based learning curricula should aim to translate the relevant knowledge and skills.

As such, the school and its pedagogical aspects are still the vital elements in any education system designed to provide the appropriate approach for the provision of high quality education, as well as training in basic skills.

The content of curriculum in TVE and training should include both technical skills and social factors to provide students with the balanced competences that can influence their future work (Wu, 2003). Providing persons with general competency is the main focus of this study, rather than the specific, narrow competence required for success in a given occupation. It is worth saying that the generic competences highlighted in this study include the ability to work with others, good communication skills, problem solving, and thinking critically, which are equally important for academic success as they are to workplace success.

The National Educational Philosophy as discussed earlier highlights the need for students who are intellectually, spiritually, emotionally and physically balanced. Generic competences are paramount to this, and they can best be developed through school based learning - which also helps students to develop their “learning/work identities, a term used by Ertl & Sloane (2004, p. 7) and to be better prepared for the work place. Educational institutions, in consequence, retain an important role in providing students with these competences. Technical or hard skills, on the other hand, can be acquired while students are involved in a workplace. Recognising this, Malaysian context, in terms of educational philosophy, is particularly important.

According to Mulder (2006) it is important to consider the different uses of the term ‘competence’ across borders. However, he concentrates mainly on the implications of competence in Europe and does not particularly consider the implications for the competence movement in East Asia. This must be remembered as an important caveat to the implementation part of the research, where I will be discussing the competence in the Malaysian system.

The following section provides a brief discussion of how generic competences are framed by learning theories, and how these can be integrated into specific educational contexts.

2.5.6 Generic Competences and Learning Theories

Generic competences need to be considered in terms of existing theories of learning. Many theorists have focused on change in the ways in which people gain knowledge or ability through the use of experience (Ramsden, cited by Smith, 1999) which is directly applicable to the idea of generic competence. It is important to understand how these theories can be used to benefit the TVE learning environment. This section, therefore, provides information about designing teaching and learning activities that will be discussed further in Appendix A. Table 2.3 summarizes four principal learning orientations. This table, therefore, summarizes a range of learning theories that can be applied in educational contexts.

As can be seen from Table 2.3, the four theories; behaviourist, cognitivist, humanist and social and situational, involve contrasting ideas as to the purpose and process of learning and education, and the role that educators may take. Cognitive theory, for example focuses on mental processing strategies that come about as an individual's learning develops with their changes in thinking, while behaviourist theory focuses on changes in behaviour and how behavioural change elicits desired outcomes. Social and situational theory focuses on interactions and relationships between people and the environment with conversation and participation being key aspects of practice.

Table 2.3: Learning Theories: Four Orientations to Learning

Aspect	Behaviourist	Cognitivist	Humanist	Social and situational
Learning theorists	John Dewey, Edward Thorndike, Ivan P. Pavlov, John B. Watson, Clark L. Hull, Edward Tolman, Frederic Skinner	Kurt Koffka, Wolfgang Kohler, Max Wertheimer Lev Vygotsky Lewin, Jean Piaget, Bruner	Maslow, Carl Rogers	Albert Bandura, Robert Gagne, Lave and Wenger, Salomon
View of the learning process	Change in behaviour	Internal mental process (including insight, information processing, memory, perception	A personal act to fulfill potential.	Interaction /observation in social contexts. Movement from the periphery to the centre of a community of practice
Focus of learning	Stimuli in external environment	Internal cognitive structuring	Affective and cognitive needs	Learning is in relationship between people and environment.
Purpose in education	Produce behavioural change in desired direction	Develop capacity and skills to learn better	Become self-actualized, autonomous	Full participation in communities of practice and utilization of resources
Educator's role	Arranges environment to elicit desired response	Structures content of learning activity	Facilitates development of the whole person	Works to establish communities of practice in which conversation and participation can occur.
Manifestations in adult learning	Behavioural objectives Competency - based education Skill development and training	Cognitive development Intelligence, learning and memory as function of age Learning how to learn	Andragogy Self-directed learning	Socialization Social participation Associationalism Conversation

(Source: Merriam and Caffarella, cited in Smith, 1999, p. 5).

Every theory has different orientations but nonetheless raises useful observations in the quest for a holistic understanding of different learning dynamics. While these theories appear to be worlds apart from each other, teachers can carefully adapt these theories to produce enriched learning in students (Hamilton and Ghatala, 1994). So whilst the behavioural model has relevance in respect of the present study as its main focus is on the change of students' behaviour and the development of competency and skill generic competences also encourage elements of cognitive or social change. The definitive characteristics of the behavioural approach identified by Mulder *et al*, (2007) are demonstration, observation and assessment of behaviour.

Competences defined from the behavioural perspective, in an employment context, are "the characteristics of a person that are related to superior performance in a job" (Mulder *et al.*, 2007, p.69) and can be applied across various situations. Burns (1995) has noted that much competency based education is based on this theory. However, cognitive orientation is equally important as Burns (1995) also observes that individuals have different needs and concerns at different periods, thus there will be a need to plan for diversity in individual cognitive capacity and interpretation. Competence, from a cognitive perspective, includes all of the mental resources that are used by individual persons to solve problem, acquire knowledge and achieve good performances, their "intelligence and intellectual abilities" (Mulder *et al.*, 2007, p.70). Correspondingly, generic competences, unlike specific, narrow competences focus on more than simply the behavioral. Generic competence is neither simply behavioural nor cognitive. Competences in this respect are acquired through learning processes that are 'more about framing an overall performance that is appropriate to a particular context' (*ibid*, p. 69) which could apply to a real work situation. This points to a need for continuous research to find new ways of adding to the gains that have already been made by behavioural learning approaches.

In summary, various theories of learning can be related to conceptions of generic competences. Unlike narrow competences, generic competences are both cognitive and behavioural. Additionally, they are contextualised by the learning and work environment.While there have been a variety of learning theories that have been put into the educational domain, there have also been a variety of teaching approaches that have been used in the teaching and learning engagement which I will discuss in the next chapter.

In reviewing these approaches, sight should not be lost of their inherent strengths and weaknesses which make it imperative for education practitioners to have a broad perspective in respect of the approaches they use in different learning situations.

2.6 CONCLUSION

If the poor often look at their children's education as the best means of escaping poverty, the development of education has to be seen as an agent of change in developing countries (Olaniyan and Omemakinde, 2008). The growing economies in Malaysia have considerably reduced poverty (UNESCO-UNEVOC, 1995). The skilled and competent workers that are produced by the education system are, arguably, the best asset to help the development of Malaysia. To expand these necessary, skilful and educated human resources, a new approach to education is required, as education is believed to lead directly to accelerated technological progress in this country (*ibid*). To meet the target as an industrial country by 2020, education in Malaysia must be designed to meet the skills required by the growing economy. As such, teaching and learning should place more emphasis on skills and competences rather than grade scores and paper certificates.

The education system in Malaysia, as has been discussed in this chapter, is centralized and coordinated by the main authority, the Ministry of Education. In this system, teachers have traditionally seen their role in terms of the dissemination of the curriculum that was set out by the Ministry. According to Ertl and Sloane (2004), when applied to TVE, this meant that many teachers have neglected the challenges of the workplace. The Malaysian education system is orientated towards credentials and didactic learning which produces narrow competences where generic competences are needed. Studies discussed in this chapter report that many employers complain that graduates from TVE programmes are not equipped with skills that suit the job tasks that they are expected to perform. Therefore it is necessary to develop teaching and learning strategies to encourage generic competences that comprise a variety of broad skills that are appropriate to changing work place contexts. In the next chapter I explore a specific approach for TVE that could be used to bring about these generic competences: the hybrid of collaborative and metacognitive approach, the HybCoMet Strategy.

CHAPTER 3

LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK OF 'HYBRIDITY'

3.1 INTRODUCTION

As discussed in Chapter 2, it has become increasingly necessary for educators to evolve teaching approaches that seek to actively address generic competences. In a contribution to this continuing debate, Yusof (2004) observed that there was a need for students to be assisted to actively acquire knowledge contained in the curriculum and also to achieve higher order cognitive processing of information that has been learnt such that it has relevance to the workplace. Other related attributes that Yusof raised as being important generic competences include communication, thinking and interpersonal skills that are all important indices of well-educated graduates. This is an expanded notion of competence that is not necessarily embedded in current Malaysian technical and vocational education (TVE) in polytechnics. This also requires new learning and teaching strategies.

In line with the need to identify new pedagogical approaches, this chapter explores the rationale for a hybrid of collaborative and metacognitive (HybCoMet) strategies, as a conceptual framework, proposed as an alternative pedagogical approach to promoting students learning in the various targeted skills. This is an example of an innovation in Malaysian TVE. The purpose of this chapter is to provide a theoretical basis for aspects of teaching and learning as teaching approaches do not operate in a vacuum but are best understood in the context of other approaches. This section explores the concept of teaching and learning, and discusses the mismatch of the pedagogical contents that have produced students who are perceived to possess inadequate competences, as highlighted by industry surveys, and establishes the need for an alternative approach.

The discussion continues through reviewing the literature on collaborative learning, which is an essential component of this approach, before proceeding to review the contextual meaning of metacognition and issues related to its application in the teaching and learning process.

This section acts as useful signposts for analysing ideas and arguments in building a conceptual framework which shows how collaborative and metacognitive approaches could complement each other to produce a hybrid teaching approach (HybCoMet Strategy) that could be used as a strategy in meeting the pedagogical deficiencies in polytechnic education provision in Malaysia. In a final section, I discuss fully the design and development of a HybCoMet Strategy, how it can be brought to classroom teaching practice, and what this entails and I review the rationale for adopting such an approach.

3.2 PEDAGOGICAL APPROACHES

Before setting out the need for a collaborative and metacognitive approach, I will foreground my discussion by reviewing literature over the years that has made major contributions to the process of teaching and learning notwithstanding the fact that some of these innovative approaches have not enjoyed the same currency in different education systems owing to problems of accessibility. A point to note nonetheless is the importance of context as a one size-fits-all approach is never able to meet the different contexts in which the curriculum is to be implemented. Thus it will be essential to nest this study in the context of learning and teaching strategies that are implemented globally and in Malaysian TVE and training, with the intention to evolve an approach which seems to work best in the country context.

3.2.1 Approaches to Learning

There are many different ways to learn, and it is useful to consider how students learn and also how to teach them in educational programs. Too often it has been assumed that provided that something is taught, it will be learnt. Such an implication ignores the variety of ways in which students learn. Students have different learning styles, and tend "to operate on perceived information in different ways" (Felder & Brent 2005, p. 58).

Learning styles have been shown to have important implications for teaching and learning as they determine, in large measure, the degree to which students understand learning tasks.

Othman and Hashim (2005) have recognized that, despite a didactic approach to teaching, Malaysian students use a range of learning styles. Amongst those models cited as having been useful in categorizing these learning styles are Kolb's Learning Styles, Dunn and Dunn Learning Style, Grasha-Riechman Learning Style and the Felder-Silverman Learning Style. Othman and Hashim have suggested that the Felder-Silverman Learning Style is most suitable for students who learn engineering and technical subjects in higher education institutions, which means, that this style could be best applied to polytechnic students as well. This style of learning divides students into five categories; sensory/intuitive, visual/auditory, inductive/deductive, active/reflective and systematic/global.

Felder (2002) raises an important observation that, to improve skill development in engineering students, instruction should be designed to meet the needs of students. In addition, Siti and Yusof, (2006), have suggested a few corresponding teaching styles to suit the need of the specific leaning styles suggested by Felder-Silverman as shown in Figure 3.1.

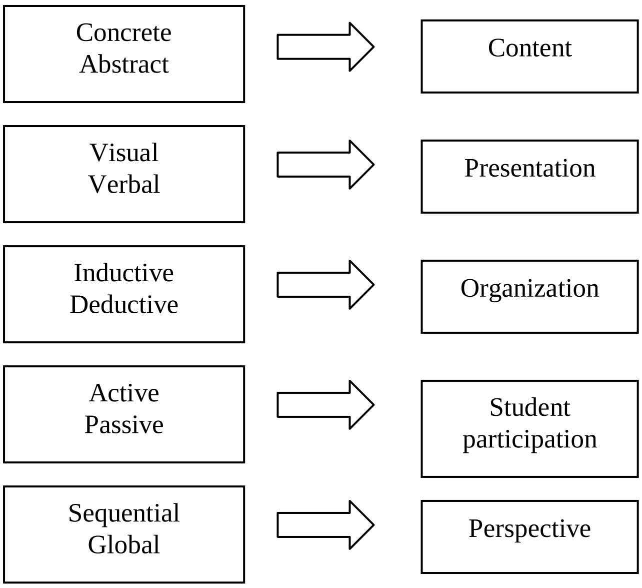

Figure 3.1: Corresponding Teaching Style (Siti and Yusof, 2006)

These corresponding teaching styles have been proposed to meet the needs of engineering students whose learning styles are often neglected by traditional pedagogies. It shows teaching and learning techniques that involve students in class activities rather than having them passively listening to lectures. It is argued that if teachers in engineering education adapt their teaching style to include the proposed dimensions, they could provide a better learning environment for most students in a class (Felder, 2002). This view has been supported by Yusof (2004) who contended that appropriate teaching styles could enhance learning and promote deeper learning among students, that these teaching styles can be applied either in a small or large class and that some of these techniques are believed to promote the acquisition of generic skills.

According to Felder and Brent (2005), one other model that has been widely applied to engineering education is Kolb's Learning Styles which claimed to have much currency in the areas of technical and engineering education. Kolb's research found that people learn in four ways with a likelihood of developing one mode of learning more than another (Smith, 2001). He found that individuals begin with their preferred style in the experiential learning cycle as shown in Figure 3.2.

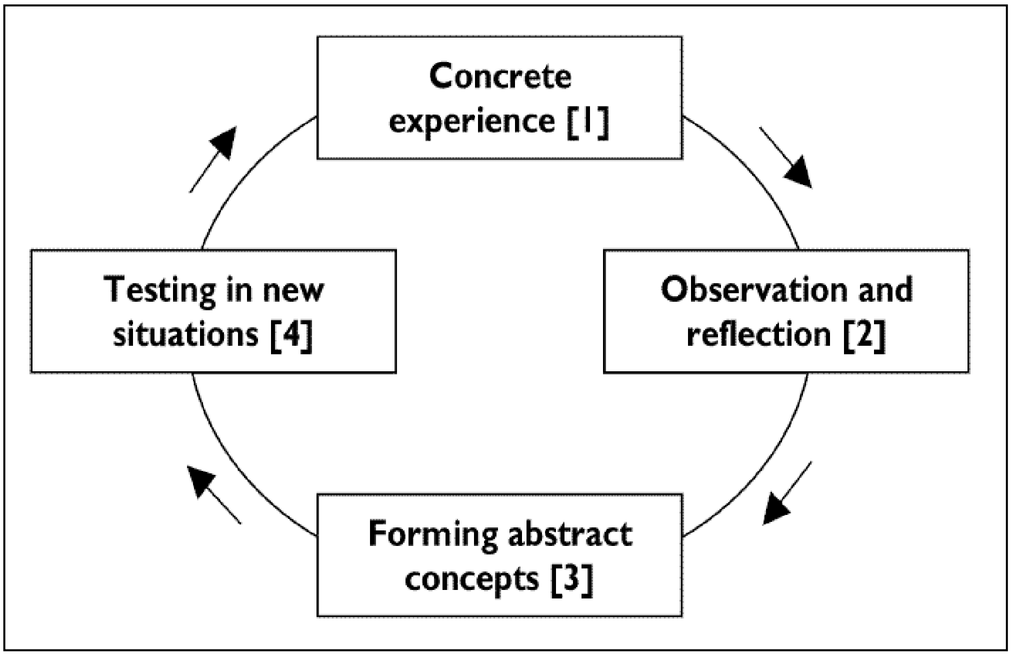

Figure 3.2: Kolb's Learning Cycle (Smith, 2001, p. 2).

The concept of the 'learning cycle' was developed by Kolb and his colleagues in 1971 and was based on a four-stage experiential learning cycle (Smith, 2001). This process describes a series of discrete mental processes which move from concrete experiences to reflective observations which in turn lead to the formation of abstract conceptualization and finally to active experimentation by testing it in a new situation (Smith 2001). Another important dimension is that the process is iterative, that there is room for movement not only in a concentric circle but also back and forth, capturing the true dynamics of human experience as human interaction is not uni-dimensional but learning is constantly being reassessed as we develop our knowledge of subject matter, skills in handling subject content and related attitudes.

Drawing upon Kolb's theory, it can be said that the 'learning cycle' can begin at any of the stages and is continuous. That is, there is no limit to the number of cycles that can be made in a given learning situation. Stated differently, this theory posits that students perceive information concretely and this information can be processed further through observation and reflection which are important attributes in learning as the students become active participants. This process is taken further as students form abstract concepts which result in testing of new situations.

The cyclical nature of the model potentially leads to growth as the new situations processed also inform concrete experience. As a whole, the benefit of the cycle is the perception that all learning is relearning that could lead to lasting learning (Smith, 2001).

Kolb's learning cycle, on the surface, is a model that could inform effective learning that can have currency in formal classrooms and TVE institutions since it makes explicit the importance of encouraging students to reflect on their learning and provides feedback to reinforce learning, and points teachers towards how to improve on the practical element of engineering courses (Healey & Jenkins, cited by Othman and Hashim, 2005). However, in reality, learning is hardly a series of discrete mental processes as highlighted by Kolb. Nonetheless, it helps in the teaching/learning situation by pointing out that learning is indeed a complex and cyclical.

In summary, various models of learning can be related to conceptions of generic competences. However, an argument to make here is whether teachers are able to provide an optimal learning environment for most students who have different styles and abilities, especially students in TVE who need to expose to unique competences that are acquired issues and challenge as experience in real life situations. It should nonetheless be proposed in the model, teachers need to sensitive to their learners, and point for more effective and active teaching that are contextualised by the learning and work environment which could help the development of generic competences.

3.2.2 Approaches to Teaching

Obviously related to learning, pedagogical or teaching approaches are of paramount importance to learning any education programme. Generally speaking, there are two broad-based approaches to teaching and these can either be transmissive or experiential (Glover and Law, 2002). Transmissive approaches are based upon a behaviourist view of the educational process and rely heavily on the teacher for social control and formal classroom management. Transmissive approaches, which are more traditional in orientation, appear to be the most dominant approach used in current Malaysian educational contexts (as discussed previously). However, where the teacher struggles with content mastery, especially in higher education, these approaches can be counter-productive as they can be based on a faulty assumption that the educator is the source of all information. In contrast, experiential approaches are based upon the constructivist view of learning by ‘experiencing’ or ‘doing’ (Glover and Law 2002, p. 80). The emphasis is on active learner engagement that comes through learner immersion in a number of activity-based learning experiences.

Teaching approaches are often related to teaching methods and teaching style. While there is a relationship between these concepts, it should be noted nonetheless that teaching approaches are not the same as teaching methods (Beverton *et al.*, 2005). A teaching method is a clear and focused classroom procedure with an underpinning rationale but the term ‘teaching approaches’ is wider and reaches beyond the classroom into the wider school context. Teaching styles, on the other hand, are more related to a teacher’s personal values and attitudes (*ibid*).

Jarvis cited by Othman and Hashim, (2005, p.113) raises useful distinctions between a teaching method and a teaching style by observing that teaching methods focus more on the 'technical process of teaching' while a teaching style considers more of the art of teaching which focuses on how teachers conduct themselves during the teaching session. The teaching approach/es in a subject will inform how a teacher makes their selection of methods and resources for teaching given the objectives related to their particular class (Beverton *et al.,* 2005). In this contextboth teaching styles and teaching methods are considered a crucial mechanism for any pedagogical approach.

3.2.3 Common Teaching Approaches in Polytechnics.

From the onset it is essential to bear in mind that each individual teacher is unique and thus there will be a need for flexibility to allow each teacher to choose the teaching style(s) that are most in keeping with their individuality. In fact, most teachers vary their styles depending on a range of factors including what they are teaching and when (Beverton *et al.,* 2005). Different teachers may employ different methods and strategies.

While there is individuality in the choice of teaching styles used, studies by Razak *et al.,* (2007) and Ibrahim (2007) suggest that teaching styles at TVE institutions are largely based on Grasha's Model. There are four styles of teaching and learning contained in this model: (1) formal authority style, (2) demonstrator style, (3) facilitator style, and (4) delegator style. Ibrahim, (2007) posits that expert and formal authority styles tend to focus more on content, with the teacher being responsible for providing and controlling the flow of content, while students are expected to receive and assimilate the content. The demonstrator style is said to place the teacher more as a role model who demonstrates acquired knowledge and skills and who also guides students on how to apply such knowledge and skills. Both formal authority and demonstrator styles are teacher-centred approaches. On the other hand, facilitator and delegator styles are student-centred approaches. Teachers who adopt a facilitator style facilitate and focus on learning activities, and they tend to allow greater control for learning by the individual or teams.

The concern for students to learn as best as they can have been an issue that has been of some concern in the Malaysian context. One of the studies which sought to enhance students' learning in Malaysia was conducted by Razak *et al.*, (2007) which had as its concern the most preferred teaching styles that were used in Malaysian polytechnics.
In the study, 175 fifth semester students from three different engineering departments were questioned about what they preferred in terms of lecturer styles that were most effective. The study established that the expert style was the most dominant among the lecturers although the students had a greater preference for the facilitator style. In another study conducted by Ibrahim (2007), a similar conclusion was reached insofar as the formal authority was the most preferred style of many lecturers at the Technical University College in Malaysia. The study also revealed that students in this institution were identified as being kinaesthetic and auditory learners as they liked to be active during the learning session rather than to sit still, watch and listen to their lecturer. The students preferred method was for lecturers to provide demonstrations, followed by group discussion and simulation. Whilst, tudents least preferred method was the lecture.

3.2.4 Traditional Teaching Methods

As stated earlier (1.6.1) a traditional teaching approach is associated with didactic methods of delivery which are teacher centered. The adoption of this approach in Malaysia occurred due to the twin drivers of modernisation / industrialisation and state formation. While the teaching fraternity has witnessed a massive revolution in the technologies used in computer-assisted teaching, often little has changed in the way students are taught (Ahmad and Abdullah, 2001). Technology may have modernised the 'chalk and talk' method to delivery modes such as overhead projectors and computer presentation but delivery styles are still very much the same. Learning is still conducted in a synchronous environment, meaning that the students must be in the same place at the same time in order to learn, an approach that emphasizes the traditional mode of instruction as the prime teaching method. For many years, the traditional lecture method was found to be the most widely used instructional strategy in classrooms, especially at school level in many countries (Harvey and Mason, 1996). Although the usefulness of other teaching strategies is being widely examined today, the traditional lecture still remains an important way to communicate information mainly in theory-laden subjects.

In higher education in Malaysia, lectures are still the predominant mode of instruction. Students resort to rote learning to commit lecture notes to their short term memories before a test, so that it can be reproduced (Ahmad and Abdullah, 2001).

Even if they are exposed and introduced to many sources of material such as reading books, internet, journals, printed notes and handouts, the retention of material is only short term. It is therefore not surprising that students can hardly recall the material covered in the previous semester and much less remember what was covered in other semesters after they graduate (*ibid*). But in many cases, even when a topic has specifically been taught many times, most students still could not answer questions in the exam paper (Yusof 2004). This scenario poses serious questions for educators because the methods in use appear not to be bringing about the desired competences in the learners. To enhance retention of material that has been learnt, the content covered must be made personally meaningful to the learners. However, the traditional lecture, if used in conjunction with active learning strategies can be an effective way to achieve instructional goals.

The advantages of the lecture approach are that it provides a way to communicate a large amount of information to many learners at the same time, maximizes instructor control and is non-threatening to students as well as to teachers (Harvey and Mason, 1996). However, the disadvantages are that lecturing minimizes feedback from students, and usually assumes an unrealistic level of student understanding and comprehension, and often disengages students from the learning process causing information to be quickly forgotten.

In Malaysian polytechnics the majority of the modules offered are theory-laden subjects. For example, the first year Civil Engineering course has six modules, and all of them are theory-laden subjects. As there are fundamental concepts to be covered, teachers give priority to covering the content rather than facilitating in-depth exploration by the students. Given this preoccupation with syllabus coverage, it is not surprising that the traditional lecture approach is seen as the most common method used in teaching situations. One drawback is that this approach to teaching tends to make students "too passive" and "unresponsive" (Motsidi *et al.*, 2009, p. 214). Being content-driven in this way, the graduates of such teaching approaches are thus seen as lacking applicable knowledge, not engaging in practical activities and without association to actuality (Ibrahim, 2007).

While traditional lectures appear to be the preferred approach by most teachers/lecturers, Tilestone (2000) highlights some of the disadvantages of this approach by making the following observation:

> *It is unrealistic to believe that students who are constantly stimulated by the multimedia world will sit for hours each day passively listening to lectures, taking notes, and preparing for a pencil-and-paper exam without dropping out mentally* (p. 13).

Therefore lectures are not necessarily the best method for producing *generic* competences. Some of the methods that can be employed to encourage creativity and promote active involvement, and generic competences, as discussed by Harvey and Mason (1996) are case methods, discussion, active learning and cooperative learning.

(a) Case Method

The case method is an instructional strategy that engages students in active discussion of issues and problems inherent in a practical application. This teaching approach has proved to be an effective way of both disseminating and integrating knowledge. It can provide students with an opportunity to apply what they learn in the classroom to real-life experiences. The advantage of this approach is that it can highlight fundamental dilemmas or critical issues and provide a format for role playing ambiguous or controversial scenarios. The case study approach works well in cooperative learning or in role playing environments to stimulate critical thinking and awareness of multiple perspectives.

(b) Discussion

On the other hand, the discussion approach engages students in a learning scenario by presenting a task that requires the students to share ideas on the task at hand. Discussions can take a variety of forms. Some teachers begin a lesson with a whole group discussion to refresh students' memories about an assigned task while other teachers find it helpful to have students' list critical points of emerging issues, or generate a set of questions stemming from the assigned task. These strategies can also be used to help students focus on a new learning task either in a large or small group.

For a successful class discussion, the teacher should make appropriate preparatory planning before the students are presented with the task for discussion (Harvey and Mason, 1996). To ensure maximum benefit is derived from the discussion, there is a need for the teacher to give very clear explanations as to what is the focus of the discussion, the points to be noted and how they are to be recorded as well as the feedback mechanisms and the time that will be taken for each discussion.

(c) Active Learning Methods

An active learning method can be described as learning environments that allows students to learn through activities such as problem solving exercise, informal small groups, simulations, cases studies, role playing and other creative techniques (Meyer and Jones, 1993). All of these activities require students to apply what they are learning. Many studies show that learning is enhanced when students become actively involved in the learning process (see Harvey and Mason, 1996; Maier and Warren, 2000; Tilestone, 2000; Yusof 2003). Tilestone, (2000) underscore the importance of determining the extent to which each learning activity engages students in their learning. A useful follow up observation made by Tilestone (2000) is that, in the 21st century, learning should indeed be less about reciting names, dates and places but should actively engage the advanced mental processes of critical thinking that require problem solving, synthesis, creativity, analysis, and evaluation. Instructional strategies that resonate with the changing times then should engage students actively in the learning process and stimulate critical thinking and a greater awareness of their learning context. Active learning often involves learning cooperatively.

(d) Cooperative Learning

Cooperative learning is a systematic pedagogical strategy that encourages small groups of students to work together for the achievement of a common goal. The term ‘collaborative learning’ is often used as a synonym for cooperative learning when, in fact, it is a separate strategy that encompasses a broader range of group interactions such as developing learning communities and stimulating student/teacher discussion (Bruffee, cited by Harvey and Mason, 1996).

Both approaches highlight the importance of teacher and student involvement in the learning process. For the achievement of a successful cooperative learning experience, there is a need to understand how to form groups, ensure positive interdependence, maintain individual accountability, resolve group conflict, develop appropriate assignments and grading criteria, and how to manage an active learning environment (Harvey and Mason, 1996).

Having reviewed the foregoing teaching strategies, it is useful to remember that these strategies are not to be taken as either/or but, rather, there are instances in which these can be employed in a complementary manner potentially resulting in a richer curriculum experience for the learners. In this study, it was of interest to me to investigate which approaches had currency in the institutions under study. I also wanted to establish the extent to which current curriculum practice either enhanced or detracted from desired learning so that the products of the curriculum matched with the desired competences. What clearly comes through from a review of the foregoing strategies is the need to carefully match teaching strategies to the teaching objectives of a particular lesson, as well as to match them to the students' learning styles.

It is also important that students' learning styles be taken into account in teaching and learning situations. Failure to engage students in creative ways can lead to the loss of "potentially excellent engineers" in society in the future (Felder, 2002, p. 674) especially when teachers employ methods that are deemed "dull and less creative" (Embi and Hwang, 2007, p. 2). As Malaysia has set itself the challenge of becoming a developed country, it becomes imperative that new responsive teaching models be considered so that existing opportunities can be enhanced in order to produce graduates who are adept at both the theory and the practice of the curriculum covered.

As I have shown in this review, several models of teaching and learning can be related to collaborative and metacognitive learning. I now turn my attention to these in more detail.

3.3 COLLABORATIVE LEARNING

'Collaboration' has been identified as one of the most important elements of learning to be introduced across the National Curriculum in Malaysia with the Ministry of Education stressing that all teachers should familiarise themselves with this strategy and should be able to employ it in their teaching (Ong, 2007). Many terms have been used to refer to this method of teaching and learning in which students group or team together to accomplish learning tasks with the most common synonyms in use in the literature being cooperative and collaborative learning.

As considered above, co-operative approaches are not as recent as collaborative, with earlier researchers such as Slavin in 1970's and Johnson and Johnson in 1980's popularising this term (*ibid*). More recently, the term collaborative has become the more preferred term being employed in the work of Gokhale (1995), Walker (1997) and Neo (2003). Panitz (1996), in particular, has raised useful distinctions between collaboration and cooperation. According to Panitz, collaborative learning speaks more to a student centred approach as students come together in groups, dealing withparticular topics in turn. This approach highlights individual group member's abilities and contributions, and the sharing of authority and acceptance of responsibility among group members for the group actions. Cooperative learning, on the other hand, is more of a teacher centred approach as the teacher exercises more direct control of the group activities. However, it also includes aspects of student-centeredness as students are given room to interact together in order to accomplish a specific goal which is usually content specific. Wiersema (2000) concurs with this, defining cooperation as a group technique to finish a certain producttogether with less effort whilst collaboration refers to the whole process of learning with teacher and students playing similar roles. According to Wiersema (2000), "collaboration is *more* than cooperation" (p. 1, my italics). From the perspective of building generic competences, the collaborative terminology is superior as it refers to a holistic perspective focusing on students' active participation from the planning stage to conclusion, throughout the learning process. The ideal collaborative approach should not be confined to classroom learning but should also go beyond the learning session.

There are various reasons why a collaborative approach is effective in building generic competences. Firstly, Gokhale (1995, p. 1) defines the collaborative approach as “a method where students from various levels work together in small groups towards a common goal being responsible for both their own learning as well as that of their colleagues”. As they work together, they are not segregated on grounds of identifiable differences such as ethnicity, religion, gender or achievement. A demonstrable strength of this approach is that inclusion, which fosters a more supportive learning environment both inside and outside the formal learning environment. This is important in terms of fostering communications between different groups of students and workers. The development of group work is crucial during the formal education phase as the majority of the job tasks in the real work situation are usually assigned as teamwork tasks.

Secondly, collaborative learning has been seen to have the added strength of being extremely valuable in respect of encouraging active student-centred learning within the classroom (Walker, 1997). It has also been seen to foster a deeper understanding of content, an increase in overall achievement in grades, improved self-esteem and higher motivation to remain on task (Walker, 1997; Neo, 2003 and Yusof, 2004). Collaborative learning is essentially different from the traditional style of education in that the students are involved in the development of their own learning experiences. Thirdly, Idrus, (1993) believed that collaboration, as a pedagogical technique, is particularly effective in that it emphasizes the collaborative educational efforts among and between the students and their lecturer. The students therefore share knowledge and information with one another and, through collaborative learning and learn *with* their lecturer, instead of from the lecturer alone. Students then begin to appreciate and experience knowledge as something to be created rather than sitting passively taking notes or listening to their teacher (*ibid*).

Collaborative learning is also effective in building specific elements of generic competence as I discuss below.

3.3.1 Collaborative Learning and Team Building Skills

Collaborative learning has been seen to be particularly strong in team building as the students will be learning in small manageable groups where students are not only encouraged to share their strengths but they are also given an opportunity to develop their weaker skills. Through this exposure, they develop their interpersonal skills and learn to deal with conflict. Working with peers has not only been seen to enhance learning but also to encourage problem solving (Maier and Warren, 2000). This may even involve the teacher who may move away from the traditional role of being the expert and sole authority to being a facilitator, guide and consultant to the students (Neo, 2003). Walker (1997) found that collaborative learning helps students to become actively and constructively involved in content mastery while the students are also encouraged to take ownership of their own learning, and to resolve group conflicts and improve teamwork skills. Interpersonal development among students can also build when they learn to relate to their peers and other learners as they work together in group enterprises. This can be especially helpful for students who have difficulty with social skills. Broadly speaking, sharing and helping patterns of behaviour are likely to occur when people are placed in a situation that requires interpersonal contact (Cowie and Rudduck, 1990). This pattern of behaviour could encourage students to work with one another and develop understanding of the group dynamics. They can benefit from structured interactions with others. Most importantly, the understanding, sharing and feelings of group cohesion could lead to the successful accomplishment of given tasks.

3.3.2 Collaborative Learning and Communication Skills

Communication skills are an essential asset when seeking employment Good communication skill is needed in work places, not only to deal with the group members, but also to deal with the top management, the employer, and also with the society from the outset (Ibrahim, 2007).

Collaborative group work is very valuable as it not only gives students ample practice in verbalising their thoughts in the public sphere but also is positive in regulating students in terms of knowing what to say and what not to say in a proper manner and also in terms of being tolerant and kind to others (Cowie and Rudduck, 1990).

Students working in small groups have been seen to feel more comfortable, safer, more open minded, and freer to express their view of point than they would when working in whole class activities (*ibid*).

3.3.3 Collaborative Learning and Critical Thinking and Problem Solving Skills.

The rapid growth of industries and advances in technology require workers who will be able to think creatively, solve problems and be competent in decision making. These requirements put an increased emphasis on group work within the workforce (Gokhale (1995). As shown above, to ensure that these skills are mastered by the work force, it becomes critical that collaborative learning be adopted as one of the principal approaches that inform the learning process in the TVE system as it will enhance the development of these skills.

Collaborative learning has a particular strength in that it encourages students to be actively involved in learning. Each member has opportunities to contribute in small groups and they are free to express themselves. Students are able to take ownership of their material and to think critically about related issues when they work as a team. This learning approach also provides more opportunities for personal feedback. Since there are more exchanges among students in small groups, students receive more personal feedback about their ideas and responses. The feedback is useful as it affords opportunities for each individual to reflect on their perceptions and understandings of the issues being discussed. This feedback is often not possible in large-group instruction, in which one or two students exchange ideas and the rest of the students listens.

Gokhale (1995), in his study, examined the effectiveness of individual learning versus collaborative learning in enhancing drill and practice and critical thinking skills. The results of the study found that most of the participants in his study felt that collaborative learning helped them to better understand the learning material. Related to this, Neo (2003), in his study on the creation of a collaborative learning environment in an undergraduate class at one university in Malaysia, found that collaborative learning not only enabled students to learn to think creatively but also enhanced the organization of the project more efficiently with ample space being given to solve presenting problems.

Siti and Yusof's (2006) study focused on how the integration of collaborative learning with a Problem Based Learning (PBL) approach could help students to improve their achievement in learning an engineering subject. This study was carried out against a background of problems that the students had in mastering the core concepts in engineering which had resulted in most of them having poor results in examinations. Results showed that the complementary use of collaborative learning and PBL helped to improve students' achievement better than the conventional method. Lee (2000) found that students who learn in a group achieve more than when they learnt as individuals. Bruner (cited in Gokhale, 1995, p. 6) contends that collaborative learning methods improve problem solving because students "are confronted with different interpretations of the given situation". Collaboration with the support of group members has also been seen to enhance students' critical thinking skills and to convert them into "tools for intellectual functioning" (*ibid*).

3.3.4 Potential and Limitation of Collaborative Learning.

Despite the enormous advantages collaborative learning approaches bring to the development of generic competences, there are a number of drawbacks that may prevent these approaches from becoming the panacea that education practitioners might desire.

One of these drawbacks is that beneficial, collaborative learning situations are not easy to set up. In many situations, particularly those in which people must work together on a problem, conflicts can arise and these can prevent the types of learning theorised in collaborative learning. However, according to Cowie and Rudduck (1990), the process of disagreeing and conflict resolution can, ironically, provide positive outcomes to students. It is positive in that it gives students an opportunity to deal with the presenting problem and also find practical ways of solving it. The resolution of the problems is, effectively, a microcosm of the problems that they will face in the world of work. Cowie and Rudduck perceive the resolution of problems in a positive light as it gives students an opportunity to 'rehearse' problem solving skills while also learning to work together with others, tolerating difference and responding to conflict creatively.

While there is much demonstrable merit in groups working together, as discussed above, there have been reservations raised against the use of small groups in teaching with the main criticism being that the use of small groups may be an avoidance of teaching on the teacher's part, as the teacher ends up escaping responsibility.

There may even be the avoidance of learning as the learner may depend upon others in the group. Randall (1999) considers one weakness is that by making members of the group responsible for each other's learning, too great a burden is placed on some of the students. In mixed-ability groups, the result is often that stronger students are left to teach weaker students and to do most of the work. However, Wiersema (2000) does not agree with the above criticism and argues that the teacher's load is not lessened as critics argue. Cowie and Rudduck (1990) have a different opinion to Randall and argue that collaborative learning is ideal in that it removes a hierarchal structure among higher and lower academic achievers.

Another criticism raised is the claim that collaborative learning encourages only lower-level thinking while ignoring the strategies necessary for the inclusion of critical or higher-level thought. It is also argued that, in small groups, there is sometimes only enough time to focus on the task at its most basic level. However, Neo (1995) in his study has revealed that collaboration indeed helps to develop critical thinking through discussion, clarification of ideas, and evaluation of others' ideas.

One other drawback that was identified by Randall (1999) is that mixing of students is a source of potential difficulties with the overuse of collaborative groups working to the detriment of students who benefit more from learning alone. However, to circumvent these problems, teachers are recommended to negotiate more with students to determine how they learn best and apply these ideas to the way that the teacher structures class learning.

All these cited weaknesses, then, are issues more concerned with the design of collaborative learning to ensure that maximum benefit is derived from the learning exercise rather than a critique of the approach as a whole. Randall (1999, p.5) makes a very useful contribution to the debate by proposing a number of recommendations that need to be taken on board to make collaborative learning most beneficial as summarised follow ;

1. make certain to identify clear questions at the outset and to show how these questions relate to students' interests,abilities and the teaching goals;
2. determine small-group conflicts as soon as they arise and showing students how to prevent trouble in future;
3. create a specific instruction at the beginning of any assignment and using these for guiding the learning process and for assessing final work;
4. help students to reflect on their learning progress on a regular basis;
5. expect students to become excellent and letting them know that you believe in them and their ability to produce excellent work.

Furthermore, Neo (1995) argues for three related considerations that will need to be borne in mind namely: (1) students need to feel safe, but also challenged; (2) groups need to be small enough that everyone can contribute; and (3) the task students' work together on must be clearly defined.

From the literature discussed above, collaborative learning, when properly planned, has great potential in the development of critical thinking through discussion, clarification of ideas, and the evaluation of others' ideas.

3.3.5 Combining Collaborative Learning with other Approaches

A point worth emphasising is that no single approach, even collaborative learning, can lay claim to being the ultimate approach to creating generic competences but rather approaches which reflect different aspects of the learning dynamic can be used together to produce valuable learning outcomes. While the collaborative learning approach has much to contribute to effective teaching and learning, a number of researchers have sought to consider other approaches that could be used in a complementary manner with collaborative learning (Neo, 2003; Idrus, 1993; Siti and Yusof, 2006; and Yusof, 2004). Neo incorporated technology into the collaborative learning environment to further promote problem solving and critical thinking while Idrus also used similar approaches. Meanwhile Siti and Yusof (2006) and Yusof (2004) combine collaborative approaches into their problem based learning (PBL) processes. A point tacitly acknowledged in the above cited works is that collaborative learning alone cannot transform the learning experience to make it accomplish all desired objectives.

In particular, the *cognitive* processes that can underpin effective collaboration need to be focused upon in greater depth as these might not be apparent just by seeing a team working in the same environment. Dillenbouag (2003) and Cowie and Rudduck (1990) consider that cognitive processes are somewhat neglected in collaborative learning. Furthermore, these approaches do not consider metacognitive processes that enable individuals to consider cognition in a wider, generic, context. Thus, an alternative way of approaching collaborative learning would be to provide individual students with tools for self regulating and monitoring. Specifically, those tools that consider the evolution of metacognitive strategies which can steer group work in the desired direction.

3.4 METACOGNITIVE STRATEGIES

The study of metacognition is generally attributed to John Flavell. The term metacognition as proposed by Flavell (1979) is used to refer to the awareness, monitoring, and regulating of one’s cognitive processes. In earlier decades (e.g. the 1940s), the study of the mental activities of the learner were mainly limited to observable behaviours with behaviourism as the main theoretical orientation informing most discourse on learning. However, the 1950s saw the growing influence of cognitive-oriented approaches with the work of Piaget in the 1960s beingmost seminal as he studied maturation as it affected cognitive development (for further discussion on this point see Haller, Child and Walberg, 1988). The first serious discussion and analysis of metacognition on mental operations emerged during the middle and late 1970s. The term metacognition itself consists primarily of an understanding of the ways different factors act and interact to affect the course and outcome of cognitive enterprises (Flavell, 1979). In Malaysia, the emphasis on cognition and metacognition can be traced back to the late 1980s with emphases on critical and creative thinking which were supposed to be hallmarks of secondary education provision at the time (Subramaniam, 2009). As part of daily curriculum practice, students were expected to “analyse, synthesise, explain, draw conclusions, and produce innovative and creative ideas’ (*ibid*, p.1).

Ponnusamy (2006), while appreciative of the positive contribution that could be realized from the encouragement of active thinking as part of teaching and learning in the classroom, nonetheless concedes that in *practice*, little attention has been given to the use of metacognitive strategies in the teaching and learning process in Malaysia.

Metacognition is an important concept in cognitive theory. It is about self-reflection, self-responsibility and initiative, as well as goal setting and time management. A growing body of literature has distinguished between the cognitive and metacognitive functions. Forrest-Pressley and Waller (1985) defined cognition as referring to the actual thinking processes and strategies that are used by the learner while metacognition has been seen as a construct that refers to what a person knows about his or her cognition, and to the ability to control cognitions.

Elsewhere, Mulder (2006) has reported that cognitive strategies help a person to process and manipulate information, whilst metacognitive strategies deal with higher level thinking which is used when planning, monitoring and evaluating learning. Stated differently, the term 'meta' itself connotes a more expansive coverage of inherent cognitive processes thus cognition/cognitive processes are subsumed in metacognition.

Flavell (1979) gives further light on what metacognition denotes by defining metacognitive processes in an individual as one's knowledge concerning one's own cognitive processes and awareness of a learning problem that one is self-reflectively involved in through the processes of planning, monitoring and evaluation of a specific problem solution. In a similar vein Mevarech and Kapa (1996) perceived metacognition as a mental operation, which directs the cognitive functions of a person and supports a learning conceptualisation. Ponnusamy (2006) underscored the importance of understanding the difference between cognition and metacognition in the quest for a holistic understanding of how learning can be enhanced. Chris Mathe (2002, p. 1) summed up the core tenets of metacognition succinctly with, "metacognition is thinking about thinking". Effective teaching, especially for students in polytechnics, will be only effective to the extent that it helps students to become reflective of their own learning and thus equipping them with 'an academic tool box', indeed a cognitive tool box, to find solutions to learning problems as they arise. Metacognition can be also summarised as monitoring, making changes and adapting strategies to solve problems.

Research by Flavell (1979) made a very strong case for the importance of metacognitive strategies in terms of generic competences as they were seen to play important roles in the dual processes of self-control and self-instruction particularly in oral conversation, problem-solving and cognition. Interest in the potential for metacognitive strategies in enhancing learning has been reflected in a number of broad areas of educational research. These include core skills in terms of studies of literacy and numeracy (see Mayer, 1998; Goh, 1997) and in terms of solving mathematical problems (see Kapa, 2001; Mohamed and Nai, 2005; Ho and Devadas, 2006). More recently, the prospect of metacognitive strategies has been widely advocated in a variety of other curriculum areas.

Ponnusamy (2006) for example, strongly advocated the use of metacognitive strategies in History, while Phelps, Graham and Kerr, (2004) focused emphasis on metacognition as a directive approaches to ICT learning within the context of rapid technological change. There appears, however, to be little literature on the use of metacognitive strategies in the teaching of technical subjects. In appraising the potential for metacognition in the present study, I will preface the discussion by reviewing the central tenets of metacognition. The potential that it has for application to the teaching and learning of engineering subjects in polytechnics will also be appraised.

3.4.1 Core Concepts of Metacognition

In an attempt to understand the importance of metacognition, a number of ideas and theories have been proffered. Flavell (1979), who as has been referred to, was one of the early contributors to metacognition, posited that metacognitive strategies essentially comprise three processes which are: awareness (consciousness), monitoring (controlling) and regulating (reflection or evaluation). In a subsequent contribution Haller *et al*., (1988) echo this position. Other more recent contributions (see Education.Calumet. Purdue, no date) perceive metacognition as comprising three principal processes (slightly different in phraseology from Flavell’s postulates) which are: meta-memory (awareness), meta-comprehension (monitoring), and self-regulation. In essence, metacognition can be perceived as having three main processes namely, awareness, monitoring and regulating functions to aid understanding.

According to Haller *et al*., (1988), awareness, monitoring and regulating could improve with maturation and instruction. A key component in metacognition is the initiation or control of future processing. One useful characterization of metacognition was developed by Nelson and Narens (1990), as illustrated in Figure 3.3.

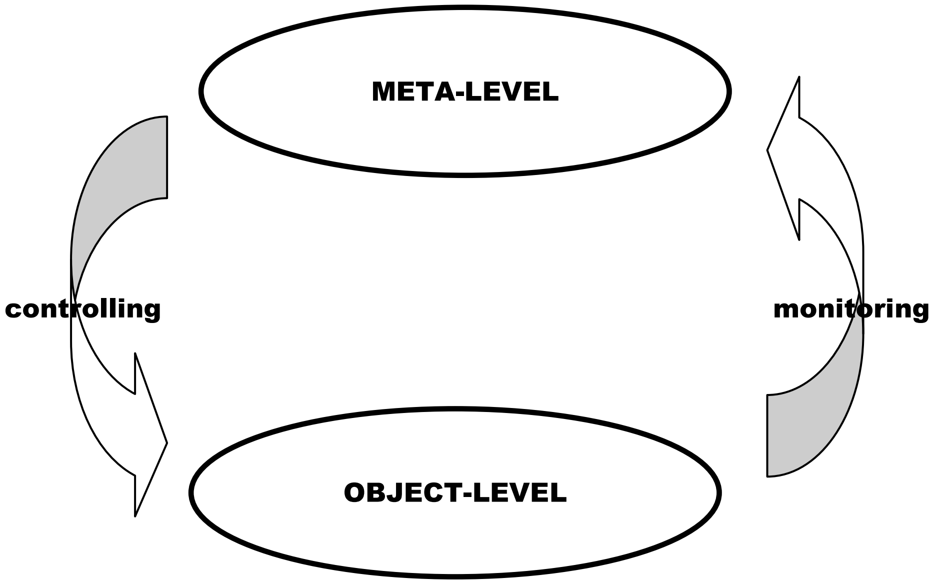

Figure 3.3: Two System View of Metacognition (adapted from Nelson and Narens, 1990, p.126)

In the model in Figure 3.3, metacognition is viewed as the interplay between an object-level system and a meta-level system. Object-level systems are representations of mental action such as knowledge-based information (semantic) memory. Metacognition is served by a meta-level system that monitors information processing at the object-level and, based on this monitoring, controls information processing. Metacognition is perceived as the dynamic interaction between object-level and meta-level information flow (Mazzoni, 1998). In this way, metacognition can be construed as a supervisory system that enables top down control of information processing. Interestingly, the two-level model of metacognition proposed by Nelson and Narens (1990) assumes active agency in the learning process with understanding underpinning all learning if it is to be effective. This model could be useful to gain understanding and conceptualise the components of metacognitive strategies which could be applied in learning process, and also the role of consciousness and the restructuring of memory while solving a problem.

3.4.2 Metacognitive Strategies for Successful Learning: Evidence from Literature

There is substantial evidence that metacognitive strategies can help in developing the wider skills of students in terms of problem solving skills. Problem solving is a complex process which involves intense cognitive operation. Recent evidence suggests that metacognitive strategies help improve students' ability in solving problems (Haller *et al.,* 1988; Mayer, 1998; Kapa, 2001; Ponnusamy, 2006). Mayer (1998) has used the term 'metaskill' to refer to the ability to solve a problem through the application of metacognition. Ponnusamy (2006) investigated the impact of metacognitive strategies among low achievers in History. He divided students into three groups who used different strategies in their learning. One group used metacognitive and problem solving strategies while the second used metacognitive strategy. The third used traditional strategies. The findings revealed that metacognitive and problem solving strategies helped students to perform better in learning tasks compared to the other two strategies. This approach had a significant impact on students' achievement as they attained higher metacognitive knowledge and could engage in higher thinking levels.

The role of metacognition in problem solving was also explored by Kapa (2001) whose study involved eighth grade students of differing abilities. The study found that metacognition helped students with low level knowledge to improve their ability to solve problems correctly but its impact on higher achievers was not that pronounced. In fact the literature on metacognitive strategies appears to have mixed messages in regards to its potency across skill levels. Some writers like Haller *et al.,* (1988) concede that although metacognition does help across all age groups, it appears to have a particular impact with lower grade levels. Local studies (in Malaysia) have, however, tended to focus on higher grade levels of students. For example Mohamed and Nai (2005) investigate the use of metacognitive process in learning mathematics that involved form four students from a secondary school. However, this might not be sufficient ground on which to base a thesis concerning more able students as the testing instruments may not have had sufficient discriminative capacity.

Additionally, we should not judge metacognitive strategies by learning outcomes alone. Mayer (1998, p.50) argued that to focus solely on teaching problem solving and metacognitive functions is incomplete as "it ignores the problem solver's feelings and interest in the problem."

Thus, despite the fact that there may be problems with using metagcognitive strategies with low ability learners in secondary schools, it may work well with tertiary learners who have a greater investment in developing problem solving skills in the workplace. For example, Ho and Devadas (2006) conducted a study on motivation and metacognitive learning strategies which focused on undergraduates in a tertiary institution in Malaysia as they learnt the English language. In this study it was shown that metacognition can work well with older students which could help students' problem solving in polytechnics.

In these studies, students used different metacognitive strategies to learn different subjects by learning from their mistakes, finding ways to be better learners and setting long-term goals to improve their learning performance. The benefits of metacognitive teaching approaches are therefore in terms of transferability. They lie in their potential to transfer responsibility for monitoring learning from teachers to students, and in promoting positive self-perceptions, affect and motivation among students (Phelps, Graham and Kerr, 2004).

As a teaching approach, metacognition has a number of inherent advantages which could greatly enhance teaching and learning. Some of its obvious advantages, such as the ability to transfer the responsibility of monitoring learning from the teacher to the student, are well chronicled by Phelps, Graham and Kerr, (2004). Other advantages lie in the promotion of self-esteem and self-efficacy as students take control of their own learning. As students take more responsibility for their own learning, there is the possibility of the development of more lasting learning states in the students which could benefit the students in their future working life.

While metacognitive teaching approaches have their inherent strengths in terms of actively engaging the learner's mental faculties in the learning process, they nonetheless have weaknesses in that, when used alone, they have not been able to produce as much transfer in learning as would be expected (Cummins *et al.,* 2005).

It thus becomes essential that useful metacognitive approaches to learning need to be supplemented and complemented by equally useful learning approaches like collaborative learning which could produce a platform through which individual metacognitive processes could be given full expression.

A further observation concerning the role of other methods that can promote full and active student engagement was made by Haller *et al.*, (1988, p. 8):

> "*that the more instructional features involved, the more effective the results. Since students may respond differently to different instructional features, the more varied the approach, the more students may positively affected*"

This indicates that metacognitive functions (awareness, monitoring and regulating) can be greatly enhanced with the support of a variety of instructional modes.

The approach that is thus proposed in this study is one which engages both metacognitive and collaborative teaching approaches in a mutually enriching model which I propose as a hybrid of these two approaches.

3.5 A HYBRID CONCEPTUAL FRAMEWORK: BRINGING TOGETHER COLLABORATIVE AND METACOGNITIVE STRATEGIES

As discussed above, collaborative and metacognitive strategies are useful in enhancing the wider skills (generic competences) of students but each has drawbacks. This section explore the potential benefit that could be offered by a hybrid or mixed mode strategies of teaching and learning in engineering subjects at polytechnic level. Many researchers have used the term"hybrid" in their studies to refer to the combination or integration of methods and methodologies or techniques and strategies to teaching and learning.

The majority of researchers writing on hybrid learning have studied the ways to integrate hybrid system in science and technology. Deniman *et al.*, (2004), for example, conducted research on a hybrid educational resource discovery system, which combines metadata and content-based retrieval methods. This hybrid system was implemented and evaluated in the context of the Digital Library for Earth System Education. Meiszner and Moustaka (2008) also conducted research in a similar area, a hybrid approach to computer science education. They call this a hybrid approach as it uses a combination of open learning environments (inviting in) and open source projects (sending out). The hybrid approach in their study is to provide the foundation required for an evolutionary growing learning ecosystem.

The combination of digital and analog systems as a hybrid system is another innovation designed by Levin and Levin (2002). In a similar vein Rocha *et al.*, (2004) used a hybrid approach for searching the semantic web. It could be noted here that all the studies above use systems or software that provide learning technologies as the components of their hybrid system. Other researchers use hybrid learning to refer to the integration of less technologically advanced techniques. For example, Black (2001) used hybrid methods in a combination of face to face (traditional) classroom strategy and online learning in order to improve students' level of computer experience. The same components have been used by Young (2002) and Johnson (2002) in their hybrid methods.

The hybrid of collaborative and metacognitive (HybCoMet) strategies has been proposed in this study to enhance the acquisition of generic competences of students learning engineering subjects in Malaysian polytechnics, with the ultimate aim of providing the country with knowledgeable and competent workers as discussed in chapter 2. This method is proposed as an alternative pedagogical approach to the traditional approaches and is intended to help students to learn in a meaningful way, by facilitating the assimilation of their knowledge and competences prior to transferring it into a real world situation.

3.5.1 Justification for Proposing a Hybrid of Collaborative and Metacognitive (HybCoMet) Strategy

An overt reliance on cognition in learning means that students do not necessarily know how to integrate their skills in the real world of work or know how to develop wider, generic competences. For this reason, collaboration and metacognition are integrated to encourage students to engage in active learning with metacognitive reflection on the learning process.

The aim is to help students to enhance their higher levels of cognitive thinking while working as a group and also to make it possible for the students to internalize external knowledge, problem solving and critical thinking skills and to convert them into tools for intellectual functioning (McMurray and Dunlop, 1999), which therefore could help students to improve their attitudes and generic competences in learning engineering subjects.

The integration could encourage meaningful learning as it creates new knowledge and skills. At the same time the integration of a metacognitive strategy may reinforce the importance of peer interaction for cognitive development. Students should become aware of their thinking through peer interaction about the lesson, and then regulate their cognitive processes to accomplish the shared goal. Gradually, through the HybCoMet learning process, students could develop understanding and improve their competence levels and attitudes. As the HybCoMet learning environment is progressing, it provides a potential platform for the knowledge learnt and the skills experienced to be transferred to other contexts of learning. The learning has the potential to become more meaningful and lasting through personal active engagement. This approach expects the students to become active participants in their learning and promotes the acquisition of generic competence as a result of their activities and engagement. This strategy may offer students' opportunities to learn valuable attitudes enhance knowledge and develop important skills that will prepare them for the work place (employment). This concept is shown diagrammatically in Figure 3.4.

The hybrid of collaborative and metacoginitive (HybCoMet) Strategy has been designed as an alternative approach to improving students learning because the hybrid method, it is believed, can help decrease the variability in finding relevant resources, providing a more consistent and predictable user experience (Deniman *et al.*, 2004). Deniman *et al.,* (2004) also suggested that the hybrid system decreased the variability in the number if users' actions required in locating learning resources. Young (2002) in his survey found that hybrid model can be 'superior' to the traditional approaches as it engages students' attention and fits their lifestyles. Meiszner and Moustaka (2008), in their conclusions, wrote that one of the advantages of the hybrid system is that "we can respond relatively flexibly to identified students needs" (p. 8) and further support is provided by Young (2002) in that mixed mode approaches help to meet students' learning needs.

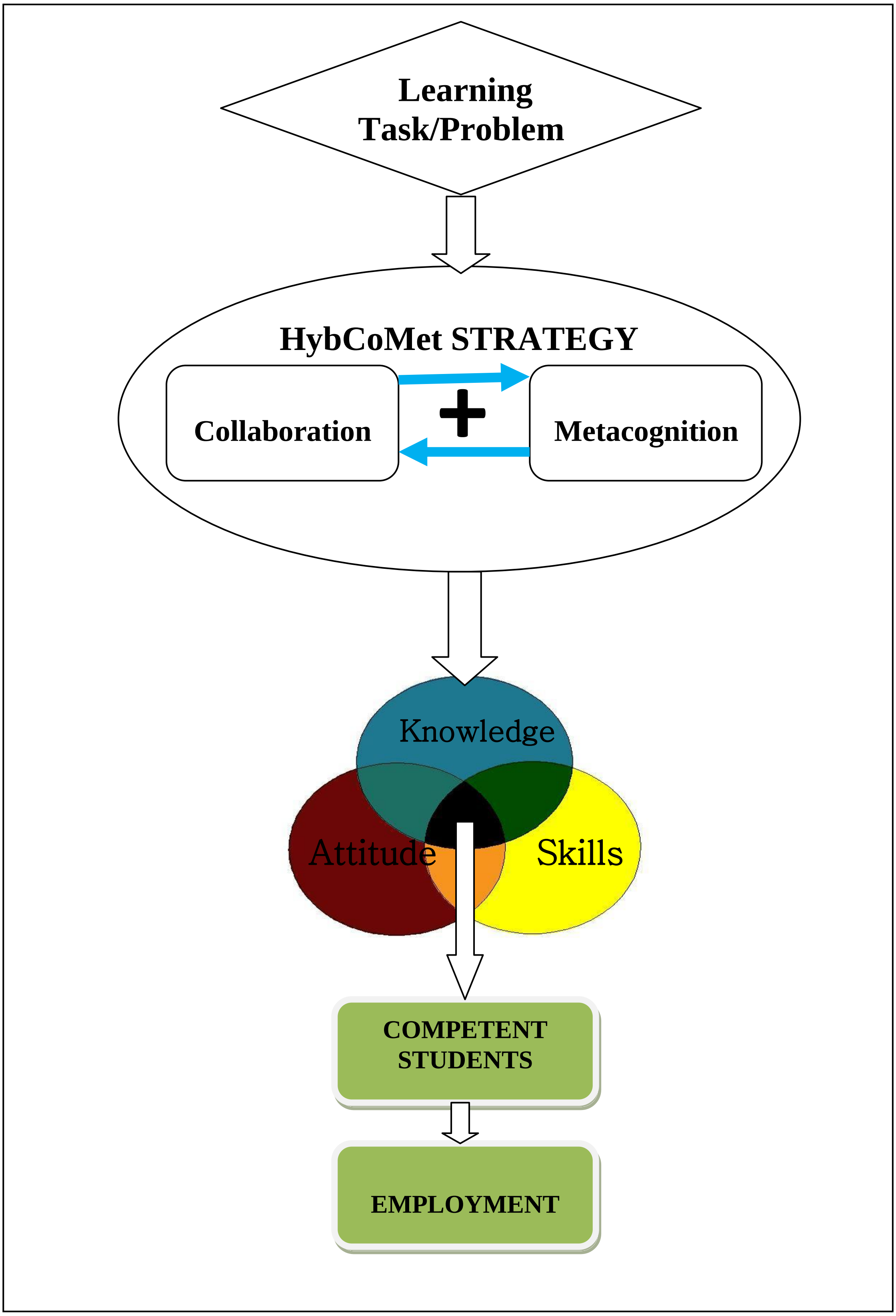

Figure 3.4: Concept for the Implementation of the HybCoMet Strategy

In hybrid learning techniques, learning takes place in a meaningful, authentic context and in a social, collaborative way. The class is set in a way which emphasizes students involvement and group participation, which make students less dependent on the teacher and they will start to learn how to learn independently (Deniman *et al.*, 2004). Johnson, (2002, p. 5), considers that "the hybrid learning format was something which significantly increased accessibility, effectiveness and connectivity".

3.6 THE DEVELOPMENT OF THE HybCoMet STRATEGY.

The HybCoMet Strategy employed here is intended to promote teaching and learning strategies that should motivate students and which may enhance their understanding in learning. The HybCoMet Strategy is developed as a new Technical and Vocational Education innovation that will guide teachers in delivering the learning content in a more systematic manner in an engineering subject. The HybCoMet Strategy for teaching and learning involves key activities which occur during the design, development, implementation and evaluation of the related course modules. These activities are summarized in this sub topic and explained in detail in Appendix A - The Hybrid Intervention Instrument: Designing and Developing a Hybrid Instructional Module.

The complete information on how to conduct and deliver lessons using the hybrid strategy was written and compiled in one booklet entitled "**A Hybrid Approach Using the Collaborative and Metacognitive (HybCoMet) Strategy: An Instructional Module for Polytechnic Lecturers".** The strategy was intended to help students to learn in a meaningful way, by facilitating the assimilation of their knowledge prior to transfer into real-world situations.

In designing the HybCoMet instructional module, I have drawn on the existing literature to review and adapt techniques that have been time and classroom tested. The main literature which contributed to this is Barkley *et al.*, (2005), who authored the handbook for Collaborative Learning Techniques (COLTs), and Wee, (2004) who provided sources for developing teaching and learning activities for the HybCoMet Strategy.

However, the design of all the activities was based on my own teaching experience and with reference to teacher's teaching planning in polytechnics. All of these sources have been integrated to produce a unique approach to teaching in the HybCoMet Strategy.

The purpose of developing the instructional module of the HybCoMet Strategy was to provide a foundation for using the strategy as a new pedagogical approach and to provide practical guidelines for designing a hybrid classroom. It was organized to make it possible for the module to be used as a practical reference for lecturers and other interested parties. It was also intended to encourage teachers to move away from the current teaching approach whereby students are 'fed' facts and information as claimed by Wee, (2004). This module was designed for teachers with the intention of: (i) exploring collaborative learning activities;(ii) creating more active and challenging classroom activities;(iii) encouraging students in the development of critical thinking skills; (iv)supporting students in the development of good communication skills and self esteem; (v)helping students to be able to recall and apply their knowledge in the 'real world'; and (vi) preparing students for action – to get their brain into gear and move their body (to be mentally and physically active) (Yusof, 2010).

Introducing the HybCoMet Strategy allows teachers to experience a new role, as a facilitator who provides support and assistance when necessary. In this regard, students could have greater room for self-reflection when performing learning tasks which could lead to greater motivation as they will be taking a more active part in the learning process. Students are geared toward becoming more self critical about their learning which could lead to greater self monitoring and self evaluation.

To help teachers to apply this strategy effectively, the teaching module was designed with three main sections: an introductory section in 'From Me, To You, and For Us'; a subsequent section "Get Ready to Start"; and a third section which employs step by step coverage of the learning tasks and is entitled "Let's Start!!!!" (Yusof, 2010). The three main sections, and constituent components, are summarised in Figure 3.5.

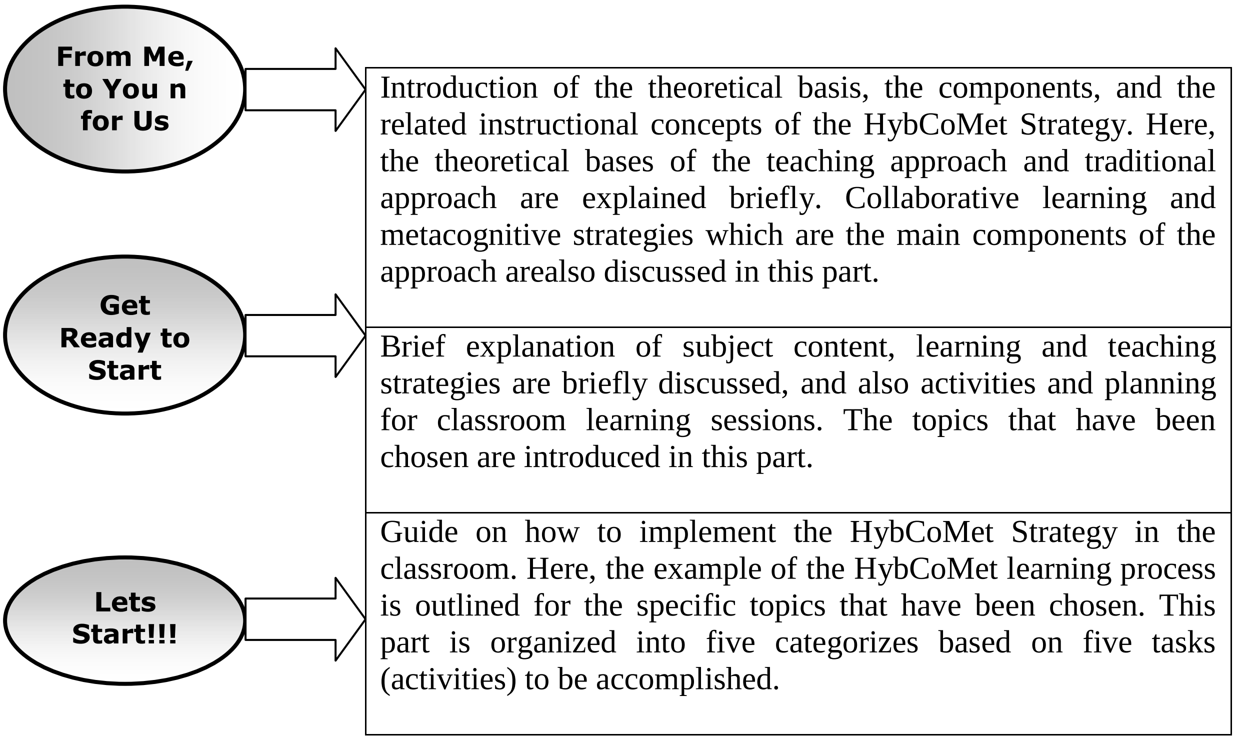

Figure 3.5: Structures of the HybCoMet Instructional Module

The step by step instruction is intended to make each strategy clear and comprehensive in order that teachers who are new to the HybCoMet strategy may follow the instructions precisely and achieve success in the implementation and engage students actively in hybrid learning.

3.6.1 Towards the Development of HybCoMet Strategy Instructional Module.

In the process of developing a module for the HybCoMet Strategy, several core aspects highlighted by Barkley *et al.*, (2005) and Kagan, (1994) were taken into account. The first thing considered was the purpose of the development of this teaching innovation. The strategy should aim to achieve the expected outcomes as highlighted in earlier chapters. Thus, illuminatory activities were designed with the intention of promoting students' learning process and helping to enhance competence, skills and attitudes. Each activity included in the module was intended to clearly define and carefully explain to the teachers and readers how to achieve the identified learning goals. It is necessary to highlight those teaching materials and methods that can be employed to achieve the desired learning states.

Basically, the instructional module is constructed based on the selection of topics from the polytechnic curriculum. The subject that has been chosen is the Concrete Technology, which is offered to First Semester Students in the Civil Engineering Course, focusing on Topic 3- A Concrete Mix. Five learning tasks have been designed to cover this topic using the HybCoMet Strategy. All the tasks attempt to accomplish the expected objectives of this topic as stated by the curriculum of polytechnics. Several aspects have been taken into account in the process of developing the HybCoMet instructional module; group size, purpose of each activity, expected outcomes, time and duration of the activity, and how to evaluate and assess students' performance as an individual and also as a group (Barkley et.al, 2005; Kagan, 1994). All of these aspects are important considerations prior to the implementation of the module. Consideration of how students can analyze and reflect on what they have learned and to determine strengths and weakness of the new teaching strategies were highlighted as well. For more specific guidance, I have referred to the ADDIE instructional model to help with planning and designing a desirable teaching approach.

The acronym of the ADDIE instructional model stands for the following: A = Analysis; D = Design; D = Develop; I = Implement; and E= Evaluation. This model is a generic, systematic approach to designing an instructional module, which provides a framework that should ensure that the module is as effective and efficient as possible (College Station, 2001). The detailed explanation on how this model can be a useful guide in planning and designing the HybCoMet Strategy may be found in Appendix A, Section 2.1.

Five activities have been designed to transfer the specific skills and knowledge required for the purpose of developing competent students. These activities attempt to promote the development of generic skills: communication, problem solving, critical thinking and team building skills. A well planned teaching approach would help students to learn at the higher levels where they can analyse, synthesize and evaluate, whereas learning with common textbook problems provides opportunities for the use of the lowest level of ability which emphasizes mere memorisation (Wee, 2004). Accordingly, activities in the hybrid approach are designed taking into account Bloom's hierarchical order of cognitive functioning and they are intentionally designed to give students ample practice for cognitive engagement at the different levels.

The sequence of each activity is designed according to the level of thinking abilities as required by Bloom's cognitive levels. The first task is at the lowest level of thinking (knowledge and comprehension), and then tasks follow which use the highest order thinking level (analysis, synthesis and evaluation) (Glover and Law, 2002).

Accordingly, five learning activities (tasks) were designed in the instructional module giving an example of the core processes that HybCoMet Strategy entails. Each task is identified by a simple description that gives a hint as to the purpose of the activity, and is clearly set forth and the purpose of the activity is also explained. All activities are explained in detail to help teachers deliver the tasks with confidence and increase the prospect of success by the end of the day/learning session. Figure 3.6 gives a summary of the 5 tasks and the structure of the module.

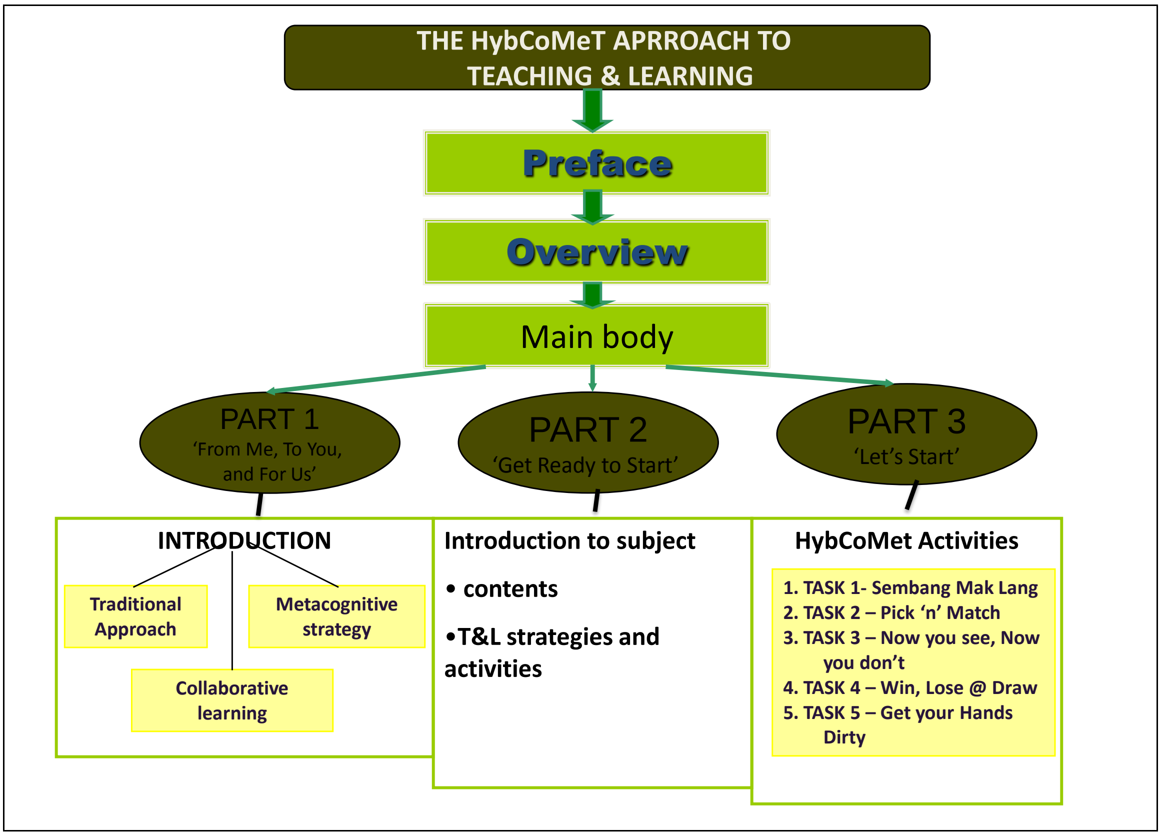

Figure 3.6: HybCoMet Learning Tasks (activities).

Complete information on the tasks is provided in section 4.0, in Appendix A.

The module also contains a preface, a list of diagrams and tables, a section of references and an appendix. The explanation in every part is written simply using daily conversational language so that a lay person can easily understand and then adapt the concepts to their teaching practices. Furthermore, the target audience are teachers and lecturers in Malaysia, where English has become a second language. The teaching module has been organized to make it possible for the module to be used as a practical reference for lecturers (Yusof, 2010).

After the initial development, this module was evaluated by experts, in the pilot phase, before it could be employed by the teachers and users. This is to affirm the face validity and the content validity of the module. The content validity looks at the content whether it is representative of the syllabus, learning objectives and the skills that it is supposed to measure (Alias, 2005). Whilst, the face validity refers to the aesthetic value of its appearance (*ibid*), and the structure of the module. The experts whose views were sought were lecturers from polytechnics and universities who were experienced in teaching the focus subject. The teaching module was then refined and corrected based on comments and suggestions given by the experts. After that, the teaching module was distributed to the teacher who was participant in the study, with sufficient time being given for this teacher to become familiar with the module and the objectives in terms of learning states that it sought to achieve. At the implementation stage, the views of the students will also be valued, of course, as they can lead to qualitative improvement of the module.

The instructional module for the HybCoMet Strategy should provide lecturers and users with a simple and flexible method that can be applied to a variety of disciplines and may help to achieve learning goals. All activities were designed in such a manner that requires users to be engaged in it actively and enables them to experience being an active learner. This experience might help lecturers and users to encourage their students to engage in the same way.

3.6.2 The Potential Beneficial and Limitation of the HybCoMet Strategy.

The major feature of the HybCoMet Strategy lies in its ability to create a new learning environment in which students not only learn to learn (metacognitively), but also learn to teach each other (collaboratively), moving away from a didactic teaching approach. In the HybCoMet classroom, students are faced with the challenge of being a ‘director’ in their own learning while the teacher should play the ‘producer’ of the scene that has been created. Introducing the HybCoMet strategy may allow teachers to experience a new role, as a facilitator who provides support and assistance when necessary. The strategy could be beneficial for teachers preparing a lesson and could be more effective at pointing teachers toward individual learning objectives. Therefore, it is expected that students could take control of the learning process and become more motivated and responsible for their own learning, which will then prepare them for their future life and employment.

The interactive HybCoMet teaching strategy will expose students to metacognitive strategies, and students will receive the benefit of collaborative group work which could foster to the development of competence skills. The HybCoMet learning experience could empower critical thinking and problem solving skills in a communicative group learning environment. This could develop a sense of self confidence and independence in students, and thus they will become critical thinkers. The hybrid approach might also extend to providing students with basic ‘real life’ working experiences which could benefit their future careers.

Another point to note is that the instructional module of HybCoMet strategy is written simply and straightforwardly, yet completely and clearly enough to provide guidance for teachers’ practice and students’ active learning. Distinct from other instructional designs, the explanation is written simply so that a teacher can easily understand and then adapt the concepts to their teaching practice. For additional effect, at the beginning of every section, and at the end of every task, ‘magic’ (key) words or idioms are provided with the intention of drawing the attention of teachers and users toward reflection on their roles. The module is written in daily conversational language to make it accessible to most of the users for whom English is a second language.

Despite many benefits that could arise from the hybrid method, there are also limitations to this approach. According to Johnson (2002), the design of hybrid courses requires a different set of instructional and project management skills than those required by a traditional course and requires more work to be done prior to implementation and at the end of the process. He added that the learning process with a hybrid intervention is always slower than that expected and takes more time as students are more engaged in learning activities. Therefore, the time assigned for each activity needs to be taken into account as well. With the average teaching session in polytechnics lasting an average of 60 minutes, the time allocated for each learning unit should also follow the standard time allocation. Nonetheless, flexibility can be applied depending on the particular learning needs of different students. Having carefully planned the module characteristics, as stated above, it will also be necessary that the module stipulates the assessment protocols that will be used.

Group size is also an important aspect that needs to be given attention in developing this module. It is essential to determine the optimum number of members in each group to facilitate effective participation and task completion in a given time. Details on how many students should be organized in a group and how to form the group are provided in Section 6.0 of the Appendix A. Both aspects are important considerations prior to the development of the module.

3.7 CONCLUSION

To design a meaningful teaching approach for all students (and to build their generic competences), there is a need to combine metacognitive and collaborative approaches. Based on a review of literature, I have identified that collaborative and metacognitive approaches are associated with the development of generic competences. However, each of these methods has drawbacks. The‘collaborative’ approach is associated with overt prioritisation of task outcomes and those of the ‘metacognitive’are associated with prioritisation of internal mental processes. I have therefore developed a new conceptual framework which will integrate metacognitive strategy and collaborative learning as an alternative pedagogical approach to the more traditional approaches.

This type of learning environment is intended to provide students with an informal collaboration and cooperation space that allows them to be aware of, to monitor and evaluate their own learning process and which could activate thinking which would be of practical value to their future life. Through collaborative group learning, students rehearse acting in a positive manner and with positive behaviour.

At the same time, the integration of a metacognitive strategy may reinforce the importance of peer interaction for cognitive development. Students should become aware of their thinking, through peer interaction about the lesson, and then regulate their cognitive process to accomplish the shared goal. Gradually, through the HybCoMet learning process, students develop understanding, improve competences and attitude and the combination all of these ‘assets’ could be the output that is ultimately applicable to their working life in the future.

The HybCoMet strategy, it is hoped, can challenge students in their learning so that, after finishing their studies, they will be able to manage similar situations which may occur in their personal lives and also in the workplace. Therefore, it is hoped to introduce this learning mode into students’ educational environment to prepare them for real-life situations and provide opportunities for optimal intellectual and academic development as well as the development of generic competences of students in the workplace of the twenty-first century. However, this vocational innovation needs to be tested and the next chapter presents the methodology and methods utilised for the testing of the efficacy of this pedagogical framework.

CHAPTER 4

RESEARCH DESIGN AND METHODS

4.1 INTRODUCTION

From chapter 3 it has been considered that the hybrid of collaborative and metacognitive strategies (HybCoMet Strategy) may be useful in enhancing generic competences in students, however in testing this research intervention, there is also a need to investigate teachers' and students' perception on current teaching approaches (the traditional approaches) and the feelings of students about the introduction of hybrid techniques.

Thus, this chapter describes the methods employed in this study in order to identify the effectiveness of the new vocational innovation- the HybCoMet Strategy. It begins by describing the research design and follows with an explanation of the selection of case locations, course module and respondents, and sampling procedures. Ethical issues in classroom research are also discussed in this section. It will then go on to discuss how recent studies on similar topics were useful in constructing these methods and follows with the reasons for the specific methods and instruments that have been chosen for this study. The subsequent section provides the instruments and procedures for data collection, which uses a range of methods. It also outlines the ways in which triangulation has been used and discusses how the data is analysed. This chapter also demonstrates how addressing the research objectives have resulted in the selection of methods for data collection. The final section explores the researcher experience and "journey" to the field work during data collection process along with the administration of collected data.

The research objectives, as discussed in Chapter 1 are to:-

1. analyse and evaluate current teaching approaches in civil engineering programmes in Malaysian polytechnics.
2. determine the effectiveness of a hybrid teaching approach compared to the more ‘traditional’ approach.
3. identify how a hybrid learning environment may help students improve their generic competences and learning attitudes.

The research questions, which are more specific articulations of these objectives, are:-

1. What are lecturers’ prior assumptions about the current teaching approaches and what are the possible resistances to the introduction of new teaching strategies in classrooms?
2. To what extent does the introduction of HybCoMet strategy in a specific context increase the generic competences and learning performance of students?
3. What are the subjective attitudes of students to the introduction of HybCoMet Strategy towards their learning and future working life?

The research design is based on the objectives and these research questions. The quantitative methods along with elements of qualitative were used to design the study as they consider both objective (skill) and subjective (attitudinal) outcomes. A variety of methods are used in this study with the purpose of helping to generate more accurate findings from both students' and lecturers' perspectives of the teaching and learning process.

4.2 RESEARCH DESIGN

4.2.1 Case study.

In order to address the research questions, this study employed a case study approach with a small scale quasi-experimental design. The study is focused on a case study involving three polytechnics in Malaysia. It focuses on an approach to the teaching of engineering subjects.

This research was influenced by my interest in educational change and my own teaching experience. In order to address the research questions for this research, a case study approach has been used. The decision to conduct case study is appropriate a qualitative inquiry which focus on processes and values. Although, by one perspective, the methodology employed for this study could be considered experimental or action research, this is within the frame of an exploratory case study, as discussed below.

There are three types of case study as identified by Yin (2009); exploratory, descriptive and explanatory. The exploratory case study approach is applicable to this study because it can involve using multiple sources and techniques in the data-gathering process (Yin, 2009). It also can be used to test in larger scale surveys, experiments or other forms of research (Cohen *et al.*, 2007) which are of interest in this study.

A case study is related directly to everyday experience and facilitates an understanding of real life situations which provides a basis for the implementation of new approaches to teaching in the classroom. They (case studies) involve looking at a case or phenomenon in its real life context, which usually employs a variety of data (Cohen *et al.*, 2007). They are descriptive and detailed, with a narrow focus, and allow the combining of subjective (qualitative) and objective (quantitative) data (*ibid*) which are appropriate for this study. The case study approach tends to use certain data collection methods (i.e.; semi structured interviews, observation, diaries, even tests) and analysis techniques, and my intention was to use both qualitative and quantitative approaches in order to provide a 'thick description' of data. Using multiple methods provides a strength that offsets the weakness of both quantitative and qualitative research (Creswell and Plano, 2007) as quantitative measures can supplement and extend the qualitative analysis. With reference to Creswell (2009, p. 4), quantitative approaches are a process for testing objective theories by examining the relationship among variables, whilst qualitative approaches are a method to explore and understand the meaning individuals or groups ascribe to a social problem.

The data collection in quantitative research consists of gathering numeric (numbered) data and usually involves a large number of individual participants. In qualitative approaches, the data collected uses more general questions to permit participants to generate responses, and it usually involves a small number of individual participants.

One argument for quantitative research is that it weaks in understanding the context in which people talk, and also it is difficult to hear directly the voice of participants. Qualitative research, then, makes up for these weaknesses. However qualitative research is seen as deficient because of the personal interpretation made by the researcher ,that creates bias (Creswell, 2005). It is also difficult to generalize findings to a large group because qualitative research usually involves a limited number of participants, which is not a problem in quantitative research. As such both of these approaches were combined.

The case study approach, with its use of quantitative and qualitative data-collection methods hence provides the opportunity to triangulate data in order to strengthen the research findings and conclusions. The use of several methods could also help in terms of validity and reliability. This research approach may additionally contribute a unique and valuable method of eliciting several phenomena of interest in terms of students' learning process in the classroom. Despite the choice of the case study approach, limitations exist for the use of a single case study, particularly the problem of generalisability and validity to other establishments. As every case study is unique, it can be claimed that generalisability is not an option and each case has to be taken on its own merits since the circumstance are only pertinent to the case involved. However, in this study (of a vocational innovation) the research produces results that are perhaps indicative of wider cultural reactions to the introduction of new pedagogical approaches in Malaysian polytechnics.

4.2.2 Quasi Experimental Research within the Case Study

As noted by Yin (2009), a case study can involve using multiple sources and techniques in the data-gathering process. Cohen *et al.*, (2007) added that experimental tests or other types of research can be used in the case study. Yin (2009) noted that many research studies are mixed methods or combine the case study with other methods into a single study. This combination can permit the researcher to collect a richer and stronger array of evidence than can be accomplished by only single method alone *(ibid*, p. 63). Therefore, along with a case study, a quasi experimental design is seen as one of appropriate methods to employ in this case study that could help to address the research questions.

One of the purposes of this research study is to determine the effectiveness of the hybrid approach compared to current traditional approaches, which determines whether the hybrid approach as the new intervention approach makes a difference in results for participants. Experimental research is the only type of research that can help to test cause-and-effects of both approaches (Gay and Airasian, 2003).

An experiment typically involves a comparison of two groups, and the participants are randomly selected from the population and randomly assigned to treatment processes (*ibid*). Quasi experimental research is similar to experimental research. However it is different in selecting and assigning participants into treatment process. Quasi experimental naturally assemble the groups such as according to classes rather than randomly selecting them (Wiersma, 1997). Because randomisation was not possible, I employed quasi experimental research. This is as my participants had been set up, and located in such a group, allocated by their lecturers, and I could not randomly assign them to different groups. The sampling process is explained in detail in section 4.3.2.

A common approach to quasi-experimental research, the non-equivalent, pre-test and post-test control group design (Creswell, 2009) was employed in this study. In this design, the groups were assigned to two main groups (control and experiment groups) and tested just prior to the experiment of the vocational innovation. The experimental group (A) and the control group (B) were allocated for a pre and post tests, however only the experimental group received the treatment process using the intervention of a hybrid approach, whilst the control group went through the normal classroom learning with the traditional approaches, without any treatment process.

In a simple form, the design can be shown in the diagram as Figure 4.1.

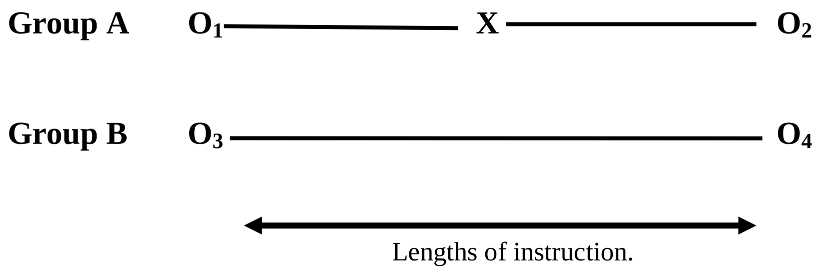

Figure 4.1: Diagram of Example Non-equivalent (Pre-test and Post-test) Control Group Design.

In the diagram, the Os with odd numbered subscripts indicate pre-test and those with even-numbered subscripts indicate post-test. The X indicates the treatment process in a given period. The post-test was measured after the experimental treatment was applied. After the experimental group has been exposed to the treatment for some period, data was then collected from both groups to determine whether there is any significant difference between pre-test and post-test score. The detail of pre and post tests is explained in Section 4.6.

4.3 SELECTION OF SAMPLES

The following section discusses the selection of research locations where the case study took place, the course module under investigation and the respondents who were invited to take part in the case study along with a discussion of the reasons for their selection.

4.3.1 Case Study Locations.

There are 27 polytechnics that operate in various states in Malaysia. However, only 13 polytechnics offer a Civil Engineering Programme. The Civil Engineering discipline was chosen because I was certified and mastered in this field. As a practitioner, I had the subject knowledge, contacts and tacit knowledge required to conduct the study.

For the purpose of this study, only three polytechnics were chosen in three different areas. The selection of each polytechnic was bounded by two parameters; the year in which the polytechnic was founded (the year of operation) and the geographical area (the location). I was particularly interested to choose different parameters (year of operation and location) of polytechnics because they could have different infrastructures and facilities, and this, more or less could affect the way how the teaching is delivered in the classroom. However, each site also shared the similar basic criteria (i.e.; organised by the Ministry of Higher Education, run Civil Engineering programme and offered the same courses).

The first case was Polytechnic A, which is the sixth polytechnic built under Polytechnic Management Division, Technical Education Department, Malaysian Ministry of Higher Education. It is located in the west part of Malaysia and has been in operation since 1990. It is situated rurally and currently, it has produced 9682 graduates to be introduced in various job sectors in various demographic areas in the country according to it's official website. There are 6 academic departments that are operating: Department of Civil Engineering, Department of Mechanical Engineering, Department of Electrical Engineering, Department of Commerce, Department of Mathematics, Science and Computer, and Department of General Studies that offered 12 main courses, included 11 diploma courses and 5 certificate courses. This polytechnic was chosen as it is one of the oldest polytechnics operated in Malaysia. The location is considered as the rural area, which could have limited access to many technologies and facilities.

The second case was located in an urban area (Polytechnic B). It was built in an urban area in the capital city of Selangor Darul Ehsan, Shah Alam. It is known as one of the more sophisticated polytechnics and has the reputation of being a 'superactive polytechnic' among other polytechnics. It began operating in February 1997 and the first students enrolled in July of the same year. From its official website, currently, Poly B runs seven courses with an average of 5000 enrolments. This polytechnic is of interest because it can be categorised as a modern polytechnic, because it provides the very latest machines and equipment for the learning process, as well as teaching and learning materials. This polytechnic is situated in the urban area with easy access to many technologies and facilities.

The final case was the Polytechnic C which was situated in a historic town in a suburban area, which is 24km from the capital city. It was the 14^{th} polytechnic to be built by the Ministry of Higher Education. It has a maximum capacity of 5060 students and has been fully operational since December 2002. It offers all of the main programmes including Hospitality and Commerce. Polytechnic C is one of the very latest polytechnics in operation.

The different characteristics of these sites provide the possibility to make a comparison between those polytechnics in term of their teaching and learning facilities.

4.3.2 The Course Module

The Concrete Technology module was selected as a course module for the purpose of this study after discussion with lecturers from polytechnics (who were not participants) prior to conducting the research study. At the earlier stage of research study, few modules are of interest, however, according to those lecturers, this course module is a crucial subject that needs to be mastered by students as it serves as a basic principal source of knowledge that will be applied widely in the real workplace and will be regularly used during construction work. Thus, an understanding of this course module is critical as it forms the basis of competent performances in the world of work. Hence, it is necessary for students to understand the topic prior to their employment.

4.3.3 Respondents and Sampling Procedure.

The samples for research project need to be selected in order to represent the population (therefore it needs to be stratified). The population of this research comprises Civil Engineering Students in Malaysian Polytechnics. Participants in this study were all first semester students undertaking a 3-year Civil Engineering Courses at the three polytechnics mentioned above. These groups of students were chosen because they will go for industrial training in their fourth semester (second year) and it is crucial for them to have experiences of how to communicate actively, think creatively and solve problems rapidly while dealing with people at work (therefore there is also a purposive dimension to the sample).

The sampling process started with a discussion with a course moderator in every polytechnic. The course moderator provided me with a list of students. There was an average of three groups who enrolled for the Civil Engineering Programme. The normal distribution of students in every group is 40 in average, with an average of 360 students in total in three polytechnics. The selection of the sample was achieved by using stratified purposive sampling. The course moderator had helped me in identifying the respondents that were available for the research purposes. From three groups who enrolled for this course, only two groups were chosen from each polytechnic, which provide a total average of 240 respondents (six groups).

Then, I randomly assigned them to control and experimental groups. The participants within the group were not randomly selected but consisted of all students allocated in the class. Nonetheless, each group containing respondents with similar characteristics that could form a heterogeneous group in terms of gender, religion, ethnicity and achievement (Ong, 2007), and they built up a sample that is satisfactory to the needs of this study (Cohen and Manion, 1994).

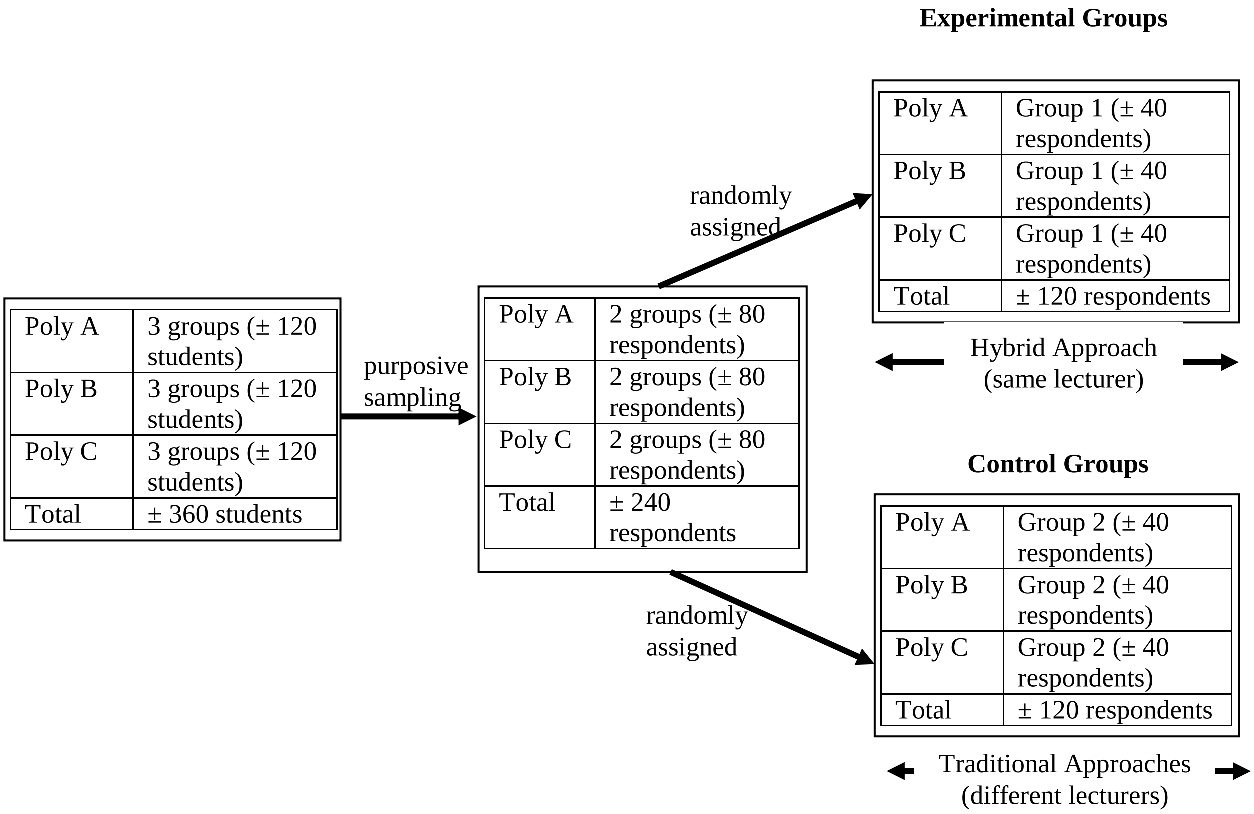

Figure 4.2: The Sampling Procedure.

There are two major groups which are control and experimental groups. The control group was respondents who went through the normal classroom learning with the traditional approaches, whilst, the group who received the treatment process using the Hybrid approach were the experimental groups. Hence, there were three control groups and three experimental groups with an average of 240 respondents involved in this study.

Besides students, all lecturers who have taught Concrete Technology in the selected groups, were automatically selected as respondents. In total, six lecturers were involved in this study, with two lecturers from each polytechnic who were invited to participate in the interview sessions.

As human subjects (teachers and students) were involved in this study, there is a concern for ethical issues.

4.3.4 Ethical Issues

This research study involves human participants who were taking part in the data collection process. Since human participants are involved, ethical and legal considerations are of concern.

Ethical is defined as "conforming to the standards of conducts of given profession or group" (Fraenkel and Wallen, 2003, p. 56). Whilst, the term *ethics* refers to questions of right and wrong (*ibid*), good and bad, and considers how the research purposes, contents, methods, reporting and outcomes abide by ethical principles and practices (Cohen, *et al.*, 2007, p. 51). Ethics in this study have mainly been associated with ethical guidelines laid down by the University of East London (UEL) and the Government of Malaysia and the gaining of ethical approval from professional and academic bodies before beginning data collection. The major topics to be taken into account are: confidentiality, anonymity / informed consent and data protection. These elements were applied to all of the research methods in the study. This may mitigate against some of the ethical issues associated with quasi-experimental techniques in terms of their lack of concern for qualitative and subjective considerations.

Once the decision was made to undertake research with human participants, my first step towards gaining approval was to submit an application (a research proposal) to UEL's Research and Ethics committee members. This committee has approval authority over potential research activities, and follows guidelines and statements about the policies and requirements for protecting human subjects involved in research. The application was important to make sure I understand and follow the ethical policies of the UEL.

The committee reviewed my application, and once it was approved, I then planned my field visit for data collection purposes. (see Appendix 4-F for ethical approval).

According to Wiersma (1997), whenever research is conducted in an educational setting, it is important to obtain permission from the approving body of the agencies. Hence, in order to collect data in Malaysia, official permission to carry out the investigation was made to the Government of Malaysia. Permission needed to be granted by the government through the Ministry of Higher Education of Malaysia, the Economic Planning Unit of Malaysia from which an official form was sent along with supporting documents (research proposal, sample of questionnaire and interview schedule). This involved obtaining consent and access to the polytechnics proposed for inclusion in this study. As soon as approval is obtained, the approval letter (appendix 4-G) was sent to the director of each polytechnic to ask for permission to conduct the study.

The copy of the letter was submitted to the head of each Civil Engineering Department in the selected polytechnic, and access was then negotiated with them. The head of department was also informed as to the nature of the study and the conditions under which it was conducted. A copy of the printed module for the hybrid teaching approach was supplied to the head of departments to give a clear view to the nature of the intervention process. They were welcome to discuss and enquire about the intervention prior to its implementation.

I also negotiated access to the site and was accepted as a part of the polytechnic societies. I obtained permission to implement the new teaching strategy, and was given full consent to handle the classroom learning process. In my research, I also took responsibility for maintaining ethical standards, respecting all participants' right and maintaining confidentiality of research data.

Informed consent is the procedure by which individuals decide whether to participate in the research study after being informed of facts that would be likely to influence their decision (Cohen, *et al.,* 2007). For the purpose of this research study, consent had to be obtained before data could be collected in both writing (for questionnaire) and orally (for interview). Consent was fully-informed and voluntary. For the questionnaire, respondents might be strongly encouraged to become involved, as they need to attend classroom learning process and will be in the case location while the survey was taking place.

However they still have the right to withdraw at any stage or not to complete specific items in the questionnaire (*ibid*). In this investigation, all participant details were confidential. Preservation of confidentiality and anonymity of all persons and polytechnics involved in this research was guaranteed with all names being changed, and their real identity being known only to me.

An outline of the conditions under which the study was carried out were prepared and handed out to participants. The purpose of the study, the conditions of the research and the guarantees of confidentiality were explained carefully to the participants. Participants were told what the research will involve, what the expectation from the study were, how much time is to be taken on their part and how the data was collected and they were also told that all information provided will be treated with the strictest confidentiality. There are no foreseeable risks to participants involved in this survey.
For the interview session, to ensure that the interview was conducted in an appropriate and non-stressful manner, an appropriate venue which offers a degree of privacy and freedom from interruption was prepared.

To ensure the confidentiality of the data, once the research had been completed and the results written-up, all the data and personal identifiers were removed immediately. The data will not be kept longer than is necessary for the purposes of this study. Fraenkel and Wallen, (2003) considered, that whenever possible, the names of the respondents should be removed from all data collection forms. Thus, the results of the research or any resulting statistics were not made available in a form that identifies individuals. The results of the survey were combined and all responses were written in general terms, so no individuals were identifiedin the final report.

The data was used only by the researcher who was responsible for overall data security. Any data stored in a computer was password-protected. All the primary data and related documents were shredded and disposed of away from the area where the research had been conducted.

4.4 SELECTION OF RESEARCH METHODS.

Before selecting the data collection methods, I carried out a thorough literature review on similar research done in several areas in different countries, locally and internationally. It was helpful for my study to explore previous research and to examine the method(s) and instrument(s) used by some researchers in their studies related to my area of interest.

Tables 4.1 and 4.2 show some studies that were reviewed from various areas in metacognition and collaboration that have contributed ideas to the selection of data and analysis tools

Table 4.1: Models of Research Methods and Instruments in Metacognition

<table>
<tr><th>Author(s) and Year</th><th>Purpose(s)</th><th>Sample</th><th>Method(s) and Instrument(s)</th><th>Procedure(s)</th></tr>
<tr><td>Goh C. (1997)</td><td>Implication of findings of metacognitive awareness in listening for the teaching and learning of listening in ELT Programmes.</td><td>Chinese students, average age 19, enrolled on an intensive English Language Programme.</td><td>Keeps a diary about students' listening.</td><td>- Ask short questions on paper,
- Reflect on specific occasions where they listened to English,
- Report what they did to understand better,
- Made one entry each week (over a 10-week period).</td></tr>
<tr><td>Bruce E. M.(1999)</td><td>1) To assess the effectiveness of a metacognitive approach to teaching word identification and reading comprehension skills.
2) To investigate effective methods for implementing the metacognitive programme.</td><td>-176 upper-primary poor readers (Years 5 and 6)
- 8 public schools and 1 private school in a semi-urban area.</td><td>- Measure of assessment instruments and comparison.</td><td>- Divide sample into control (CG) and experimental groups (EG).
- Run as a 3-phase study.
<table><tr><th>Phase</th><th>EG</th><th>CG</th></tr><tr><td>Study 1 (groups of 4-8)</td><td>Full programme</td><td>1 programme</td></tr><tr><td>Study 2</td><td>Training phase</td><td>Regular classroom structure</td></tr><tr><td>Study 3</td><td>Programme as Study 1</td><td>Programme parallel to Study 1</td></tr></table>- Additional control group used was changed at different phases of the study.</td></tr>
<tr><td>Kapa E. (2001)</td><td>To explore what kind of metacognitive support system should be provided students in order to improve their ability to solve mathematical problems.</td><td>441 eighth-grade students from 4 integrated schools in the Gush-Dan region.</td><td>- Pre- and post-tests.

Data Analysis using:
- ANOVA,
- Duncan test.</td><td>- Students were randomly assigned to the different treatment cells.
- Students and teachers from other schools did not know each other
- All the groups learn how to use the computer except during the first two lessons.
- 1 hr each week students work with the programme in computer lab.
- Students were examined before and after treatment by answering a question individually.
- A post-test constructed according to the content based on the pre-test.</td></tr>
<tr><td>Phelps, Graham and Kerr (2004)</td><td>Investigate the applicability of the metacognitive and reflective approach to teachers' professional development through ICT.</td><td>40 secondary teachers in Lismore Diocese.</td><td>- Pre- and post-intervention surveys,
-Reflective journals,
- Online interaction,
- Unstructured interviews,
- Documentation.</td><td>- Data collected before and during the intervention,
- Participants attending workshops, interacting with self-paced print, CD and Website-based resources, participating in online communication.</td></tr>
</table>

Author(s) and Year	Purpose(s)	Sample	Method(s) and Instrument(s)	Procedure(s)
Mohamed, M. and Nai, T.T. (2005)	-To investigate the process of solving mathematical problems in terms of definable metacognitive behaviours. - To determine the type and pattern of metacognitive behaviours.	Form Four secondary students in Johor Bahru, Malaysia.	A case study approach: - Verbatim transcription. - Thinking aloud method. - Observation and retrospective interview. - Review students' written answers.	Samples are: - Train to carry out the thinking aloud methods. - Requested to solve 3 non-routine maths problems using thinking aloud. - Instructed to state verbally what was taking place when solving the problem. - Draft out the solution, steps or diagrams. - Audio/video-tape the observation.

From the summary in Table 4.1, it can be seen that various methods have been developed and used to assess metacognition. Different authors have measured metacognition in a variety of ways, each with its advantages and drawbacks. From the table, there have been four methods used to assess metacognition. These are reflective practices - diary/journal/students' answers (3 studies), case study (1 study), interview (2 studies) and experimental/statistical measurement (3 studies). With the exception of one study that used thinking aloud and verbatim transcription (Mohamed and Nai, 2005), most of the studies used the personal written method (diary, journal and students' answers) and experimental/statistical measurement (pre- and post-tests) as a useful method for research into metacognition.

Goh (1997), who investigated learners' metacognitive awareness about listening, believed keeping a diary provided the right stimulus for learners to reflect on their listening because learners' awareness about listening cannot be observed directly. Diary methods can help to report students' activities on specific occasions and to understand their thoughts and feelings better. It can help the researcher to get extensive information about learners' metacognitive awareness in related skills. In addition, Cooper (2006) also used journal writing as a tool to promote critical thinking skills in career and technical education. As such, journal writing is a suitable instrument to investigate the thoughts and feelings of students while going through the new learning process.

One question that needs to be asked, however, is whether these methods are suitable for application in engineering subjects because metacognition in the studies above was applied mainly in studying literacy and numeracy. Even though the journal method of reflective observation has been employed to obtain supporting data in one study about computer technology (Phelp, Graham and Kerr, 2004), there is no detail on how this instrument was employed. Nonetheless, Socha *et al*., (2003) found that journaling helps an individual to clarify what has happened and what they have learned about themselves. They also indicated that reflective documents help to derive value from the exploration of a specific question and retrospectively help to clarify what has happened and suggest how to operate these better. A group journal, students' portfolios and diaries can also be used to examine collaborative learning as shown in Table 4.2.

Table 4.2: Models of Research Methods and Instruments in Collaborative Learning

<table>
<tr><th>Author(s) and Year</th><th>Purpose(s)</th><th>Sample</th><th>Method(s) and Instrument(s)</th><th>Procedure(s)</th></tr>
<tr><td>Gokhale A.A. (1995)</td><td>Examined the effectiveness of individual learning versus collaborative learning in enhancing drill-and-practice skills and critical thinking skills.</td><td>48 undergraduate students in industrial technology, Western Illinois University.</td><td>- Treatment groups:
• Individual learning.
• Collaborative learning.
- Pre- and post-test</td><td>- The treatment comprised two parts: lecture and worksheet with the same worksheet being given to both groups.
<table><tr><td>Individual learning</td><td>- Explain the task.
- Given 30 minutes to work on the w/sheet at their own level and rate.
-After 30minutes, answer sheets were given out.
- 15 minutes to compare the answers and understand how the problem had been solved.
- Post-test.</td></tr><tr><td>Collaborative learning</td><td>- Clearly specify the task.
- Explain the collaborative learning structure.
- Distribute instruction sheet for the collaborative process.
- Discuss solutions to the problems.
- Listen carefully to comments of members.
- Teacher then gives a solution.</td></tr></table></td></tr>
<tr><td>McMurray D.W. and Dunlop M.E. (1999)</td><td>To investigate how the collaborative technologies improve the quality of the overall learning of distance education students studying completely online.</td><td>66 Bachelor of Social Science, Southern Cross University.</td><td>Teachers'
- personal diaries,
- interviews.

Students
- Pre- and post-survey

Data analysis:
- Scenario.</td><td>- Developed online learning.
- Transform conventional external study material to computer-supported, collaborative-learning format.
- Project team met twice weekly to discuss the range of opportunities resulting fromthese technologies.
- Examine existing online courses.
- Ongoing discussion.
- Deliver the newer technologies to students.
- Staff complete weekly diaries-personal reflection
- Interview staff during and after the design and delivery phase.
- Each student was asked to complete a survey prior to commencing the study and at the end of the semester.</td></tr>
<tr><td>M. Neo (2003)</td><td>To create a collaborative learning environment via a web-based design project to enhance</td><td>First year undergraduate students in Multimedia</td><td>- Group journal.
- Questionnaire survey.</td><td>- Students are given the project at the beginning of the class.
- By 2nd week, form group of 4-6 people, choose group leader.
- Submit proposal.</td></tr>
</table>

<table>
<tr><th>Author(s) and Year</th><th>Purpose(s)</th><th>Sample</th><th>Method(s) and Instrument(s)</th><th>Procedure(s)</th></tr>
<tr><td></td><td>students’ problem-solving and critical thinking skills.</td><td>University, Malaysia.</td><td></td><td>- 5th week, students were provided with the basic techniques for creating images and web pages.
- 8th week, handed in the project and gave a presentation.
- submit a progress report (journal) every 2 weeks.
- Questionnaire was completed after the project completed.</td></tr>
<tr><td>Ong E.T. (2007)</td><td>To investigate the effect of cooperative learning methods on achievement in mathematics and sciences.</td><td>187 third year Bachelor of Education student teachers at University Pendidikan Sultan Idris, Malaysia.</td><td>- Quasi-experimental.
- Pre- and post-test.
- Students' portfolio.

Data analysis
- ANOVA.
- Pearson correlation matrix.</td><td>- Students divided into Group A (experimental group) and Group B (Control group)
<table>
<tr><td>GROUP A</td><td>GROUP B</td></tr>
<tr><td>- Were taught STAD via mass lecture approach</td><td>-Were taught STAD via STAD approach.</td></tr>
<tr><td>- Follow 4 main phase of STAD:
• Teacher presentation.
• Team study.
• Individual quiz.
• Team recognition.</td><td>- Actively participate in all the 4 phase of STAD to learn unfamiliar content.</td></tr>
<tr><td>- given explanations and elaboration at each phase.</td><td>- Quibblean Spelling Rules used for the approach.</td></tr>
<tr><td></td><td>- certain school-based curricula in science subjects were invoked and subsequently after completed cycle of STAD</td></tr>
</table>
- Pre-test was done in the first half of the semester based on students’ portfolio
-Post-test was administered to both groups during week 12.</td></tr>
</table>

Neo (2003), for instance, used group journals submitted every two weeks, which asked students to report on the progress of their collaborative work. This is to ensure that the students were following the guidelines properly and to identify any issues that may be of concern. The journals became one of the outcomes that was evaluated at the end of the research project. On the other hand, Ong (2007) drew on a portfolio to measure the extent to which the students had grasped the approaches taught in a classroom. This portfolio was used as a pre-test, which gave a score to the students. Overall, it seems that reflective practices have been used widely as a method in research design. This encourages their use in this study as one of the appropriate methods to observe metacognitive skills, as well as collaboration. An important aspect of the study above is that, the use of reflective practices is not limited to a certain age group and can provide a useful method to collect detailed information on respondents' experience on a daily basis.

Other methods that are regularly used in the studies above are interviews and experimental/statistical measurement. Phelps, Graham and Kerr, (2004) conducted two phases of unstructured interviews in their study. The first phase was conducted during the intervention and the second phase 6 months after the intervention. This was to determine the longer-term outcomes of the professional development intervention and the rate of adoption and integration of technology in teachers' daily teaching practice. Mohamed and Nai, (2005) used retrospective interviews to identify the metacognitive behaviours and problems faced by students when trying to express the metacognitive behaviour during the solving of mathematical problems. Unfortunately, neither of these studies discussed further how the interviews were conducted because they were applied as a supporting instrument only. Meanwhile, for research on collaboration, there is only a study conducted using an interview (McMurray and Dunlop 1999).

The interview in that research is quite similar to that of Phelps, Graham and Kerr, (2004), the difference is that they are focusing on staff, not students. Staffs were interviewed in two phases and the interviews concentrated on technological, instructional and academic issues. Even though only three of these studies showed the use of interviews in research, further reading reveals many studies that have employed interviews as a useful method of gathering data.

Experimental/statistical measurements are another well-known method employed in research design. As can be seen, pre- and post-tests are used in both tables 4.1 and 4.2. Hence, pre and post tests were also employed in my research study through the quasi-experimental methodology. The term quasi-experimental, rather than experimental, is used as in a pedagogical context as it is not possible to control all intervening variables. Observation and questionnaire surveys are the least-used methods of studying metacognition and collaborative learning. However, questionnaire surveys are useful for the purpose of my study, as they allow one to consider generic skills, and will be considered as a primary method for data collection process. The detail of those methods and how they could apply to answer the research questions will be discussed further in Section 4.5.

From the above discussion, I found that most studies on metacognition and collaboration are carried out using both quantitative and qualitative methods due to the diversity of the outcomes of learning. Therefore, I also decided to employ both quantitative and qualitative strategies in order to provide sufficient evidence for research in the study area. The strategy was to use the quantitative data to provide basic evidence of the current teaching and learning situation as well as the impacts of the new pedagogical approach from students' perspectives. This information would then provide the focus for the analysis and interpretation of the qualitative data. The two types of data (qualitative and quantitative) are illustrated in the Figure 4.3. Both sets of data are used comparatively in my analysis.

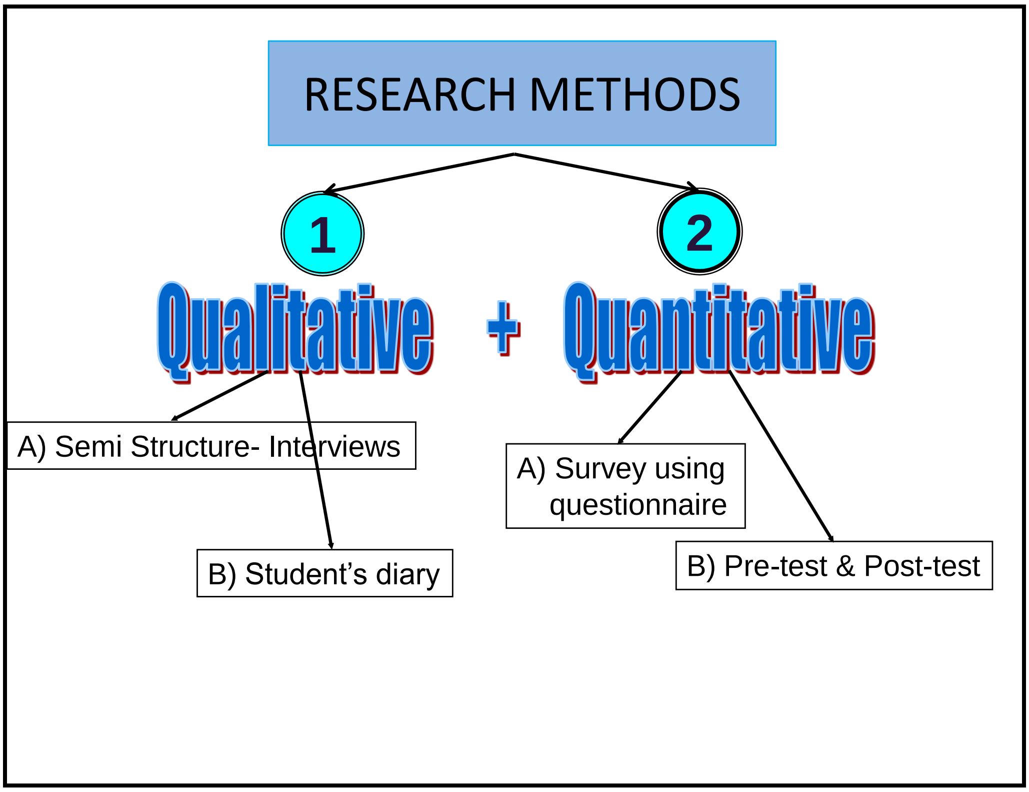

Figure 4.3: Research Methods Employed

Before employing any methods of data collection, it is important to precisely define the aim of each method in gathering information and data for the research findings. Table 4.3 summarises the methods that were considered in this research study as data collection instruments and how they could achieve the research objectives.

Table 4.3: Data Collection Methods and its Purposes.

No	Method(s)	Objective
1	Questionnaire and interviews.	To analyse and evaluate current teaching approaches and possible reactions to new approaches.
2	Questionnaire and students' diaries.	To determine the effectiveness of the Hybrid Approach *vs.* the 'Traditional Approach'.
3	Pre and post tests, and students' diaries.	To identify how the approach may help to improve students' generic competences and learning attitudes .

The following section sets out the overall process of decision making in relation to research design and methods.

4.5 RESEARCH PLAN AND DATA COLLECTION PROCESS

The study employed a case study approach with a small scale quasi experimental design in which classrooms at each site were randomly assigned to experimental or control groups status. This resulted in a total of three experimental groups and three control groups in all three polytechnics. As mentioned earlier, all the experimental groups received the new alternative instruction, the HybCoMet Strategy, however the control classrooms did not receive any special instruction. They learnt using the previous/ traditional teaching strategies. Teachers in the experimental classroom utilized teaching instruction that had been designed (Hyb CoMet Instructional Module) to lead to a restructuring of the way students learn towards positive attitude and develop generic competences.

In conducting the research, it was divided into three phases in order to achieve the aims and objectives of the study that were outlined in Chapter 1. The phases are illustrated and discussed further in Figure 4.4.

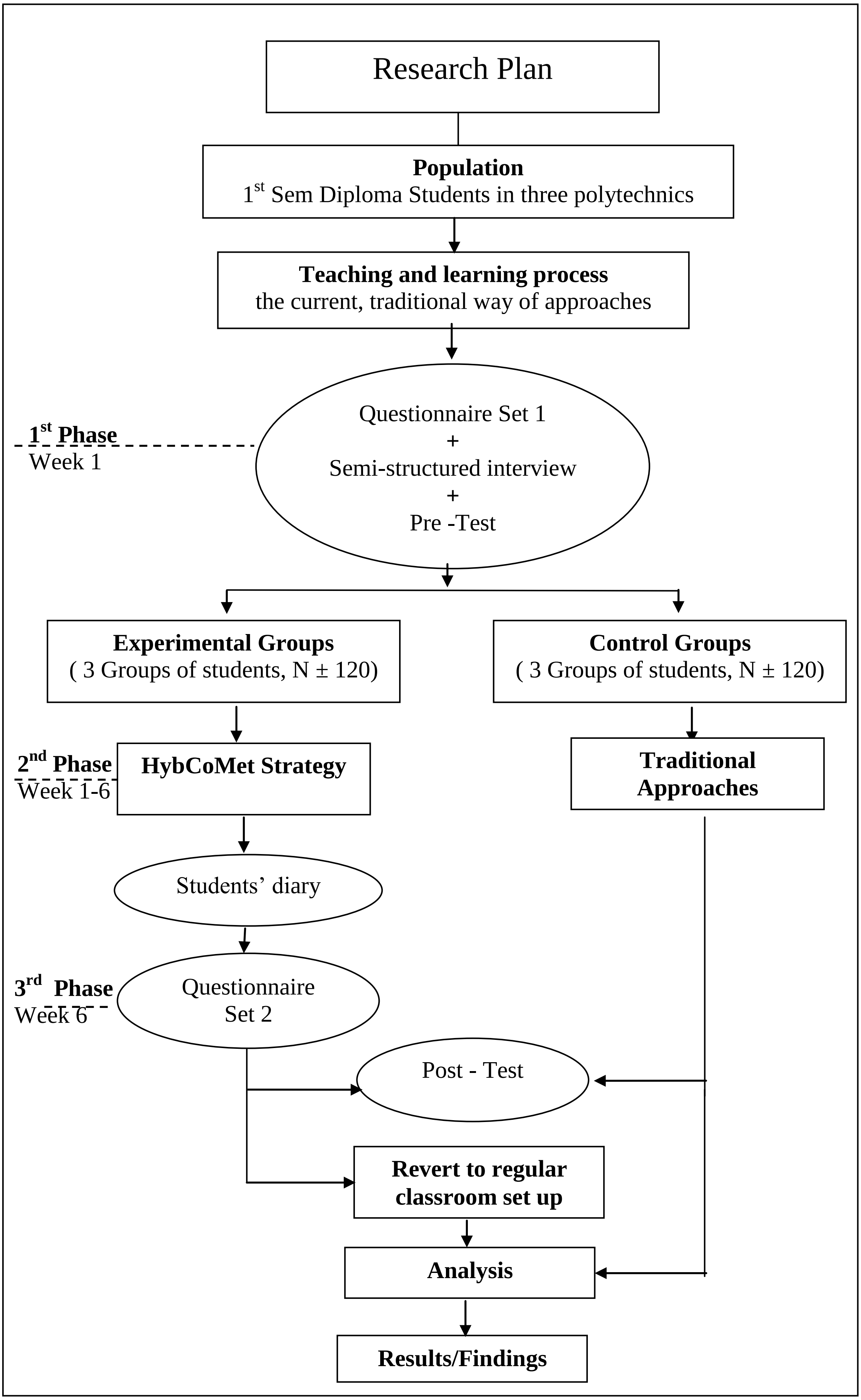

Figure 4.4 : Flowchart for Research Plan and Procedures

(a) Phase 1

- In the first phase of this case study, the survey was conducted by distributing a set of questionnaire to the students, which is Set 1 that focuses on the current, traditional teaching approach. Set 1 was distributed before students were assigned to either the control or the experimental group. Before starting, all students were briefed on how to participate in the survey, the conditions under which the study was conducted, and what is to be done with the information they provided. They were then asked to give their informed consent and agreement to take part in the survey. The face- to-face survey was then administered by the researcher.

- For this case, I also interviewed the selected teachers who were teaching the Concrete Technology module to obtain qualitative information to answer the research questions. Semi-structured interviews were conducted to generate information about the lecturers' teaching practices. Data from the interviews were to complement the data that had been gathered from the questionnaire. Two lecturers from each polytechnic who were teaching the course module were interviewed. Before carrying out the interview, an appointment to ensure access was negotiated with each lecturer and permission for the method of recording to be used in the interview obtained. In this study, a digital sound recorder was used for recording purposes with permission from the lecturers. They were then given a briefing and an explanation of the interview, including the purposes of the interview and how the data it generates will be used. They were also informed how long the interview would take and an appropriate room was prepared to ensure privacy and freedom from interruption.

- The pre-test, was conducted for all experimental and control groups during the same phase. The purpose of the pre-test was to assess students' knowledge and comprehension of the particular subject after gone through teaching and learning process using the traditional approaches.

(b) Phase 2

In the second phase, the new intervention teaching approach, the HybCoMet Strategy was introduced to the experimental groups, who would receive the intervention. The control groups would continue the current teaching and learning process (traditional approaches) without any intervention and special instruction. The same lecturer administered the HybCoMet Strategy to all experimental groups, whilst different lecturers taught the control groups. The intervention process took place over 6 weeks to cover the topic that had been designed following the new HybCoMet strategy.It is important to understand that both groups had gone through the same learning experience before the intervention and had a clear understanding of the traditional approaches.

At this stage, the use of students' diary (the log sheet) was considered as the appropriate instrument to obtain perspectives of the learning process and to determine how the new approach may help to increase students' generic competences. Students in experimental groups needed to reflect on the few questions that were asked, write their answers on the sheet and submit them as soon as possible after the end of every learning session.

(c) Phase 3

In the final phase, after completing the intervention within the six weeks period (which is the time given to complete the topic under investigation), both control and experimental groups were tested again with a post test. The post-test is a measure taken after the experimental treatment has been applied to measure the effectiveness of the HybCoMet Strategy. Then, results from both pre and post tests will be compared to identify similarities and differences in achievement. Finally, at the end of the process, a second set of questionnaire was given to students in the experimental groups to get a better understanding of the new approaches. After completing the treatment, students were revert to their regular classroom pattern and continued learning for about eight weeks with the normal classroom practice before commencement of the final exam. Data was then analysed using specific techniques which are explained in section 4.7. The following section explains in detail on how the methods were used for data collection purposes.

4.6 DATA COLLECTION METHODS

There are various data collection methods for qualitative and quantitative approaches as mentioned above. This section discusses in detail the methods and instruments chosen for this study along with the reasons for their choice and an explanation of how they were employed in this study. Discussion of the advantages and disadvantages of each method are also discussed in this section. In order to obtain the data for this study, the following methods and instruments are used.

4.6.1 Survey

According to Wiersma, (1997), survey research is probably the most widely used research type in educational setting. Surveys gather data at a particular point in time with the intention of describing the nature of existing conditions, or identifying standards against which existing conditions can be compared (Cohen, *et al.*, 2007). This case study investigates the existing teaching and learning process (traditional approaches) in learning the engineering subject, which was compared to the new alternative teaching approach- the HybCoMet strategy.The use of survey allows the researcher to analyse the students' perceptions of the course, the subject matter, the previous teaching approach, and the hybrid approach. A questionnaire is the most common and appropriate instrument used in survey research (Wiersma, 1997). In this case study, a survey was conducted using two sets of questionnaires as the instruments. Set 1 of the questionnaire (pre questionnaire) focuses on the traditional teaching approaches and Set 2 focuses on the hybrid approach (HybCoMet Strategy). The pre questionnaire was distributed before the intervention to both control and experimental groups, whilst Set 2 (post questionnaire) was distributed after finishing the intervention using the HybCoMet Strategy to only experimental group. The questionnaire is grouped into few parts as presented in Table 4.4:

Table 4.4 : Structure of Questionnaires

	SET 1	SET 2
PART A	Demographic details.	Demographic details.
PART B	Students' evaluation on courses taken and traditional teaching approaches.	Students' evaluation on the influence of the HybCoMet to the development of generic competences.
PART C	Students' evaluation on traditional teaching practices.	Students' evaluation on the effectiveness of the HybCoMet Strategy.
PART D	Students' evaluation on their own learning practices.	Open ended question emphasizes on how to improve the HybCoMet Strategy.
PART E	Open ended question asking for comments and suggestions on improving the current teaching and learning strategies.	. -

In Set 1, Part A requires respondents to choose the relevant answers from those given on the sheet. All the items in Part B, C and D are structured with a Likert-type scale. The Likert scale is a scale with a number of points or spaces, and the most common is five point scales. The scale should comprise not less than three and not more than seven points (Wiersma, 1997). However, it could be up to ten point scales depending on the purposes of the study (Dawes (2008).

Five point scales and four point scales are used in the questionnaire. According to the literature, different scales (i.e.: 4, 5 point) can be combined as long as the items on each scale are adequate for the measurement and that the responses are appropriate for the items asked (Wiersma, 1997). Likert scales provide a categorical way of ascertaining respondent's opinions rather than a binary (yes / no) or qualitative method (where responses can be written in). Each item is given a weighted score with a high score relating to positive feelings. Part E consists of open ended question asked for students' comments and suggestions. This part is aims at giving the respondent a room to express themselves beyond the limits of the previous parts. Whilst for the Set 2, Part A and D are similar to as the Set 1. Part B and C required the respondents to react to statements using a 4-point Likert-type scale ranging from strongly disagree (1) to strongly agree (4).

The detail of both pre and post questionnaires can be seen in Appendix 4-A and 4-B.

In this study, the questionnaire was developed in English. For data collection purposes, the English version was translated into Malay and this version then used to gather data in Malaysia. This is due to the fact that the Malay Language is the national language in Malaysia and it is used as the medium of communication. To formulate the survey questionnaire, I referred to texts on questionnaire construction such as Cohen and Manion, (1994), Cohen *et al.*, (2007), and Creswell, (2005) and related research studies (i.e.: Kasa 2006, Hanafi and Bakar, 2007), and it was then adjusted to meet the purposes of my study.

The next step was to seek expert opinions to ensure the content validity and realibility of items. Content validity is the degree to which a test measures the intended content of questions that are constructed (Gay, *et al.*, 2009). To satisfy the content validity, the drafted instrument has been reviewed by three lecturers from a technical university and three polytechnic lecturers who were experts in the related field. Corrections were made based on their comments and recommendations and with the agreement by the supervisor until the questionnaire was deemed acceptable for distribution to the samples.

The questionnaire was sent to Malaysia for a pilot test to check the reliability of the constructed items. Reliability is the degree to which a test consistently measures the attribute it is measuring (Gay, *et al.*, 2009, p.158). The purpose of the pilot test was to determine whether the instrument served the purpose for which it was designed and whether any further amendment was needed. A colleague assisted in the conduct of the survey by distribution to a group of students who were not otherwise respondents, but who had similar characteristic to those of the target groups of respondents.

The collated data was then analysed to calculate the alpha coefficient (α). The alpha coefficient, also known as Cronbach Alpha is an important indicator of an instrument's internal reliability or consistency (Fraenkel and Wallen (2003). The calculation indicates the intercorrelation between items in a test. An alpha coefficient value of $\alpha = 0.70$ is the lowest acceptable bound, whilst values ranging between $\alpha = 0.80$ and $\alpha = 0.90$ are commonly identified as very good (*ibid*)

To analyse the coefficient reliability of the pilot study, Statistical Package for Social Science (SPSS) software for data validation, version 15.0, was used to calculate the alpha coefficient of all items tested. The analysis disclosed that the alpha coefficient of the questionnaire was α=0.816 as shown in Table 4.5, which would indicate that items were strongly intercorrelated.

Table 4.5: Coefficient Reliability for Questionnaire.

Case Processing Summary

		N	%
Cases	Valid	37	93.1
	Excluded(a)	2	6.9
	Total	39	100.0

a Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.816	0.818	21

The questionnaire was then distributed to the actual respondents after few modifications.

4.6.2 Semi Structure Interviews

Interview data was also gathered to provide additional insights regarding teaching approaches, subjects/course value and the extent of students' learning. This method provided additional evidence concerning the dependent variables and provided opportunity for in-depth probing and the elaboration and clarification of terms, if necessary (Wiersma, 1997).

The interview method is preferred in this study because it involves the gathering of data through direct verbal interaction, which allows researchers to measure information, preferences and the beliefs of a sample (Cohen and Manion, 1994). Direct verbal interaction between individuals allows in-depth and comprehensive information to be obtained (Wiersma, 1997). Meanings, which are clear to one individual, may be relatively unclear or capable of being misunderstood by another, can be clarified by this method of data collection (Cohen and Manion, 1994).

However, Cohen and Manion (1994) went on to state that interview is prone to subjectivity and bias on the part of the interviewer. Nevertheless, this can be eliminated if the interviewer has a good level of skill and takes care to exercise it. Accurate information can also be collected if the respondents are sincere and are willing to participate. This is important to ensure the respondent provides valid and trusted information (Cohen *et al*.,2007) . Therefore, the interviewer has a major role in making preparations to achieve a good *rapport* with the respondent to ensure that the interview session can achieve the objectives of the study. Since, in this study, it is likely that some of the respondents may be known to the interviewer as colleagues or former students, it can be presumed that a 'natural conversation' in a relaxed and comfortable environment will be achieved.

For this study, the interviews were semi-structured interviews, divided into sections concerned with educational background, teaching experience, teaching mechanism and teachers' perception of students' behaviour towards learning. Open-ended questions were constructed to give a freedom to lecturers to give their responses and ensure the fluidity of the conversation. This allows the researcher to ask consistent questions and record responses more systematically. The questions were open ended to match the exploratory nature of the case study design. Interviews were recorded using a digital sound recorder. In this study, two lecturers from each polytechnic that taught the engineering subject were interviewed to give at least the possibility of difference of opinion. All lecturers were offered a briefing explaining the ethical issues. The interview schedule is included in Appendix 4-D

4.6.3 Pre-test and Post-test

Wiersma, (1997), referred to a Pre-Test to a measure or test given to the subjects prior to the experimental treatment, whilst a Post-Test is a measure taken after the experimental treatment has been applied. In this study, the pre-test is helpful in assessing students' prior knowledge of the engineering subject using the traditional approaches and the post-test is administered to measure the effectiveness of the HybCoMet Strategy. Both control and experimental groups take a same pre test and post test, however, only the experimental groups received the treatment process.

Bloom's taxonomy of conginitive domains that introduced by Benjamin Bloom (Waugh and Gronlund, 2003) was used as a reference point to develop a blueprint for the pre-test and post-test to suit to the different cognitive level of students. The same questions were constructed for both pre and post tests. The questions were constructed based on the existing syllabus and have been referred to the previous assessment module and lecturers to ensure the reliability and validity of the questions. The test was a paper-and-pencil test consisting of items that require students to clarify information, solve the problem and judge the solution against the principle of the subject matter. There are open-ended questions that need to be answered within 30 minutes.

As displayed in the diagram 4.1, the post-test was measured after the experimental group had been exposed to the treatment for some period. Gay, *et al.*, (2009) suggest a period of 2 to 6 weeks can be used to determine the stability of a test. If the period is too short, the students may remember answers they made on the test for the first time. If the given period is too long, students may improve on the test due to an intervention process or maturation (*ibid*, p.159). Therefore, a 6 week interval for the pre and post tests is sufficient and could help provide realiable data for this study. Data was then collected from both groups to determine whether there is any significant difference between pre-test and post-test scores.

The detail of the pre and post tests can be found in the Appendix 4-C

4.6.4 Student Diaries

Students were asked to give a report by keeping a diary to record their observations, reactions and perceptions and to help to obtain a systematic record of their reflections on the learning process. Referring to Louise (1993), diaries are used as research instruments to collect detailed information about behaviour, events and other aspects of individuals' daily lives. The use of a diary might provide convincing evidence of the processes involved in the hybrid learning environment. Maceviciute (2006) contended that keeping a diary can offer an ideal opportunity to reflect on the new teaching practice. It is also provided the right stimulus for learners to reflect on the process, and helped the researcher to get extensive information about students' activities on specific occasions (Goh 1997). The primary purpose of the diary was to ensure reflection on the learning process and increase the validity of responses to the survey.

In this study, the diary consists of a two-page sheet with orienting questions about what students have done during the day. In this study, I named such a record as a log sheet which is distinct from more general, open-format diaries that allow respondents to record activities and events in their own words. However, this log was structured so that all activities are pre-categorised. This type of diary encourages students to appraise their thoughts and feelings about what they have learnt in more structured way. The basic design of the sheet should be familiar to most of them.

The diary was designed with a few questions that related to the task, including students' thoughts on how their own learning progressed, their interest in learning process, how they feel about their team members, their participation as a team member, and the level of competence that is mastered during the learning process. Cooper (2006) stated, "presenting the students with questions is another way of ensuring that they keep on task" (p. 74), and this will help to avoid an over-abundance of data. It is likely that the students would answer a question more easily than they can express their thoughts about the new approach in a very open format. The questions would help students to be more focused and encourage them to reflect on the new approach. Such a format could also help me to easily analyse the data obtained.

The log sheet was to be completed as soon after each learning session as possible. This would increase respondent motivation to complete the asked questions. According to Maceviciute (2006), writing a diary as soon after the event as possible often offers positive results because the feedback offers a valuable alternative to the teacher's perspective. Besides that it can also help students self esteem and make them more committed to the learning process (*ibid*).

All methods bring advantages but, at the same time, also have drawbacks. All reflective practices, especially diaries, are prone to errors arising from respondent conditioning, incomplete recording of information and under-reporting, inadequate recall, insufficient cooperation and sample-selection bias (Corti, 1993). Respondents tend to become less diligent as the period of diary keeping goes on. This may be due to the changing behaviour of the respondent over time with differences in motivation to complete the diary over the period of collection. As such, the use of diaries with more structured format as introduced in this study- the log sheet- could mitigate this drawback.

A sample of the log sheet can be found in Appendix 4-E.

4.6.5 Triangulation of Data.

Because multiple methods were used, a massive quantity of data was produced in this study. Therefore, the systematic organisation of the data was important to avoid data-overload that may have caused the researcher to lose sight of the original research objectives. To avoid this circumstance, all the methods that can be used appropriately in order to achieve the objectives were combined. Table 4.3 in the previous section shows how multiple methods and instruments may apply to this study. This process makes it easier to triangulate the data. In this way, the triangulation can be used as a validity approach to check the data drawn from several of those methods (Creswell and Clark, 2010) to address the research objective.

Triangulation is the process of using multiple methods of data collection strategies to obtain a more complete picture of what being studied and to cross check data obtained (Gay *et al.,* 2009, p. 377). Triangulation is appropriate to this study because two different approaches to teaching are to be evaluated. The triangulation of the collected data was applied wherever possible. There are several types of triangulation suitable for different purposes such as data triangulation, investigator triangulation, theory triangulation and methodological triangulation (Cohen and Manion 1994). The kind of triangulation used here can be categorised as methodological triangulation, where different methods are used on the same object of study. As can be seen in the table 4.3, more than one method is involved in the pursuit of a given objective. A triangulation method can give a conclusive finding and increase the validity of the research and also become a useful technique when, as here, research is engaged in a case study (Cohen and Manion, 1994). Some of the triangulation process was achieved and is presented during the qualitative data analysis in Chapter 6.

4.7 DATA ANALYSIS AND ADMINISTRATION.

There are two sets of data analysis; the quantitative data analysis and the qualitative data analysis. The qualitative data were analysed to generate a wide range of descriptive information that were related to the research questions. The quantitative data then were utilised as the basic framework for the qualitative analysis.

The quantitative data from the students' questionnaires were analysed using Statistical Package for Social Science (SPSS) software for MS Windows, version 15.0. By using the software it helped me to compute the data faster and more accurately. As noted by Wiersma (1997) computer programmes are useful for their analytical power, especially for some complicated analyses, because of their 'functionality, speed, accuracy and accessibility' (p. 337).The analysis methods used included descriptive statistics tests, correlation tests, factor analysis tests, paired sample t-tests and one way analysis of variance (ANOVA) tests. The techniques were used to consider the mean level of responses and any significant relationships and difference between the variables.

For descriptive statistic test, the demographic background analysis was presented using frequency and percentages. Besides that, the mean and standard deviation were used to indicate the level of use of every teaching and learning approach. Correlation tests were used to indicate any significant relation between all variables, and factor analysis tests to determine the group of common teaching approach that most employed. In order to test the comparative means (pre-test and post-test, and control and experimental groups), t-tests and ANOVA tests were undertaken to identify any significant differences between variables. For the open ended questions in the survey questionnaire, data were analysed using coding and categorisation.

The qualitative data from the interviews with the lecturers were analysed for trends in responses from the entire sample using a coding system and categorization for similar themes. Categorisation helps organize data and identifying the categories that best present the data (Gay and Airasian, 2003). Its aim is to analyse data into pyramids into at least three levels as suggested by Gay and Airasian, (2003), which are data pieces, categories and patterns. The responses were compared with the quantitative data to examine how the perceptions of the lecturers and students compared with the empirical data.

Pre- and post-tests were analysed using percentages and then the results were compared, using statistical tests, to identify similarities and differences in achievement so as to gain a better understanding of the different approaches. While for the log sheets, both analysis process; a categorisation and coding system, as well as SPSS were applied.

The following section considers in greater detail the analysis process and administration of collated data.

4.7.1 Questionnaires

The questionnaire had been constructed into two sets of questions: set 1 (pre-questionnaire) which is distributed before intervention using the HybCoMet Strategy, and set 2 (post-questionnaire) which was distributed after the intervention. In conducting a survey session using pre questionnaires, assistance was sought from a lecturer who was going to teach the sample. The purpose and conditions of the survey were explained to the lecturer, as they need to explain the same to the students. The lecturers who were responsible for conducting the questionnaire were reminded to ensure that students should answer the questions individually and that no discussion was to be allowed. Although the surveys were completed under lecturer supervision, I was happy to trust the confidentiality of the survey. However, students were found to have a difficulty in responding to question no.3 in section B of the questionnaire. Many students could not write the correct answer as requested, which might due to a problem in interpreting the questions. Therefore, it has been omitted from the research study as the data is no longer reliable for the purpose of this study. This problem should not have occurred since the questionnaire had already been piloted and some amendments should have been made to the question to make it easy to understand. Nonetheless, the omission of this data has no significant effect on the study.

4.7.2 Semi-structured Interviews

Semi structured interviews were conducted with six lecturers who were teaching the Concrete Technology in the three participating polytechnics. The purpose of the interviews was to help to investigate the teaching phenomena further and supplement the data that had been collected from the survey questionnaire that had been administered to selected students. Once permission had been sought and granted by the Head of the Department, the individual participants were contacted and appointments arranged for the interview session with the researcher. Separate meetings with the participants were arranged and audio-taped with each participant's permission.

The audiotape was played (at least three times) to transcribe it and the interview was transformed to word document transcripts. The transcription process proved especially time-consuming. The transcripts then were reviewed page by page. The interviews were conducted in the Malay language, therefore it was necessary for me to translate the interview into English in order to analyse and transcribe it easily for the purpose of this study.

The data from the interview transcripts were highlighted with the different color of highlighter in order to group, categorise and code into a relevant themes. The categories and themes that have emerged from the transcript are displayed in Figure 5.5 in the following chapter.

Categorisation and coding cannot be done with a single reading of the data. The process is 'complex and iterative', as contended by Gay and Airasian (2003,p. 236). The qualitative analysis was found to require more time to complete than the quantitative analysis. Gillham, (2000), has noted that 'a one-hour interview will take ten hours to transcribe, and five hours to analyse...." (p. 82), and this proved to be the case.

4.7.3 Pre-Test, Post-Test and Students' Log Sheet.

The pre- and post-tests were the 'pen-and-paper-based' assessment. The same questions had been constructed for both assessment sheets and conducted with both control and experimental groups in all polytechnics. The assessment had been administered by the individual lecturer who is responsible for teaching the Concrete Technology module for control groups, and myself, the researcher who was responsible for teaching the hybrid module to all the experimental groups. All lecturers were reminded not to give any advance notice prior to the assessment session. This was to help identify students' own knowledge before and after learning the topic, without the influence of memorizing the content from the textbooks. However, it was a source of some disquiet that some lecturers may have given information about the test in advance, which gave students in control groups the chance to revise before sitting the test. This did not apply to the experimental groups where students had to rely solely on the information and knowledge that they had gathered from the learning session and their prior knowledge in helping them to answer the question.

Therefore, it might not be surprising to see that all the control groups scored higher marks in the post-test compared to the experimental groups. However, the results are considered reliable for the purpose of this study as this was largely a random, rather than systematic, bias.

Meanwhile, for the log sheet, in certain tasks, only a few students managed to give their feedback. This might due to the time constraint as they need to hand the sheet in immediately after finishing each learning task. Therefore, more time was given to help students answer the log sheet precisely so as to provide more reliable information for the research study. However, as stated above, the primary purpose of the log sheet was to encourage critical reflection on learning.

4.8 ACCESS AND RESEARCH 'JOURNEY'

After the access was granted, the journey to the research site began. The fieldwork lasted from 14th July until 10th October 2008 (13 weeks) in the three polytechnics in different states in Malaysia. This period was chosen since it is the normal start for the new academic session for polytechnic. The implementation of the new teaching intervention- the HybCoMet strategy, was the main concern in this section.

In educational research, the role of researcher and researched is often clear. However, on entering the research site, I had the dilemma of whether my role was that of a single researcher or as a facilitator/lecturer implementing my own research intervention. In the first place, I had decided that I was going to implement the HybCoMet instructional module by myself at every polytechnic that I had chosen. However, due to the distance between the participating institutions, I realised that it was not feasible for me to conduct the whole research on my own. Therefore, I had to ask some selected lecturers to apply the HybCoMet Module in their classrooms. Nonetheless, at Poly B, which was within easy reach from where I was living, I decided to deliver it by myself. One advantage which this ease of access afforded me was that I had more time to prepare the teaching and concentrate on the data collection processes.

On first going to Poly B, I met the head of department and explained the purpose of my visit. I was then introduced to the course moderator and the lecturers who would be teaching the course module under investigation. After discussion with them, they agreed to participate in the study and also allowed me to take over the class and implement my intervention module. My working relationship with key members of staff at this institution was very good and I was welcomed as one of the training lecturers in that polytechnic. I have developed better working relations with the lecturers thus making it much easier to conduct the research. I was given access to all facilities, including stationery, and had my own desk to do my work. I appreciated all the support that I received as I was made to feel like one of them.

The following day, I went to Poly A and first met with the course moderator. We talked and discussed my intention to implement a new teaching approach. The course coordinator identified two lecturers who were willing to take part in the study. I subsequently met with the lecturers to discuss further details of the research including the choice of both the experimental and control groups. My intention was to ask the lecturer in the experimental group to employ the intervention module by herself because I already had to teach the experimental group in the Poly B. However, I had to modify my plans of having the two different lecturers teaching two experimental groups after the head of department expressed some disquiet over the likely effect of different teaching styles on the results. He said that different lecturers will have different styles of teaching and it might affect my findings as well. As I saw some merit in this suggestion, I accepted it. Thus, I ended up teaching two classes in both polytechnics with approximately 40 students in each class.

At Poly C, the head of department was less demanding and was agreeable with the arrangement that another teacher could use the HybCoMet Strategy apart from me. I briefed the lecturer on the HybCoMet approach and she was keen to implement it. One other point I found interesting was the possible comparison of teaching styles between me and the other lecturer in respect of the possible effect on the students' learning.

However, what had initially promised to be an interesting partnership did not come to much as the lecturer, who had freshly graduated from university, could not manage to teach the content as prescribed because of a lack of experience.

She had only been with the polytechnic for two months after graduating and so was relatively inexperienced as a teacher. This task involved a variety of skills and knowledge with which she was not familiar. Hence, she was not willing to take any risks to do something she was not familiar with and, at the same time, she had to struggle to finish a syllabus. She was worried about her inability to cope with the curriculum content and being unable to finish a course subject in a given period. Thus, I had to take over the teaching of the new approach as the lecturer was not comfortable in teaching it. I had to respect her decision and felt that I would have no problem teaching another group of students, as this is what I had planned earlier, before the fieldwork began. Finally, I had to teach all experimental groups in all polytechnics. However, I needed to properly plan my schedule and manage a number of practical issues (e.g. transportation, place to stay, travelling time, travelling cost, etc).

I finally situated myself as the lecturer/facilitator where I had to deliver and implement the teaching strategies I had developed for this study, and at the same time had to situate myself as the researcher who investigated my own teaching practice and the learning process. I am therefore, also part of the process as I have been engaged in the activities that I had set out to investigate, namely, the teaching-learning processes that were located in the ‘natural settings’ of polytechnic classrooms. I also found that, besides the desire to accomplish the teaching task, the role of the lecturer-researcher is really a tough and time-consuming job. Despite the exhaustion caused by this role, I finally managed to balance the competing roles of researcher and lecturer and this type of research allowed me the freedom to be directly involved in the classroom learning process.

Among its advantages, it is agreed that the role of lecturer/facilitator-researcher helps to produce more accurate information and an understanding of the attitude and behaviour of participants under investigation as it affords the researcher a lot of unfettered access to the participants in real life teaching situations. As I am a part of the learning environment that demands my full engagement, I am able to discern ongoing behavior as it occurs and able to make appropriate notes about its salient features. To be with the students for certain periods helped me to deliver the new teaching strategy more effectively and understand the actions of students who learn in the classroom, which then provide deep and rich data for my research project.

Below is the summary of my 'journey' in the data collection process.

Table 4.6 : Summary of Data Collection Process

Week	Task
WEEK 1 (14th – 18th July)	• Distribute a draft of the HybCoMet Instructional Module for final review and proofreading by a few lecturers in a technical university. The draft was also distributed to three lecturers in polytechnics. It was assumed that all these reviewers would be able to provide an enlightened input, as they were considerable experts in the field, as seen from their experience in the related field. • This task was important to make sure the content was appropriate for the students, the input clear and well-organized and the final output relevant and suitable to deliver to students.
WEEK 2 (21st – 25th July)	• Making phone calls to all selected polytechnics to inform them of my arrival as well as working out the best times to arrange the research appointments. • Collection of feedback on the HybCoMet Instructional Module from all reviewers. • Making corrections and amendments. • E-mailing amendments and corrections to supervisors. • Waiting for approval of amendments and corrections from supervisors.
WEEK 3 (28th July -1st Aug)	First visit to all polytechnics during which I met the Head of the Civil Engineering Department. • Negotiating access to the department (granted unrestricted entry at any time). • Seeking formal permission to conduct the research study. • Brief explanation about the purpose of the study and the introduction of the HybCoMet Module. • Negotiating most suitable time for commencement of data collection. Meeting with the Course Moderator (leader of the programme): • Discussion of who the study participants were going to be (lecturers and students). • Final choice of participants (as suggested by the Course Moderator). • Revision of the teaching schedule and timetable of the selected lecturers to suit to my schedule. Approaching the selected lecturers: • Personal introductions and briefing on study objectives and anticipated manner of participation by participants. • Scheduling of future meetings, a time for the next meeting and arrangement for interview sessions.

Week	Task
	Interview first participant from Poly A (Razmi) and Poly C (Elda). *Not all lecturers could be reached in the same week so arrangements were made to phone them in the following week to organise the next meeting.
WEEK 4 (4th -8th Aug)	• Edit and correct the module based on comments and feedback from supervisors. • Make a copy of complete draft of HybCoMet Module and get ready to distribute to the lecturers in experimental classrooms. • Distribute the module and give a brief explanation to the lecturer. • Meet the rest of the lecturers for introduction session and arrange for interview session.
WEEK 5 (11th – 15th Aug)	• Officially reporting for duty report to the head of department as I was to teach and deliver the lesson in the experimental classroom. (Reason for this duty will be explained briefly in the conclusion chapter.) • I have positioned as a training lecturer in the department. • Interview the remaining participants from Poly A and B (Farrah and Noreen).
WEEK 6 (18th – 22nd Aug)	• Revise and review the HybCoMet module. • Prepare material for teaching. *Mid-term break for polytechnics (1 week)*
WEEK 7 (25th – 29th Aug)	• Distribute questionnaire to all samples in all polytechnics. • Conduct pre-test with both control and experimental groups • Start to analyse the data obtained and decide on how to organize all groups to go through the HybCoMet learning process systematically. • Implement the HybCoMet module - Task 1.
WEEK 8 (1st – 5th Sept)	• Implement the HybCoMet module - Task 2. • Interview Deena from Poly B.
WEEK 9 (8th -12th Sept)	• Implement the HybCoMet module - Task 3. • Interview the final respondent, from Poly C; Rania.
WEEK 10 (15th -19th Sept)	• Implement the HybCoMet module -Task 4
WEEK 11 (22nd – 26th Sept)	• Implement the HybCoMet module - Task 5. • Conduct post-test with both groups. • Distribute post-questionnaire to the experimental groups.
WEEK 12)	• Finalize all marks for tests, quizzes and assignments and up-

Week	Task
(29th- 3rd Oct	dated attendance sheet to be submitted to the former lecturer. • Prepare initial report and findings to be submitted to the head of department. **Polytechnics are closed for celebrating Eidul fatar (1 week)*
WEEK 13 (6th -10th Oct)	• Submit completed marks and attendance report to the former lecturers and thank them for their cooperation and participation in the study. • Submit initial report and findings to the head of department and thank them for their cooperation and assistance while conducting the study. • Say good-bye and thank you to all lecturers who were involved directly or indirectly in the study.

At the end of the cycle, the fieldwork site visits and planned tasks, including both research and teaching tasks, had been completed and responses received from the students, teachers and the heads of department who had been fully committed, helpful and supportive throughout. It is important to have the cooperation of many people in conducting a research study to ensure a successful implementation (Gay and Airasian, 2003).

4.9 CONCLUSION

This chapter discussed how the research design and methods were selected and rationalised for the selection made including the methods involved in collecting data, sampling, analysing, and in data collection processes. Overall, this study used a range of methods in order to obtain the data including both quantitative and qualitative approaches. In summary, there were four principal instruments employed during the data collection process which are questionnaire surveys, semi structured interview, pre and post tests, and log sheet.

Multiple measurement methods, both qualitative and quantitative, have been used to supply ‘richer descriptions and analysis of the results’ (Phuong-Mai *et al.*, 2009, p. 862). The combination of both quantitative and qualitative methods could reveal other important issues related to the teaching and learning process in this study.

The use of case study with small scale quasi experimental designs with combination of multiple methods for data gathering process provides a new way of viewing research which will enable the researcher to reflect on what was happening. This is another merit of this research study. The use of multi-methods of data collection may provide opportunities to triangulate the data in order to strengthen the research findings and the conclusions. This, it is hoped, will contribute to a new direction in collecting educational research data.

As the above chapter shows, in considering the HybCoMet Strategy, a mixture of quantitative and qualitative data analysis allows one to consider both objective and subjective data. An expanded case study approach, with the used of various methods in each study, is considered to be optimal in this case.

Besides the above points, the fieldwork in each case site provided a lot of experience which I consider as an invaluable addition to my knowledge that could not be acquired from reading materials. This fieldwork has helped to change my perceptions about doing case study research and also helped me to learn more about how teaching and learning interact in the analysis.

CHAPTER 5

FINDINGS 1: CURRENT TEACHING PRACTICES IN MALAYSIAN POLYTECHNICS

5.1 INTRODUCTION

This chapter focuses on teaching approaches that are currently implemented at polytechnic level and the issues surrounding the choice of those approaches. The discussion will be based on findings from interviews with lecturers and a survey of students using a set of questionnaire (Set 1). Data from interviews will present teachers' reflections on their careers and their current teaching practices in a classroom learning session, and also share teacher's perspective about students and their learning behaviour in the polytechnic. The data collected from the questionnaire was helpful in providing basic information about students' perceptions of the module, the subject matter and the regular teaching and learning practices employed by their lecturers. The student data was supplemented with findings provided by lecturers in the interviews to reflect on the lecturers' mode of delivery in teaching the civil engineering subjects, and evaluations of student's learning strategies. The interview data is helpful to determine any differences in understanding/opinions between lecturers and students with respect to academic performance and aspirations. The findings from the questionnaires are as important as the interview, in terms of triangulation. Any conflict of agreement between both lecturers and students will be discussed further in the conclusion chapter.

In this chapter, the lecturers' perceptions on current teaching methods and materials are anaylsed and presented. The analysis is to answer the first objective of this research study: to evaluate current teaching approaches in the delivery of the civil engineering module in polytechnics. This is followed with an analysis of students' perceptions on lecturers' delivery modes and students' learning strategies, with the intention to explore the elements of generic competences. Findings from open ended questions are also discussed in this chapter. Note that the new module will be considered in chapter 6.

5.2 ANALYSIS OF CURRENT TEACHING APPROACHES: LECTURERS' PERSPECTIVES

Data for this section consists of interviews with lecturers who were teaching an engineering subject, the Concrete Technology module in the three participating polytechnics. Lecturers who were teaching the Concrete Technology module in every group of students sample were automatically selected as respondents in the interview session. There are six lecturers in total who were involved in the semi-structured interview process with two teaching representatives from each polytechnic.

The first part of this section gives a brief explanation of participants including their teaching experience, professional background, higher qualification, and also their attitudes while teaching in the current polytechnic. The following section presents findings on the most common teaching approaches employed during a teaching session. Lecturers' teaching preferences and problems that they encountered while performing the job are also highlighted in this part. Challenges and obstacles faced by lecturers while delivering a lesson and desires to perform good practice are described in the third section. The final section explores lecturers' opinions on how teaching and learning could be improved.

5.2.1 Lecturers' Backgrounds

In this section (see Table 5.1) the participants' brief biographies are presented. While the information presented is authentic, pseudonyms are used to enhance confidentiality. All names were created for the participants, and only known to the researcher.

As can be seen from Table 5.1, of the six respondents, only one is a male respondent, who is Razi. Further information on the participants' profiles is presented in Figures 5.1 and Figure 5.2, respectively.

Table 5.1: Lecturers' Biographical Background

Sample	Biographical background
Poly A	
1. Razmi	A 30 years old male lecturer who is a diploma holder in Civil Engineering with Education from a local university. He has been teaching in this polytechnic for 6 1/2 years, since February 2002.
2. Farrah	A 27 year old female, has a Master's Degree in Education and currently doing her part time study of Doctor of Philosophy at a local university. She joined this polytechnic in 2005. She started teaching at the polytechnic on completion of her university studies and this was her first teaching post.
Poly B	
3.Noreen	She is a 35 year old mother of three. She started teaching in the polytechnic system in 1998 with a Diploma qualification. Currently she is doing her part-time Bachelor's degree. Poly B is her second place of posting and she has been in this post since 1999.
4. Deena	A 31 year old female lecturer. She has a Diploma in Civil Engineering. This polytechnic was her first place of employment and she has been in continuous service in the same polytechnic for the past 10 years.
Poly C	
5. Elda	A 28 year old female who has served as a polytechnic lecturer for 5 years. She joined this polytechnic after completing her study in 2003 with a diploma qualification from a local university.
6. Rania	A female lecturer aged 34 who read for her Bachelor's Degree in 2005. Prior to teaching in the polytechnic system she worked for the Department of Ministry of Education. She started her career as a lecturer in year 2000. As a lecturer, she has served in three different polytechnics and has worked in this polytechnic since 2006.

Note: The year in which data are collected is 2008.

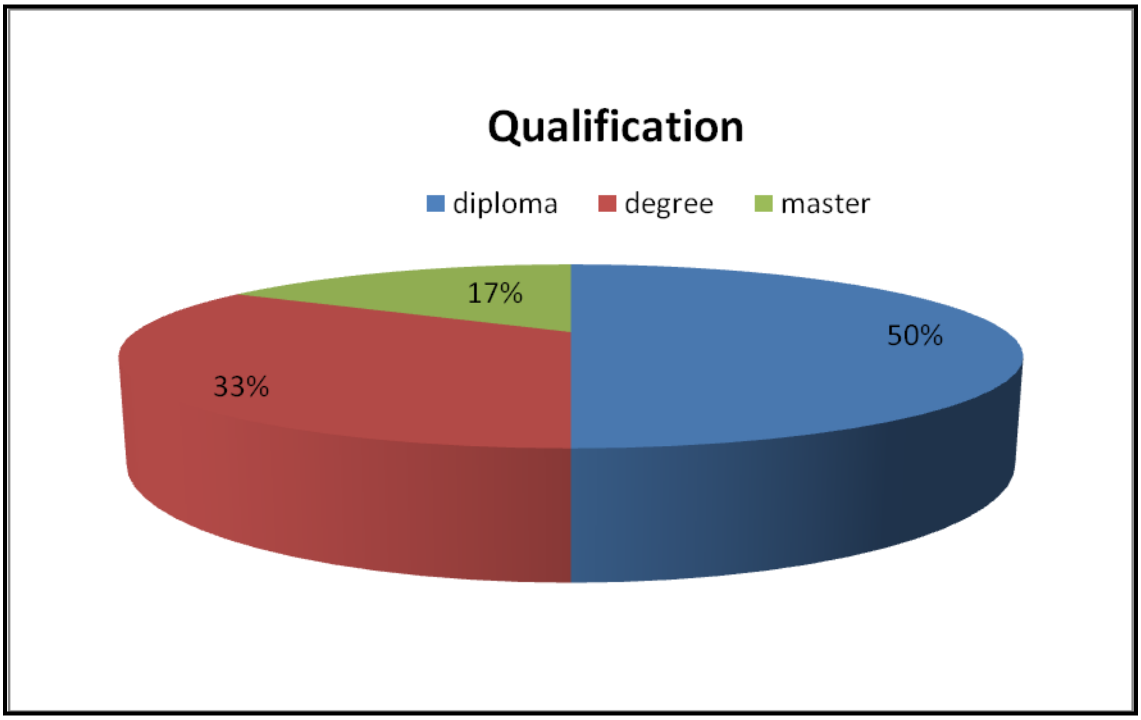

Figure 5.1: Lecturer Academic Qualification

From the interview scripts, lecturers who participated in the study have different qualifications ranging from Diploma to Master's level as can be seen in Figure 5.1, with the majority holding diploma qualification (50%).

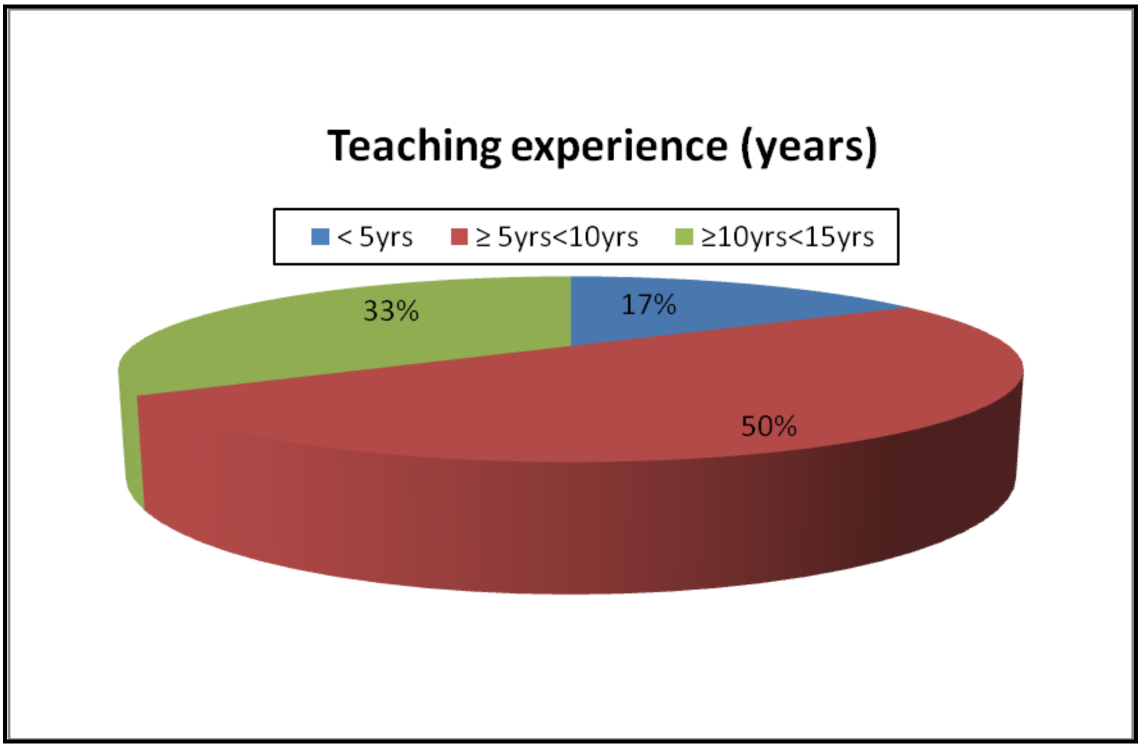

Figure 5.2: Lecturers Experience in Teaching.

As displayed in Figure 5.2, most of lecturers have more than 5 years teaching experience (88%) which speaks to the hands-on experience they have acquired over the years.

This result may be considered to be typical of the polytechnic staff insofar as the lecturers are qualified and experienced enough in their profession. This experience was potentially useful in terms of engaging the participants on issues relating to teaching and learning as they had ample time to see what worked and what were some of the challenges in their own teaching. This experience was important as all experience can have a formative effect on teaching ideologies and approaches to teaching, and expectations for their career (Sikes, 1992).

Many of the lecturers have been in the same polytechnic since their initial posting except Rania, who has worked in two different organisations, the polytechnic system and the Ministry of Higher Education. Working in different contexts might provide teachers with a broader perspective for tackling challenges experienced in the teaching environment. The experience might be very helpful to deal with students having different level of achievements and backgrounds. Rania has benefitted from those experiences as she stated;

"Considering my teaching career, so far so good. Because I have experienced working on a construction site, so, I managed to organize all topics, which is too much for the syllabus, in a 1 hour teaching period. Other lecturers such as those who are inexperienced in working at building construction sites, who don't have experience working outside of polytechnics, they might find it difficult to manage and finish all the topics in a 1 hour teaching session"

To explore further their feeling about teaching and being a lecturer in a polytechnic, lecturers were asked the following question; '*What do you enjoy about being a lecturer in a polytechnic?*' In response to this question, the following were given as feedback by the respondents:-

(1)Razmi : *Being a lecturer in polytechnic is ok, not too bad. The students are ok, and the teaching tasks are ok as well. But the problem is behind the teaching, our additional tasks; sometimes it is burdensome with additional duties outside the classroom.*

(2)Farrah: *I love teaching. Even before this (joining polytechnic), during the term break, I served as a tuition teacher in one tuition centre at my place. The thing that I enjoyed was teaching because it gives one an opportunity to interact with, and communicate with students and it gives one the opportunity to teach others.*

(3)Noreen: *I love teaching in this polytechnic. The first reason is because this polytechnic is close to my house. Secondly, we can gain more experience from what we have taught.*

Besides, there are many facilities provided especially for practical work, we have new and sophisticated equipment. In the previous polytechnic we had to use the manual one (equipment) which has the needle to show reading, but in here, it is more of a digital system which automatically produces a reading.

(4) Deena: *Yes, of course. I enjoy being a lecturer.*
I love teaching. I like to meet my students.
And I think being a lecturer is a suitable career for me as a woman.

(5) Elda: *Being a teacher....is ok... I like to be a teacher....*
Being a teacher means you have to teach, then you need to teach…
You like it or not, you have to do it!.

(6) Rania: *Teaching civil engineering courses is my area of expertise. I have been teaching in this area since my first placement. I've taught few subjects; such as Survey, Concrete Technology, laboratory and practical work. I've been teaching similar subjects in this polytechnic. So far I've been teaching subjects that are relevant to the course taken during my bachelors study. So...it is fitting to my experiences.*

From lecturers' statements and an analysis of the above transcripts, the majority of the lecturers gave positive feedback regarding their teaching in polytechnics which is a good starting point in terms of engaging the lecturers as professionals. While this was the case, some like Razmi felt overwhelmed as they had additional administrative responsibilities which appeared not to take into account their other competing commitments. Elda's statement also suggests that she has to be occupied in this kind of employment as she is only qualified for this profession. Though teaching and being a teacher fits her, this might not be her first choice of profession. However, a teacher ideally must be a teacher where they can be 'the sort of teacher they want to be and be seen as being' (Sikes, 1992, p. 41). Nevertheless, through the conversation I can see that most are passionate about their career and show their commitment to doing this job. Razmi and Elda value their role.

The rest of the lecturers generally showed their passion and enthusiasm in taking teaching as their career. Rania for example, when asked about her preference between a career in administration and a career in teaching indicated that she prefers teaching as opposed to a life in administration as she had the opportunity to try her hand at both areas. She had a special preference for teaching as it gave her practice in familiar territory that drew upon her area of expertise. This gave her positive contribution to the classes she taught as she was operating in more familiar territory. The interest and knowledge possessed by a lecturer has been perceived as playing a critical role in enhancing learning as it can provide an atmosphere conducive to learning (Walklin, 1990) thus helping in students' learning development. The passion and commitment that teachers have may significantly influence the students' learning process (Glover and Law, 2002). This passion can be passed on to the students thereby enabling the learners to become better learners.

5.2.2 The Most Common Teaching Methods and Materials/Aids Employed by Lecturers.

Lecturers were asked to rate 'yes' or 'no' to questions related to the most common methods and materials that were being used in classrooms. The question relates to teaching strategies that are adopted by lecturers while teaching the Concrete Technology subject. In all, ten methods were listed which were seen as the most usual methods that were used by lecturers in delivering a lesson which are lecture, group discussion, debate, demonstration, project work, problem-based learning (PBL), inquiry, contention, simulation and tutorial. Figure 5.3 shows feedback given by lecturers regarding teaching methods that have been employed in a classroom.

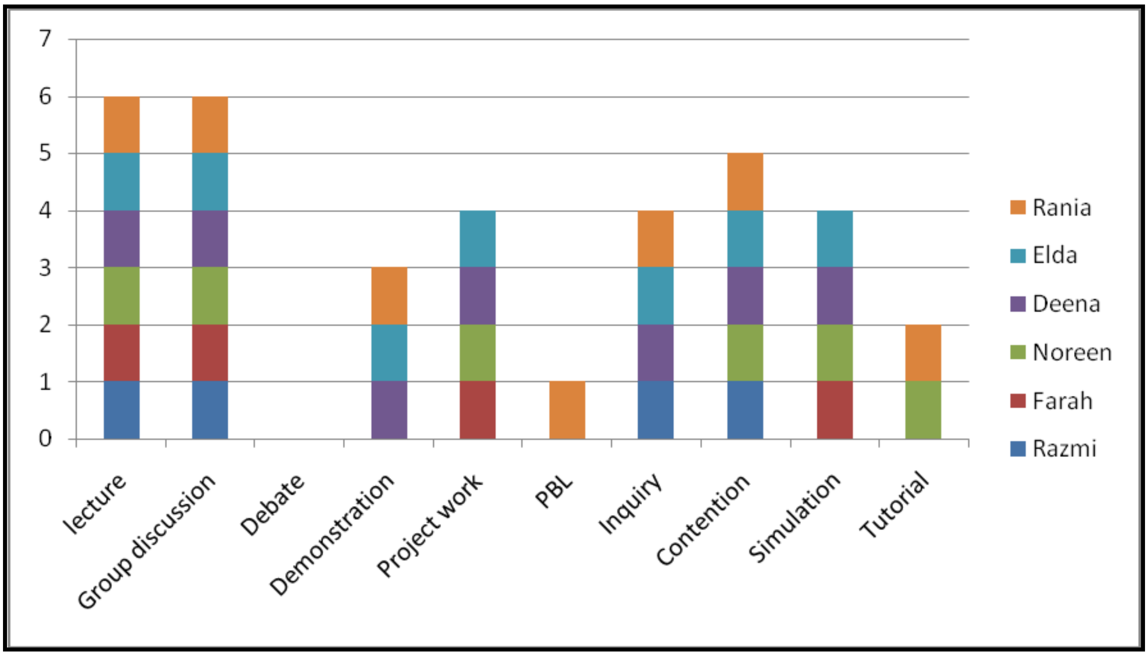

Figure 5.3: Most Common Teaching Methods Used

While different methods were identified, there was unanimity in respect of the use of the lecture method and group discussions which were perceived as the most frequently used. Other methods that were identified as coming next in line were contention, project work, enquiry and simulation which were rated as the second favourite methods conducted in classrooms. The rest of the methods (PBL, tutorial and demonstration) were less applied during the learning process, with only one or two lecturers who applied them (Rania and Noreen). However, nobody applied debate in their teaching practice. This finding suggested that teacher-centred approaches are dominant among approaches employed by lecturers.

From the chart, it also can be seen that Rania, as well as Elda has employed almost all of the methods while delivering the subject. They both might have high enthusiasm towards their teaching practice.

Lecturers were also asked to rate eight teaching materials/aids that are frequently used while delivering a lesson. Figure 5.4 displays feedback given by lecturers regarding teaching materials/aids that have been employed in a classroom.

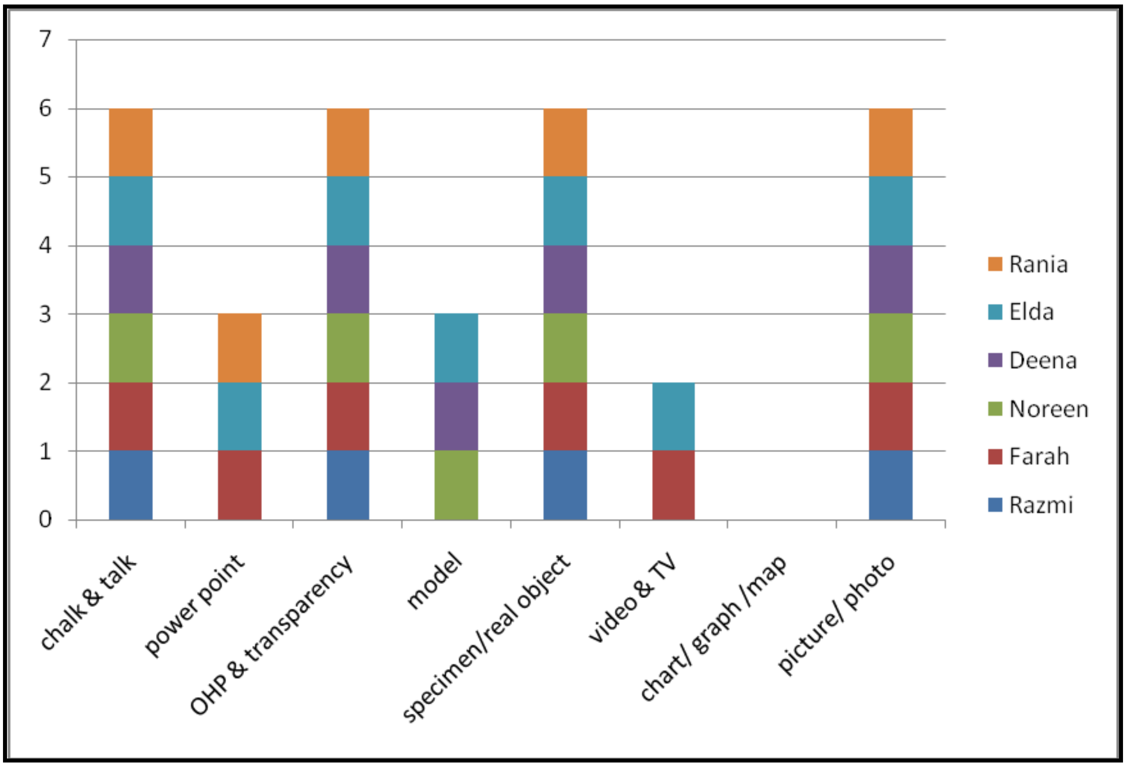

Figure 5.4: Most Common Teaching Materials/Aids Used.

From the figure, it can be seen that all lecturers have chosen chalk & talk, OHP & transparency, specimen/real object and picture/photo as the most frequent materials/aids employed in their teaching. The figure also showed that Elda and Rania are the lecturers who employed the fullest range of the materials in their teaching.

Power point, model and video & TV were moderately used by the lecturers. While chart/graph/map seems not a favourite choice of teaching materials/aids while delivering the Concrete Technology subject. More discussion on findings of these methods and the reason for selection of such strategies are further expanded in the next part. The next part also discusses the reasons that limited lecturers' choice of each method and material and also those challenges and obstacles faced by them while delivering a lesson and while desiring to perform good teaching practice.

5.2.3 Challenges Faced by Lecturers in the Quest for Better Teaching Practice and Barriers to the Use of Alternative Approaches to Teaching and Learning

This part focuses on lecturers' reflections on the question; "*Is there any problem that stops you using those teaching approaches regularly, and how do you propose to improve your teaching practice in this polytechnic?"* For this part, the interviews have been transcribed, then categorised with a range of synonyms and words associated with keywords. Four keywords (categories) have been extracted from the scripts; students, lecturers, subject/syllabus and teaching facilities. Figure 5.5 overleaf outlines the words which were associated with the categories as were transcribed from the interview.

According to the lecturers, these four factors (students, lecturers, and subject/ syllabus and teaching facilities) become a main challenge in performing their teaching duties and could be barriers to the use of alternative approaches to teaching and learning. These will be discussed in more detail in the appropriate section that follows.

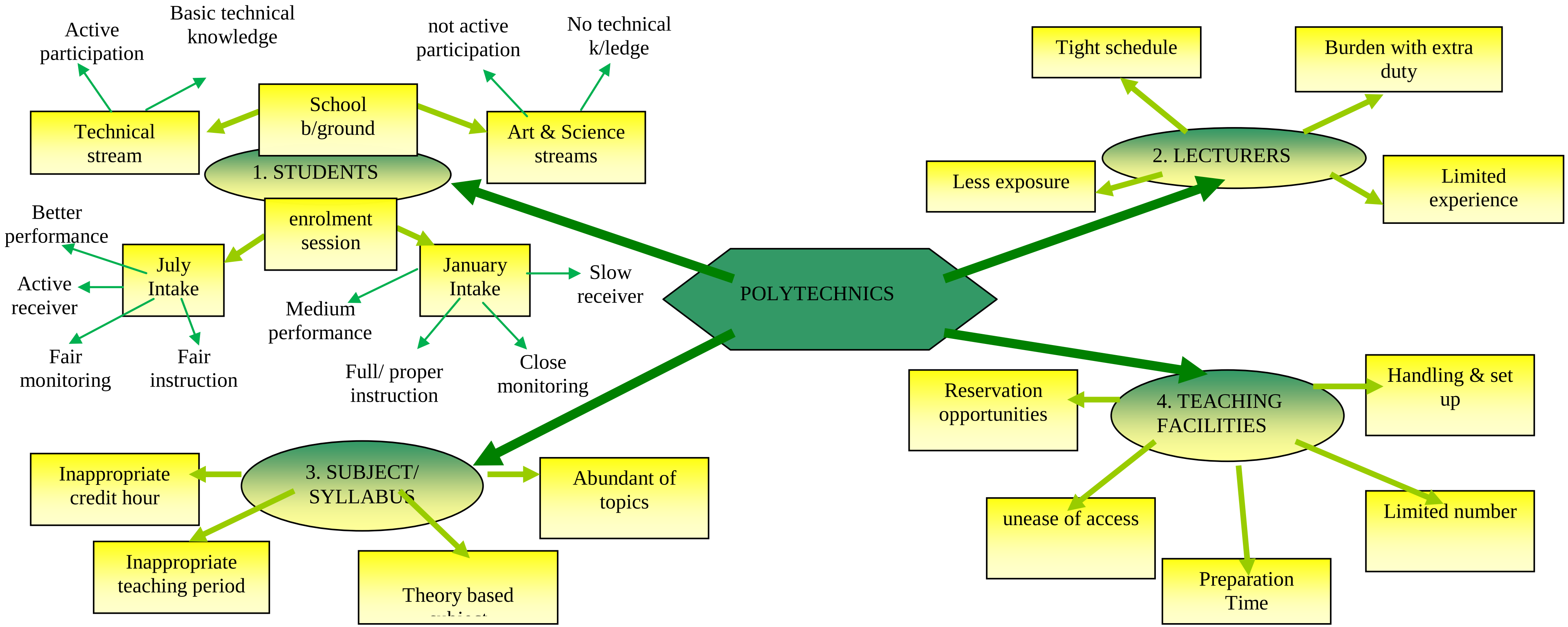

Figure 5.5: Factors that Influenced Lecturers' Choice of Teaching Approaches.

(a) Students

From the interview transcripts from lecturers, and as summarised in Figure 5.5, students can be classified into two categories based on their school background and enrolment session. Polytechnics have two sessions of enrolment. These are for the July intake and January intake. The July intake is the first intake of students who are freshly enrolled after they finished their Sijil Pelajaran Malaysia, SPM (The Malaysian Certificate of Education, equivalent to GCE O level). The January intake is normally for students who are enrolled for the next enrolment session (usually 6 months after the first group).

According to Razmi (sample Poly A), basically, this group of students is not able to pursue their studies in any other further and higher education institution, and their academic achievement is somewhat lower than that of the first group. This group is generally perceived by lecturers to have difficulties in their learning processes as they usually have lower achievement in the SPM. They need close monitoring, guidance and facilitation from lecturers during each learning session, and are generally too dependent on lecturers in many aspects of learning. They usually score lower marks in the exam and are also known as 'second level students', which is a euphemistic way of indicating that they were not bright students.

It was also noted that they create more disciplinary problems as can be seen from the following quote;

"We have quite a problem with students in January intake. They have problem in learning, 'slow receivers' and this needs us to give more detail in explanation. Both of these intakes, I have to teach in a different way" (Razmi).

In contrast, the July intake was much more independent in their learning and managed to accomplish any task given with less guidance from lecturers.

"July intake, I can say is much better. Hmmm... for example, they are fresh, when we give any assignment, even about a topic that I did not teach in the classroom, I can just leave them alone to do the assignment. There is no need for me to guide them closely. They have their own initiative to find out additional information and materials for the assignment.

But... for the January intake, I can't leave them alone. I have to guide, and explain in detail what are required for the assignment. We need to do it properly" (Razmi).

The lecturer's impression and expectation of their students, basically, will influence the behaviour of their students during learning. Teachers tend to stereotype students according to their past experience of common characteristics. On this basis, students may be given certain labels (as in this study students being labelled as '2nd level students') which indirectly, can affect their progress and performance (Walklin, 1990). Students tend to behave as lecturers would expect them to behave which then constructs the lecturers' approaches to teaching (*ibid*).

Besides that, the participating students come from different secondary school backgrounds and different disciplines, namely the art stream, science stream and technical and vocational stream. From the feedback in the questionnaire, the majority of students come from technical & vocational school. Therefore it might be observed that they might not have too many problems in learning at polytechnics as the learning styles are similar. However, this is not always the case:-

"We should know how to tackle students to understand better. Even they are from a technical & vocational school background, but when they enter polytechnics, they are just like students from daily school. They cannot perform well and sometimes they cannot understand anything even they did have some basic knowledge. We have to teach them from the very beginning. We cannot expect that students who come from technical & vocational school, to understand everything" (Elda).

Not all lecturers have the same point of view as Elda. Rania, for example; acknowledged that this group of students (from technical and vocational schools) had a prior knowledge about technical subjects that gave advantages to them, as well as to their classmates.

"Ok. Polytechnic students mainly come from two school streams. If they come from technical & vocational school, it might be easier in learning, they have more exposure to this. They can easily imagine the topic while we give explanation. And one good thing about these students, while doing laboratory work, or workshop, is that they will mix with students from other school backgrounds. So they will work together and help the friends from different backgrounds who cannot understand or not really understand about technical 'things'" (Rania).

Her statement suggests that students from technical & vocational streams appeared to be much more at ease since they generally had foundation knowledge of subjects offered in these institutions.

This group of students seemed to be privileged by their previous learning experience which is an extra asset to help their studies in polytechnics. This would also give advantages to teachers as they could plan for more active learning and gear this to student-centred learning as students are more independent and could manage their own learning. However, Schomburg (2007) has agreed that type of secondary education may not be a sufficient measure to identify success of students at further/higher education level and Rania's view was not shared by all lecturers.

The perception of lecturers with respect to their students' learning is very critical as lecturer attitudes can affect students' learning to a great extent. According to Bruer, cited in Glover and Law (2002), a good teacher will try to adapt students prior knowledge to help them understand and remember new knowledge, and good teaching will lead to better learning and help students gain good grades for their courses (Remedios, 2008). Accordingly, it is important for lecturers to understand that students come from different backgrounds and have different achievement levels. Lecturers should not place too high expectations on their students as, if unrealised, these might disappoint lecturers and they will become demotivated from teaching (Avis and Bathmaker, 2007). As such, lecturers should plan teaching and prepare approaches that can suit various levels of students.

(b) Lecturers

As mentioned earlier, most lecturers have more than 5 years teaching experience in polytechnics. They are very familiar with the surrounding area, rules and regulation and understand their students as this is the place to which they were posted since their first involvement in their teaching career. From the interview session (as in section 5.2.1), most of them enjoyed being a lecturer in their institution as they can gain experience, develop their career paths and share their expertise with the students. Even though two of them (Razmi and Elda) seem not too pleased to be teaching, nonetheless, they showed a high commitment in their profession and managed to perform their teaching tasks.

Besides their professional role as a lecturer, generally, many of the lecturers in polytechnics have to handle some other additional duties/roles. In the Poly B context, lecturers have a role as Academic Advisor/Counsellor (well known as a PA).

This is an additional responsibility that lecturers have to shoulder across the Malaysian higher education system. The PA is a lecturer who is appointed to give academic and personal guidance to designated students from respective programmes. Some of the responsibilities entail discussing with each assigned student the problems that the student will be facing and finding ways to overcome these problems. Another purpose of this system is to let the students become well acquainted with their lecturers as a way of bridging the relationship between them (UTHM, 2004).

The PA role has a number of advantages principal amongst these is the fact that the lecturers become the dominant positive influence in the students' learning experience and also provide guidance at the most critical periods both inside and outside the classroom.

"PA is a Academic Advisor/counsellor who takes responsibility of students as their guardian starting from the first steps into polytechnics in semester 1 until they are graduated. For diploma programme, three years and two years for certificate. They are quite dependent on us" (Noreen).

I can see through the conversation with Noreen and in extracts above, that students have expectations of their PA in many aspects of their student life. They expect a lecturer, as PA, to be somebody to care about them. PA positions, more or less, might also influence students' behaviour and attitudes towards their learning.

There is a different scenario in Poly A, where the lecturers have to undertake other additional administrative tasks. Razmi has been appointed to handle students' disciplinary matters. The job sometimes required him to take some actions which are both tough and emotional:-

"You know what? At one level, I have to be a security guard. Inspect students who have a discipline problem. Standing at the guardhouse and when students come…wearing an outfit that is not according to the regulations…I have to take an action. I have to ask them to go back home and change it to the proper outfit".

Razmi states that this job sometimes is a burden to him and interrupts his original task as a lecturer. It demands his full attention and cooperation in order to cope with disciplinary problems that are created by students, and sometimes involves an emotional aspect as well:-

"We have lots of additional tasks compared to teaching tasks. As myself, I don't have many subjects to teach but the additional tasks are an interruption to my teaching" (Razmi).

Both situations – advice and discipline – discussed above have become a tension faced by lecturers. They have to be involved in both academic and non academic tasks. Lecturers feel they have to invest more time and energy on student problems and administration management. As they have had other tasks to concentrate on, it might not be possible to increase the focus on their original task, as a lecturer, and this, might impact on students' learning capacity.

The administrative demands impact on lecturers and sometimes could lead them to reduce the time for preparation and concentration on the classroom learning process (Chapmen *et.al* 2001). The additional workloads can sometimes limit lecturers' creativity. Therefore, it is necessary for lecturers to manage their time to balance their commitments inside as well as outside the classroom.

(c) Subject/Syllabus

The subject that has been chosen for this study is Concrete Technology. The selection of subject was at the suggestion of polytechnics lecturers after informal discussions with a few lecturers who were not involved in the study. This subject carried 1 credit hour, contains eight main topics with a few other sub topics (refer to Appendix 2-B) and it is known as a theoretically-based subject. Only one hour is provided for teaching this subject in a week. Most of the lecturers who were interviewed complained about the shortness of teaching periods. They said that it was difficult to deliver all the topics within the time constraints. Due to these circumstances, they were not able to plan many teaching activities and were unable to vary the mode of delivery.

"Try to imagine, if we plan to use a LCD projector in a 1 hour teaching session. Students have to rearrange their seats and so on which sometimes takes about 5 minutes. Then we have to set up the projector. Usually the facility is not enough, and it sometimes collides with other lecturer commitments. So we cannot use it anymore. As a conclusion, I can say it brings too many problems. 1 hour is too short". (Noreen).

Time is the major issue faced by lecturers. According to Sandholtz *et al.*, (1997), time is considered as one measurement to determine student's engagement in learning, therefore a sufficient time allocation for the subject is important to gain students' engagement. Some lecturers claimed that the allocated time (8 topics to be covered in 15 hours of learning sessions) required them to only apply teaching methods that were available in a classroom, such as white board and Over Head Projector (OHP). Lecturers have to deliver the subject content in approximately in 15 weeks out of 20 weeks of course length. Polytechnics have 1 or 2 weeks mid-term break, and the remaining time is designated to exam preparation, including an exam period (refer to appendix 2-B for further details).

Lecturers normally have to concentrate on summative strategies for assessing students' performance. Therefore, it is essential for lecturers to make sure they can finish the lesson and complete the course in a given time period. This is the normal phenomena where a centralised exam system is set up for the students in Malaysia (Embi and Hwang, 2007), as discussed in Chapter 2

The provision of limited teaching hours and insufficient credit hours for the subject became one of the considerations when planning for teaching activities and choosing teaching strategies. The limited teaching hours pose an obstacle for lecturers varying their mode of delivery, as they have to speed up to cover all topics in the syllabus. This is a content-driven approach to teaching as lecturers have to deliver content within a set time-frame. Lecturers have strong concerns regarding time and this becomes a restriction for them when planning for more variety and an interactive learning environment and they may naturally choose a more didactic form of teaching. Glover and Law (2002) have demonstrated that the pressure of time in an overloaded curriculum has led teachers to complete each course in a didactic way.

Moreover, with this limitation, some participants are stymied at attempts to vary their mode of teaching as they feel pressured by time constraints and may therefore reduce their preparation time. Although a lack of time typically does not stop lecturers from teaching, it sometimes kept them from progressing further in adopting innovative methods (Glover and Law, 2002). For this reason, 'chalk and talk' becomes the most preferable teaching strategy for its ease of use and access and reduced need for preparation. For colourful learning sessions, lecturers sometimes deploy OHP and transparencies to display teaching inputs. The detailed findings on the current teaching approaches employed by lecturers are presented in Section 5.3.

Besides teaching the Concrete Technology subject, the lecturers are required to teach two or three other subjects, which is a further time pressure. Elda states that:-

"If we think about doing something, we have to consider that we have many classes to teach. This is not the only class (concrete technology). If we have to concentrate only on this class, it might be ok. But we do have other classes to handle. It's too packed... our time table is tight. We don't even have enough time for preparation as well".

These teaching loads also constrain lecturers in varying their teaching practice.

(d) Teaching Facilities

When lecturers were asked about alternative methods and materials for teaching, they showed their eagerness and enthusiasm to adopt them, but they also stated that they had to be content with whatever methods and materials are available in a classroom. They were keen to implement as many strategies as possible, but they have to comply with the reality of polytechnic teaching and learning facilities.

"For me, once polytechnics have been upgraded to higher level institutions, facilities should be complete. Now, not all classes are equipped with OHP. Sometimes we have to borrow one from the next class. If it is being used, then we have to postpone the lesson. If we want to use the LCD projector…we just have two units, one belong to the Civil Construction Division, and one for the Architecture Division. We do have two units of video as well. Just imagine if all sixty lecturers want to use the same facilities at the same time. So, that's the problem" (Razmi).

There are limited numbers of teaching facilities and lecturers face difficulties while dealing with audio-visual equipment, such as slide projectors, and TV and video. Due to the limited availability of these facilities, reservation priorities, limited access and the problems of setting up the equipment, lecturers feel frustrated and that discourages them in tems of using these facilities in the classroom.

"We do have slide projectors. But we have to book them in advance. If somebody has taken it we can't use it. Moreover, we have to bring our own lap top. Usually we just use OHP. What to do? That's the only one we have!" (Razmi).

As stated by Razmi, the problem of limited resources sometimes interrupts the whole teaching and learning session, or else, he has to find other alternatives to make sure the teaching process progresses. Therefore lecturers do not feel encouraged to bring technology into their classroom:-

"The technology is there, but the facility is not enough, especially the projector. It is the main problem" (Deena).

According to Deena, the use of such technology as LCD and computer technology depends on time and resources (availability). As expressed by Glover and Law (2002), technology, while it may be desirable, may be not possible. Furthermore, lecturers need to spend more time in preparation and they feel that they do not have 'payback' for their time. However, this lack of technology can encourage other creative teaching techniques by acknowledging everything that can be found in a classroom:-

"Because we have only 1 hour to teach, usually I just used an OHP, besides pictures and photos, and also everything that we can find around us, inside the classroom. Such as beams and columns....I just showed them what we can see around the room. It is really helpful to do this." (Noreen).

Sometimes, lecturers have to ask their students to imagine what they can see around their living area and surrounding campus area to frame the lesson:-

"Ok, if you go to a construction site, can you see the big steel…yes...that is type T, and the steel that goes around the big steel is type R. And as I want them to understand about the building structure, I show them what we have in a classroom such as beam, column and slab" (Rania).

"Ok, if I can, I wish to employ many teaching strategies. For instance, a LCD projector and others. But, because we have time only for 1 hour, we can only use OHP, besides picture and photo, and other objects that can be seen and available in a classroom that we can show to students" (Noreen).

They claim that this way of teaching is reflected in students' learning behaviour. This demonstrated that lecturers have the initiative to vary their teaching practice, but they need more time and opportunity to perform their skills in teaching. Overall the pattern of teaching and learning process in the majority of polytechnics under investigation is more akin to a typical traditional classroom teaching approach. Compounding these barriers, classroom teaching approaches have obviously been influenced by a national curriculum setting that put lecturers in a dilemma.

The Malaysian education system, in particular the examination system which is centralised for all polytechnics and focuses on a summative exam structure, has a more content-driven approach, with a restricted choice for lecturers to implement their approaches to teaching (as discussed in chapter 2). Lecturers have to make certain decisions on their preferred approaches, which impact on their teaching practice. Subject content becomes the prime concern, as pointed out by almost all of the lecturers, rather than other pedagogical aspects. Noreen, as seen in the following extract, stresses the importance of preparing students for exam purposes which influenced her way of teaching;

"My way of teaching, after completing each topic is, I'll ask students to find out last years final exam questions. Look at the questions, the popular topics and the pattern of the questions and so on. So they will be asked to form in group of 2-3 and then discuss about what they have learnt about the topic. It is really helping them to get ready for the exam as they already familiar with the format and questions".

In conclusion, I can say that all these factors, students, lecturers, subject/syllabus and teaching facilities and resources, are related to each other, and influence each other, in their contribution to successful teaching which could lead to successful learning. As can be seen, there are various barriers to the introduction of innovative new teaching approaches and which reinforce a tendency for reliance on a didactic approach.

However, even despite these pressures, there is also clearly a desire to help students to succeed and a willingness to adopt creative approaches, even given a lack of technology. For example, lecturers will refer to real world situations, or will use the surrounding environment, in classroom teaching.

5.2.4 Lecturers' Views on Improving Teaching

This part discusses findings obtained from lecturers in respone to the question, *'In what ways do you think you could improve your teaching practice in this polytechnic?'*

Lecturers or teachers have been found to play a major role in ensuring that students can understand and then be successful in their learning. Farrah stressed the important role of lecturers and suggested that if every lecturer wants to improve their teaching, then they should improve themselves first:-

"I think...the first thing to do is…the lecturer has to make extra effort. Besides using the traditional way of teaching by only writing on the white board, it is better for the lecturer to try to vary their teaching methods. Once we improve our teaching, indirectly, students will cooperatively work and learn along with us. And at least, they will get something" (Farrah)

The extract suggests that, in order to change and improve learning, the lecturer needs to change the way in which they conceive learning and teaching and also to focus more on students. Fundamentally, lecturers need to be experienced and familiar with their specialist teaching area. This will help to avoid lecturers being blamed for the poor education received by students with the assumption that teachers and their teaching is inappropriate or inadequate (Sikes, 1992). With experience, lecturers are believed to improve the way that they teach and manage to tackle any problem that might occur in the teaching and learning process. At the same time, lecturers need to put more effort into improving and varying the techniques of delivering subject content.

On the other hand, Deena has a different opinion;

"...and I think, even with the different methods we use, it depends on the student themselves. Not because of the method of teaching. Even if we implement a good teaching method, with the support of proper facilities and also maybe use a power point presentation, if the students don't want to listen and concentrate on what we teach in the front, the problem still will be the same".

This extract suggests that students' attitudes and behaviours are the major influence in their learning process rather than other elements. Students need to change their attitude as suggested by Deena;

"Actually the level of the difficulty of study here is not too high. Students need an extra effort to be excellent. Actually it's not too difficult to study at this polytechnic. That's why some of them still get a very high mark. They have a good attitude due to their effort, and their self motivation".

According to some lecturers, what students need to do next is to direct their learning as they need to be able to update their knowledge and skills effectively and efficiency. Therefore, it is important for lecturers to encourage students to take responsibility in the classroom and play a greater role in their learning (Wee, 2004).

This might help students to be more independent in their learning and to train themselves to be mature in their future life.

5.2.5 Discussion on Lecturers' Teaching Practices in Polytechnic.

My analysis from the interview sessions is that, with a few exceptions where lecturers adopt some techniques, teaching and learning has become stagnant and static. This feeling was supported by the majority of my participants who tended to see themselves as being 'traditional' in their approaches to teaching. This is associated with the fact that although lecturers, with different career paths, face different circumstances they are also constrained by similar constraints of time, curriculum and, facilities and resources. The findings recognise that the choice of one's teaching approach may basically be attributed to four major factors which are students' background and characteristics, lecturers' enthusiasm and capability, the criteria of the subject/syllabus and teaching methods, and facilities and resources. The interplay of these four characteristics, in the main, leads to a preference for a traditional, didactic approach.

Many lecturers claim that, fundamentally, working conditions adversely affect what they are able to do in their teaching. Insufficient teaching time becomes an obstacle for lecturers to plan and prepare for a more active learning environment. All these factors lead lecturers to accomplish their 'teaching mission' in a more didactic way.
It can be presumed that, given this way of lesson delivery, students are unlikely to take an active role in their learning. Motsidi *et al.*, (2009) consider that this way of learning (didactic) covers mainly basic and fundamental concepts which leads to students becoming 'too passive' and 'unresponsive' (p. 214). This might be opposed to a hybrid of collaborative and metacognitive approaches. As Sandholtz *et al*. (1997) exclaimed, "students became better test takers, but at a terrible cost" (p. 12).

From the interviews with lecturers, I could not see that many of them were attempting to adopt any element of generic competency and skill enhancement in their teaching exercises such as communication, problem solving, and critical thinking skills. They do, however, have a group work and presentation session that allowed students to perform in the classroom, but the lecturers did not stress those skills which are required for these activities.

From their statements in the interviews, I considered that when lecturers did perform innovative activities they wanted to do it in order to ‘cheer up’ the learning environment, not with the purpose of sharpening the ‘hidden’ skills and competences of students.

Glover and Law (2002), recognised that effective teaching needs *different* approaches according to maturity, subject area and objectives of the course. Findings from these interviews show that lecturers are unlikely to use a variety of teaching elements in every teaching session. As explained above, lecturers in the polytechnics in this study sometimes have responsibilities beyond teaching. They were not just solely playing a role as a lecturer who delivers a lesson to students in their care, but they were also involved in administration and other tasks that needed attention. Besides all these tasks, lecturers needed to maintain the standard of grades and achievements required to maintain a good reputation for each polytechnic which is one of the wider cultural factors that influences the lecturers’ teaching practice.

However, knowledge alone cannot compensate for competence (Motsidi *et al.,* 2009). Therefore, although lecturers should be encouraged to adopt approaches to teaching which are more relevant and could invite active involvement of students (to encourage the development of wider skills), this must be done with consideration for the internal and external barriers to these processes that these lecturers have identified.

5.3 ANALYSIS OF THE CURRENT TEACHING APPROACHES: STUDENTS’ PERSPECTIVES

The above analysis leads to a suspicion that, with a few exceptions, the main approach used in teaching the course across Polytechnics will be didactic. The purpose of this section is to analyse and evaluate the current teaching approaches in Civil Engineering Programmes in the three polytechnics that have been selected from student’s perspectives. Central to this are the teaching methods and materials that are regularly applied by lecturers to deliver a subject. An evaluation of the teaching strategies with regards to students’ perspectives is presented in this section, focusing on how often a lecturer delivers a lesson using specific strategies. This is not only to gain the students' perspectives but it also facilitates triangulation with the lecturers' views.

In this section, descriptive statistical analysis was used to analyse the variables (using the SPSS computer package), which included mean, standard deviation, t-test and correlations. Data reduction was conducted using the factor analysis methods, again using the SPSS computer package. The analysis focus on five parts in the questionnaire is displayed in Table 5.2.

Table 5.2: Structure of Questionnaire (Set 1)

PART A	Demographic details
PART B	Students' evaluation on courses taken and traditional teaching approaches
PART C	Students' evaluation on teachers teaching practices.
PART D	Students' evaluation on their own learning practices
PART E	Open ended question asking for comments and suggestions on improving the current teaching and learning strategies.

Part A required the respondents to choose from the relevant answers given on the sheet. Parts B, C and D allowed the respondents to react to 27 statements using a 5-point Likert-type scale, ranging from 'always' to 'never'.

For parts B, C and D, which used Likert-type scales, the mean and standard deviation for the rating of each question was calculated using SPSS Version 15.0. In analysing the data, the average means were grouped as follows (Table 5.3):

Table 5.3: The Average Mean Group

Regularity	**Scale ranges**
Always	3.50 – 5.00
Sometimes	2.50 – 3.49
Never	1.00 – 2.49

The decision to group the means in this way was to reduce confusion while analysing the data by reducing the number of scales to a more manageable level. The questionnaires were distributed to all the sampled students, who completed them anonymously before the intervention module (the HybCoMet strategy) was introduced to them. Students were given 20-25 minutes to complete the questionnaire, which were then collected immediately after completion.

The initial survey sample consisted of a total of 209 students from all three polytechnics who are purposively selected and stratified, and randomly assigned to control and experimental group status. The distribution of sample students for each polytechnic is shown in Table 5.4.

Table 5.4: Distribution of Samples from Each Polytechnic

POLYTECHNIC	**CONTROL**	**EXPERIMENTAL**	**TOTAL**
A	30	29	59
B	39	41	80
C	32	38	70
TOTAL			**209**

However, after analysing the data, it was found that only 195 students had responded to the questionnaire. The final distribution of the respondents, and associated lecturers, was as follows:

Table 5.5: Final Distribution of Samples from Each Polytechnic

POLYTECHNIC	CONTROL	EXPERIMENTAL	TOTAL
A	30 (Farrah)	29 (Razmi)	59
B	30 (Noreen)	38 (Deena)	68
C	31 (Elda)	37 (Rania)	68
TOTAL			**195**

Obviously, both the control and experimental groups from Polytechnic B have been reduced, because many of the students were absent when the questionnaire was distributed, as they were participating elsewhere in another programme which had been previously organised for that day.

One student was absent from both control and experimental groups in Polytechnic C while the survey was conducted, lowering the total respondents for that polytechnic. However, the samples from Polytechnic A showed no difference for both groups. The names in the brackets correspond to the lecturer responsible for teaching Concrete Technology module in each of these groups, and who also acted as respondents for the interviews as discussed in earlier section. It was considered that as the level of attrition (drop out) from the survey was small, the non-participation by students in the study was not sufficient as to introduce bias.

5.3.1 Demographic Details and Backgrounds of the Students

The survey provided demographic analysis of the students surveyed, including gender, religion and ethnic grouping. The academic background consists of each student's previous school and their score in the SPM. Each student's perception of what is the most difficult subject that has been learnt at the polytechnic so far is included in this section as well.

This section is important in that it provides basic information about the student population within each polytechnic. Data from this part might be useful in supporting the data analysis for other parts of the questionnaire. The data may also provide an additional input as to how the distribution of gender and ethnicity, as well as school background, might affect the teaching and learning process.

(a) Gender

Table 5.6 summarises the demographic profile of the respondents. In terms of gender, 116 were boy and 79 girls.

Table 5.6: Distribution of Gender for the Student Sample

POLYTECHNIC		BOY	GIRL	TOTAL IN GROUP
A	CONTROL	21 (70%)	9 (30%)	30 (100%)
	EXPERIMENTAL	24 (82.8%)	5 (17.2%)	29 (100%)
B	CONTROL	13 (44.8%)	16 (55.2%)	29 (100%)
	EXPERIMENTAL	18 (47.4%)	20 (52.6%)	38 (100%)
C	CONTROL	24 (75%)	8 (25%)	32 (100%)
	EXPERIMENTAL	16 (43.2%)	21 (56.8%)	37 (100%)
SUM		**116**	**79**	
TOTAL		**195**		**195**

Both control and experimental groups from polytechnic B, as well as the experimental group from polytechnic C, contained more girls than the other groups of students, which is more than 50% as can be seen in Table 5.6. On the other hand, polytechnic A had the least number of girls in the sample of both control and experimental groups, with only 9 (30%) and 5 (17.2%) students, respectively.

(b) Ethnicity

Students came from various ethnic backgrounds, with the majority being Malay (174 students) and the fewest being Chinese (7 students) for all three polytechnics, as presented in Table 5.7.

Table 5.7: Distribution of Ethnicity for the Student Sample

POLYTECHNIC		MALAY	CHINESE	TAMIL	TOTAL IN GROUP
A	CONTROL	28 (93.3%)	0 (0%)	2 (6.7%)	30 (100%)
	EXPERIMENTAL	26 (89.7%)	0 (0%)	3 (10.3%)	29 (100%)
B	CONTROL	27 (93.1%)	0 (0%)	2 (6.9%)	29 (100%)
	EXPERIMENTAL	36 (94.7%)	0 (0%)	2 (5.3%)	38 (100%)
C	CONTROL	25 (78.1%)	4 (12.5%)	3 (9.4%)	32 (100%)
	EXPERIMENTAL	32 (86.5%)	3 (8.1%)	2 (5.4%)	37 (100%)
SUM		**174**	**7**	**14**	
TOTAL		**195**			**195**

The entire samples of Chinese ethnicity were from polytechnic C. This might be due to the population of the area where polytechnic C is located, who are known as the 'Baba and Nyoya' society and who come from Chinese roots. 'Baba' and 'Nyonya' are terms used for the descendants of late 15th and 16th century Chinese immigrants to the Nusantara region during the Colonial era. Due to economic hardship on mainland China, waves of immigrants from China settled in Malaysia, and especially in Malacca, the state in which polytechnic C is located. The other ethnic groups in each group are distributed equally, with Experiment group in Poly B providing the highest number of Malay student; 36 (94.7%).

(c) School Stream Backgrounds

With reference to the students' backgrounds in secondary education, the majority of the students (111) came from technical schools, with 77 students coming from art-based schools and only 4 students coming from science-based schools, as shown in Table 5.8.

Table 5.8: Distribution of Students' School Stream Backgrounds

SAMPLE		TECHNICAL STREAM	ART STREAM	SCIENCE STREAM	TOTAL IN GROUP
POLY A	CONTROL	16 (53.3%)	14 (46.7%)	0 (0.0%)	30
	EXPERIMENT	15 (53.6%)	12 (42.8%)	1 (3.6%)	28
POLY B	CONTROL	18 (62.1%)	10 (34.5%)	1 (3.4%)	29
	EXPERIMENT	23 (60.5%)	15 (39.5%)	0 (0.0%)	38
POLY C	CONTROL	17 (54.8%)	12 (38.7%)	2 (6.5%)	31
	EXPERIMENT	22 (61.1%)	14 (38.9%)	0 (0.0%)	36
TOTAL OF SAMPLES		111	77	4	192

From this finding, it might be assumed that the lecturer should not have too much difficulty in teaching these students, in terms of background knowledge, as the majority of them came from technical and vocationally based schools.

Even though many students came from technical schools and had learnt an engineering subject (Civil Engineering Studies), nevertheless their achievement in the national exam (SPM) can only be said to be average, with a score between C4 (70%-74%) and C6 (55%-59%). As can be seen in Figure 5.6, the majority of the students scored C5 (65%-69%) for the engineering subject. No students scored the top (A1) grade, and fortunately no-one failed (grade F9) the subject either.

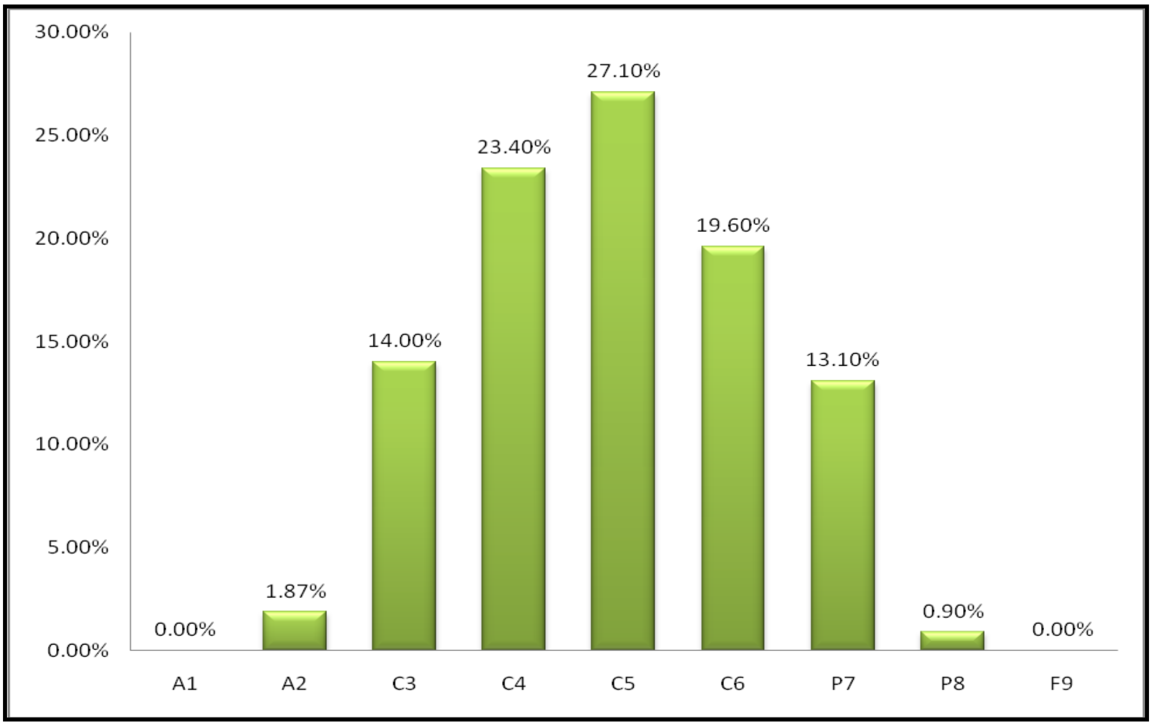

Figure 5.6: Students' Grade Achievements in the SPM

This finding suggests that even though the score is average, nonetheless, it could be assumed students had foundational knowledge of engineering subjects offered in the polytechnic that might help their learning in polytechnics. However, different lecturers had different perceptions of students, with some perceiving them as weak while others felt that they were competent for the learning experience, as has been explained in the previous section.

On the whole, it can be seen that there is little significant difference in the demographic profile of all the respondents from the three polytechnics although there are many Chinese students in one of the polytechnics. Thus, it can be concluded that the sample is not overtly skewed with regard to the population of interest. However, even the minor differences in composition here may be statistically significant and have an impact on the inference of the results, which will be addressed in the discussion chapter.

(d) The Most Difficult Subject Learnt at the Polytechnic

When asking students to rate their learning experience while at the polytechnic, many of them (127 of the 195) considered that the engineering module was the most difficult subject to learn at the polytechnic level.

Five categories of subjects were included in the questionnaire; engineering subjects, mathematics, sciences, computer programming and general studies (see Appendix 4-A for the questionnaire). This question was posed to get information on the perceived difficulty level of learning each category of subject which was offered in the enrolment session. Feedback on the level of difficulty of every group of subject is presented in Table 5.9.

Table 5.9: The Most Difficult Subject Learnt in the Polytechnic

SUBJECT	POLY A		POLY B		POLY C		TOTAL
	CONTROL	EXPERIMENT	CONTROL	EXPERIMENT	CONTROL	EXPERIMENT	
Engineering	20	17	17	27	18	28	**127**
Sciences	3	4	10	3	10	5	**35**
Mathematics	5	2	1	2	2	2	**14**
Computer Programming	2	1	0	4	2	2	**11**
General Studies	0	1	1	2	0	0	**4**

This data suggests that students feel that learning engineering subjects is challenging. When I asked lecturers about the Concrete Technology course (the engineering subject under study), lecturers validated this suggestion by providing feedback that students' interest varied considerably in the subject. Some of them complained that students showed little or no interest in learning the subject, for example Razmi said:

> *"It is difficult to say at this level* [first year] *as students still cannot adopt the way of learning at polytechnic level. Whatever subject is learnt they just follow it* [e.g. they listen and follow whatever they have been told by the lecturers]*".*

His statement is also corroborated by Rania:

> *"Students are not really interested in this subject… there is a time constraint, the syllabus too tight, too theoretical… the teacher needs to create an active environment to attract participation".*

However, some of them were uncertain as to how much students really liked this subject:

> *"….difficult to measure or evaluate the level of interest of students… they just listen what have been said, maybe because this subject only brings 1 credit hour".* (Farrah)

Deena was not clear whether students liked the subject but said:

> *"Maybe they do like the subject, though, because they always give a good feedback/response…"*

Meanwhile, Elda said that students might be interested in learning the subject due to certain conditions that can attract them:

> *"...students are only interested if the teachers do some activities while teaching… they love to have some movement, not just sit still and listen to the teacher while learning".*

However, not all lecturers gave a negative feedback. Noreen reflected that her students loved to learn this subject:

> *"...students love the subject… they can relate it with something in real life… they can learn something new in the construction field".*

A student’s interest in learning specific subjects might influence their achievement in the examination. According to the lecturers, in terms of student achievement in this subject, the majority of students from all three polytechnics scored 60% on average in their final exam, which is an average level of achievement.

> *“In average, all students can pass* [this subject]. *All can reach the minimum mark. Not too high and not too low! But this depends upon the topic and students’ preparation as well. Because this subject is not too difficult to learn, it is a simple subject that just needs students to read and to understand”.* (Deena)

From the extract above, it can be said that this subject is recognised as an easy subject to pass among other subjects offered within the programme. Hence, students should have no problem in gaining a good score if students are well prepared, as contended by Deena.

5.3.2 The Most Common Teaching Approaches Employed in Polytechnics

In this section, students were asked to rate their answers to the same questions that had been asked of the lecturers during the interview session. The same questions were asked in the questionnaire to students to ascertain the reliability of the findings from the interviews. Both sets of questions were concerned with those teaching strategies employed by the lecturers while teaching the subject of Concrete Technology. Identical questions were constructed which could then be easily used and processed to yield data to help students reflect on the lecturers’ teaching practices. However, the format of the questions was somewhat different, as the students needed to rate the most frequently used strategies using a Likert-type five point scale, ranging from ‘always’ to ‘never’.

Findings from both the lecturers and the students’ answers are mutually supportive. Section 5.3.3 and 5.3.4 present the finding of the most common approaches (materials and aids, and methods) employed in polytechnics, and detailed discussion is provided at the end of each section.

5.3.3 Analysis on the Current Teaching Materials/Aids Employed in Polytechnics

To respond to this section, students were asked to rate eight teaching aids/materials which are found to be the common materials/aids utilised by lecturers while delivering lessons and were also discussed in literature (i.e; Harvey and Mason, 1996). This section merely provides information on data analysis. The detailed explanation of results obtained will be discussed in Section 5.3.3.1.

Table 5.10 presents the overall descriptive statistics for the materials/aids that are employed in the classrooms of all three polytechnics under study, including the mean (M) and standard deviation (SD). It should be remembered that the scale of measurement is ascending from 1 to 5, ranging from ‘never’ to ‘always’ with 5 assigned to the most frequently used and 1 assigned to the least used.

(a) Chalk and talk

From Table 5.10, it can be seen that ‘chalk and talk’ was rated overall as the most common, with M = 4.09, SD = 1.037, and its mean was slightly over 4, indicating a high level of usage. All groups from each polytechnic gave a very high response to this item. The highest is rated by Experimental group from Polytechnic B with M = 4.37 and SD = 0.786. Control group from Polytechnic C gave the second highest response with M = 4.25 and SD = 1.107, followed by Experimental group from the same polytechnic with M = 4.19 and SD = 1.050. The lowest score was collected from Control group in Polytechnic A with M = 3.70 and SD = 1.119. Nonetheless, the mean rank is greater than 3.50, which also suggests a strong level of its application in this polytechnic too.

Table 5.10: Materials/Aids Most Frequently Employed in the Classroom

			POLY A				POLY B				POLY C			
	OVERALL SAMPLE		CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL	
MATERIAL	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Chalk & talk	4.09	1.037	3.70	1.119	3.85	0.818	4.04	1.232	4.37	0.786	4.25	1.107	4.19	1.050
Slide presentations	3.08	1.038	4.03	1.033	2.48	0.802	3.04	1.105	2.71	0.867	3.16	0.847	3.08	0.954
OHPs	2.77	1.040	3.33	1.061	2.00	0.832	3.07	0.979	2.39	0.790	3.00	1.047	2.81	1.023
Model	2.61	1.257	3.07	1.530	2.56	1.121	2.39	1.227	2.29	1.183	2.44	1.216	2.92	1.140
Specimens/real objects	2.68	1.130	2.70	1.179	3.15	0.907	2.64	1.162	2.55	1.108	2.34	1.096	2.76	1.211
Video & TV	1.84	1.149	2.47	1.456	1.74	0.859	1.89	1.370	1.50	0.862	1.78	1.099	1.76	1.038
Chart/graph/map	2.47	1.189	2.60	1.453	2.41	1.152	2.46	1.290	2.32	1.016	2.50	1.164	2.54	1.145
Picture/photograph	2.96	1.184	3.40	1.404	3.07	0.958	2.68	1.020	2.47	1.156	3.31	1.203	2.92	1.090
Valid N (listwise)	192		30		27		29		38		32		37	
Missing value														

(b) Power Point slide presentations

With regard to lecturers' regular use of power point slide presentations, it can be seen that overall the respondents rated the frequency of this material with M = 3.08 and SD = 1.038. The result suggests that this is the second most preferred material used by lecturers. Nonetheless, the mean rank is below 3.50, indicating a moderate level of usage. In terms of response from each group, Control group from Polytechnic A provided the highest mean, M = 4.03 and SD = 1.033, which suggests that slide presentations are the most common material employed for this group.

In contrast, Experimental group from the same polytechnic gave the lowest mean, with only M=2.48 and SD = 0.802, which is below a mean of 2.50, indicating that this material is only very seldom used with this group of students. Both groups at this polytechnic have a conflict of agreement with this item, which will discuss further in the section 5.3.3.1.

The remaining samples from Polytechnics B and C rated slide presentations with a mean greater than 2.50, indicating a moderate level of usage with both.

(c) Overhead projectors (OHP) and transparencies

The mean level for overall samples indicates a moderate usage for OHPs and transparencies (M = 2.77, SD = 1.040). Considering the results obtained from each sample, the style of feedback for this item was quite varied, and there was a conflict of agreement between the Control and Experimental group for some polytechnics. For instance, in Polytechnic A, the Control group gave the highest reading with M = 3.33 and SD = 1.061, indicating a moderate level of usage for these aids. However, for the experimental group, there was a contrast, as this aid was rated as the least used in the classroom, with M = 2.00 and SD = 0.832. There was a similar pattern of feedback gained from both groups in Polytechnic B as well.

Nonetheless, there was no difference in feedback gathered from both Control and Experimental group from Polytechnic C, as both groups chose ‘sometimes’ as the most regular use of this aid, with a mean score of, M ≥2.50. This finding is further discussed in Section 5.3.3.1.

(d) Model

For this item, the mean level for all of the groups was M = 2.61 and SD = 1.257, which suggests a moderate level of use for this aid in the learning process. Both Control and Experimental group from Polytechnic A rated this with a mean score above 2.50, indicating a moderate level of usage of models in this polytechnic. Experimental group from Polytechnic C also showed a similar level of usage, with M = 2.920 and SD = 1.140. The remaining groups rated a mean scale of M<2.50, which suggests that the use of a model is not a particularly popular aid, being less applied than others in the teaching and learning process.

(e) Specimens/real objects

The results shows overall that M = 2.68 and SD = 1.130, indicating that this material is sometimes used by lecturers. Feedback given by all groups from each polytechnic also suggests that this material is sometimes used in many of the classrooms at all three polytechnics, with a mean rank M< 2.50. However, Control group from Polytechnic C rated ‘never’ (M = 2.34, SD = 1.096) in reflecting the use of specimens/real objects at their polytechnic.

(f) Video and television

As can be seen from Table 5.10, it is clear that video and television are the least common aids employed by lecturers in the classroom, with a mean of M = 1.840 and SD = 1.149, which is below the mean rank of 2.50. Students from every group in all three polytechnics also rated this item as the very least or even never used aid in the classroom.

The highest reading was obtained from Control group of Polytechnic C, with M = 1.78 and SD = 1.099, and the least mean (M = 1.50, SD = 0.862) provided by Experimental group from Polytechnic B.

All in all, the students from all groups gave a very low score for the use of this teaching material.

(g) Chart/graph/map

The results obtained from all samples suggest that this aid is one of the least applied in the classroom with M = 2.47 and SD = 1.189. Most groups rated this aid with the same level of regularity, such as both Control and Experimental groups from Polytechnic A and Experimental group from Polytechnic B. The rest of the groups preferred to rate 'sometimes' to the use of this aid. Nonetheless, the mean rank is slightly over 2.50, ($M \geq 2.50$), which indicates that it is not a very popular aid used as well.

(h) Picture/photograph

The use of a picture or photograph was rated overall as 'sometimes', with M = 2.96 and SD = 1.184. From the results, it is clear that all groups rate this item as one of the aids that is regularly applied in the teaching and learning process in the classroom, with a mean of up to M = 3.40 (Control group, Polytechnic A). However, Experimental group from Polytechnic B gave a contrasting result of M = 2.47 and SD = 1.156, indicating minimal use of a picture or photograph in their classroom lectures.

5.3.3.1 Discussion on the Most Common Teaching Materials/Aids Used in the Polytechnics

The above findings reflect the general situation on how frequently these materials/aids are employed in the teaching and learning process within each polytechnic. The findings reveal that the material/aid most commonly employed by lecturers in all three polytechnics under investigation is 'chalk and talk'.

With reference to lecturers' feedback, this material was the most popular because it is easy to use, easy to access and, furthermore, needs less preparation. This strategy seems to have much currency with lecturers as it simplifies relationships between teachers and their teaching, but it only permits limited involvement of students (Glover and Law, 2002).

The second most frequently used material/aid is the power point slide presentation, followed by a picture or photograph as the third preferred material/aid used by lecturers. These strategies were found to be another mode of instruction to accompany lecture sessions. According to lecturers, power point was used to give 'colour' to their teaching as it is combined with the use of technology.

Video and television appear as the lowest rating in this category, where many students ticked 'never' for this item. With reference to lecturers, this material was not preferable to use, due to certain circumstances (resource constraints) which have already been explained in section 5.2. As well as video and television, the item of chart/graph/map was another material/aid seldom or never used by lecturers while delivering a lesson. The remaining materials (OHPs, models, specimens) were 'sometimes' applied in a classrooms. The constraints upon lecturers' choice of each material are due to four factors discussed earlier, such as lecturers' enthusiasm and capability, the teaching facilities and resources.

It was also found that there was a conflict of agreement as to the use of teaching materials between control and experimental groups in the same polytechnic. For example in Polytechnic A, the Control group rated the slide power point presentation as the most common material employed. On the other hand, the Experimental group rated the same material as only seldom used. To understand this phenomenon, it must be appreciated that a different lecturer was teaching each group. Different teachers might select different methods and resources for teaching that are suited to the objective and students' needs in their particular class (Beverton et.al, 2005).

Therefore, even for students who learnt in the same polytechnic, it is not necessarily the same approaches that were used.

Overall, statistical analysis of the student questionnaire suggests that lecturers apply many of the aids/materials (mean >2.50) when performing their teaching. Despite the variation, 'chalk and talk' was commonly used across all classes in all polytechnics. This is triangulated with the lecturers' views from interviews: as discussed, they did indeed employ many of these aids/materials. However, it depended on the circumstances, such as the use of such items whenever they were needed, or pragmatically, when the lecturers managed to get access to such aids/materials.

5.3.4. Analysis of the Current Teaching Methods at Polytechnics

After commenting on the use of teaching materials/aids, students were also asked to rate the frequency of ten common methods of teaching which applied in a classroom when lecturers deliver a lesson. Table 5.11 presents students' rating for these methods.

Table 5.11: Ranking by Students of the Ten Most Popular Methods Used by Lecturers When Delivering Lesson

			POLY A				POLY B				POLY C			
			CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL	
METHOD	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Lecture	3.84	1.001	3.86	0.789	3.11	0.737	3.86	1.079	4.03	0.915	4.06	1.134	4.00	1.027
Discussion	3.61	0.902	3.93	0.923	3.50	0.839	3.43	0.997	3.79	0.741	3.69	0.780	3.35	1.033
Debate	2.63	1.095	3.62	1.115	2.75	0.645	2.25	1.295	2.13	0.844	2.53	1.107	2.62	0.924
Demonstration	2.93	1.164	3.79	1.292	3.43	0.959	2.71	1.117	2.24	0.971	2.69	0.965	2.95	1.053
Project	3.49	0.981	3.72	1.162	3.54	0.693	3.68	1.124	3.39	0.974	3.47	0.761	3.27	1.071
PBL	3.61	0.879	3.86	0.833	3.64	0.678	5.36	9.787	3.53	0.830	3.66	0.937	3.49	0.870
Inquiry	2.95	0.959	3.69	0.660	2.93	0.663	2.61	1.100	2.45	0.950	2.91	0.893	3.19	0.908
Contention	2.85	1.035	3.72	0.922	3.11	0.737	2.36	0.951	2.42	0.976	2.34	1.066	3.22	0.750
Simulation	2.93	1.083	3.69	0.967	3.25	0.752	2.43	1.103	2.42	0.948	2.56	1.134	3.32	0.915
Tutorial	3.67	1.029	4.00	1.195	3.64	0.911	3.50	1.072	3.34	0.878	3.72	0.991	3.86	1.058
Valid N (listwise)	192		29		28		29		38		32		37	
Missing Value														

From Table 5.11, it can be seen that the favourite approach used in all samples in all three polytechnics is the lecture, with M = 3.84 and SD = 1.001. This was followed by the tutorial (M = 3.67, SD = 1.029), problem-based learning (PBL) (M = 3.61, SD =0.879) and discussion (M = 3.61, SD = 0.902). All of these methods and related dimensions are above a mean rank of 3.50, indicating a strong level of usage. The use of a project (at M = 3.49, SD = 0.981) is slightly below 3.5, thus indicating a moderate level of usage. The rest of the methods surveyed shows mean levels below 3.5 as well, but greater than 2.50 which also suggest moderate usage by teachers while delivering a lesson in a classroom.

In terms of the sample from each polytechnic, Control group from polytechnic A gave feedback that the lecturer often applied all 10 methods, as the mean ranks were greater than 3.50. This finding suggests that all methods are regularly employed by their lecturers, although the tutorial (M = 4.00, SD = 1.195) seems to be the most favoured method used for this group of students. Tutorial also appears as the most common method used for Experimental group of the same polytechnic (polytechnic A), with M=3.64 and SD = 0.911, along with PBL (M = 3.64, SD = 0.678).

For the rest of the sample groups from polytechnics B and C, the lecture method is rated as the most frequent method used by lecturers, with an average mean of greater than 3.75. Tutorials, PBL and discussions ($M \geq 3.50$) are also popular methods in the majority of the samples from polytechnics B and C. For the remaining methods applied within these polytechnics, the mean levels are above 2.50, indicating moderate use of these methods, which includes enquiry, simulation, demonstration, project and debate.

However, both Control and Experimental groups from polytechnic B rated debate, contention and simulation with a mean level lower than 2.50, suggesting that these methods are the least commonly employed at their polytechnic.

5.3.4.1 Discussion on the Most Common Teaching Methods Employed in the Polytechnics

In term of the most common method that is currently applied by lecturers, the lecture method is found to be the most employed in classroom learning session as it appears as the highest rated category. The findings from the lecturers' interviews also suggested that this technique is the most preferred technique used by them.

Other than lecture method, tutorial, PBL and discussion are also popular methods used. These tend to be prominent in those lessons in which a teacher is employing a technique for presenting tasks, question and answer, seeking students' opinions and encouraging them to generate ideas (Harvey and Mason, 1996), lessons customarily conducted in polytechnics classroom. However, for proper class discussion, the teacher should make a proper preparation before students are presented with any task (*ibid*) to maximise the learning output.

The remaining methods — inquiry, simulation, demonstration, project and debate — are found to be moderate in use. Contention and simulation are the methods least-employed in these polytechnics. Findings from the interviews indicated that the didactic teacher-centred approaches are the preferred techniques in classroom learning process. As such, these methods (contention and simulation) might not be favourable in circumstances when a teacher is dominant in the process because these methods are widely applied in active learning processes (Harvey and Mason, 1996) which focus more on student-centred approaches.

To sum up, lecture with the use of chalk and talk is widely used and the most popular approach in these polytechnics. This finding is not a great surprise because much literature has indicated that this mode of teaching is the dominant approach in classroom learning (Harvey and Mason, 1996; Glover and Law, 2002).

Accordingly, chalk and talk, alongside the lecture method, might be considered as the most desirable strategy by all lecturers in the studied polytechnics. Hence, it can be said that there is agreement regarding the use of certain teaching aids/materials and teaching methods.

To examine further the level of association between methods and aids/materials employed in the classroom while teaching, factor analysis and correlation procedures were conducted.

5.3.4.2 Factor Analysis on the Most Common Teaching Approaches (Methods and Materials/Aids) Employed in the Selected Polytechnics

As has been discussed above, there are eight teaching materials/aids and ten teaching methods listed in the questionnaire which cover the more common techniques employed in polytechnic under study. In total, there are eighteen different variables listed in the questionnaire, and data were gathered from 195 students in different polytechnics. It is useful to find out how many variables were employed at a time and how they can be grouped, based on their feedback. Factor analysis was therefore employed to help grouping together several variables under one or more common factor(s), in order to reduce the amount of data into smaller sets of factors, as suggested by Field (2009). Factor analysis is important to help to detect structures and commonalities in the relationships between large numbers of variables, and thus helps to identify where different variables are, in fact, addressing the same underlying concept (Cohen *et. al*, 2007). Therefore, it is necessary to reduce the relations in the dataset to help produce a more manageable set of data.

The most widely used form of factor analysis is a principal component analysis (PCA). PCA was conducted on the eighteen variables, which included both the teaching methods and aids/materials which are currently employed in the selected polytechnics. The use of SPSS helped in the process of undertaking PCA and produced the output as shown in Table 5.12. This method helps to structure the components and group together several variables under one or more common factor(s) into more interpretable themes (Field, 2009).

Table 5.12: Rotated Component Matrix (a)

	Component				
	1	**2**	**3**	**4**	**5**
Chalk & talk	-0.170	0.126	**0.751**	-0.203	0.038
Slide presentations	0.172	0.154	0.102	**0.750**	0.079
OHPs	0.066	0.208	0.021	**0.801**	-0.077
Model	0.123	**0.602**	0.014	0.235	-0.029
Specimen/real objects	0.063	**0.677**	0.059	0.005	0.288
Video & TV	0.258	**0.597**	-0.315	0.252	-0.100
Chart/graph/map	0.093	**0.798**	-0.020	0.070	-0.120
Picture/photograph	0.204	**0.732**	0.087	0.079	0.177
Lecture	-0.035	-0.187	**0.671**	0.044	0.022
Discussion	0.147	0.191	**0.690**	0.159	0.038
Debate	**0.696**	0.175	0.070	0.175	0.024
Demonstration	**0.686**	0.170	0.014	0.197	0.290
Project	0.146	0.177	0.297	0.224	**0.646**
PBL	-0.068	-0.007	-0.001	-0.142	**0.801**
Inquiry	**0.766**	0.048	-0.040	0.113	0.044
Contention	**0.826**	0.169	0.077	-0.036	-0.102
Simulation	**0.839**	0.123	0.046	-0.005	-0.078
Tutorial	0.249	-0.095	**0.599**	0.143	0.139

The Table 5.12 shows the component matrix of the dataset after rotation using the SPSS method of Varimax Orthogonal Rotation. Here, I have 18 different variables, and the factor analysis helps indicate which variable is loading into which factor.

As shown in the table, there are only five factors left after the extraction which are represented by the columns. The matrix contains the loadings of each variable onto each component. Regarding the pattern matrix for these data, the same five components (factors) seem to have emerged. The output will assist in making the right choice of values for the variables and to decide the factors and where these should be placed. To ascertain the right value (loading) for each variable, it was noted that Field, (2009), recommends for a sample size of 100, and that the loading should be greater than 0.512, and for a sample size of 200 it should be greater than 0.364. As the sample size in this study was 195, which ranges between 100 and 200, it was decided to choose a loading which is greater than 0.40 for each factor.

The decision reflects the suggestion by Field, (2009, p.666), that loading greater than 0.40 is of high importance. However, the variable chosen should not only have high values but also have values that are similar to each other (Cohen *et. al*, 2007).

As has been demonstrated in Table 5.12, in the column labelled '1', we can see that 5 variables (bold and underlined) that loaded highly (>0.4) on factor '1', and all of them are similar to each other. Hence, I would report that 5 variables have been selected for inclusion in column 1 which included debate, demonstration, contention, inquiry and simulation. On the column labelled '2', there are 5 variables that clustered with a high loading on factor 2. The 5 variables are model, specimens/real objects, video and television, chart/graph/map and picture/photograph. Chalk, lecture, discussion and tutorial are found loaded highly on factor 3. Two items loaded highly on factor 4, which are slide presentations and OHPs. In the final column, there are also two items shows the higher loading, which are PBL and project.

A name (theme) was then devised that described the factors in the questionnaire that had been clustered onto the same column, which cannot be identified by SPSS nor any other software package. All eighteen variables referred to teaching approaches employed by lecturers in the classroom. Therefore, a theme had to be constructed that related to these approaches.

All factors that loaded highly on factor 1 are types of teaching methods that required the students' active participation, and were therefore labelled as 'active teaching methods'. The 5 variables that are loaded on factor 2 seem to relate to teaching aids and materials which are more dynamic, which were thus labelled as 'active teaching aids/materials'. On factor 3, the loaded items seem to reflect different aspects of teaching that are regularly conducted by the teacher, which were therefore labelled as 'teacher-centred'.

Items that are loaded on factor 4 also related to teaching aids/materials, but since these are less of an active teaching approach and more of a static approach, these were labelled as 'passive teaching aids/materials'. Finally, PBL and project are loaded highly onto factor 5. In this case, both items contain components of the student orientated learning activities and thus were named as 'student-centred'.

This analysis reveals that findings in Section 5.3.3 and 5.3.4 of the questionnaire (analysis of current teaching methods and materials/aids) can be said to comprise five sub-scales, consisting of 'active teaching methods', 'active teaching aids/materials', 'teacher-centred', 'passive teaching aids/materials' and 'student-centred'. This finding indicates that these five constructs are sub-components of the most common teaching approaches at polytechnic level.

The eighteen dependent variables were then allocated to 5 factors (strategies) with the variables loading for each strategy as summarised in Table 5.13.

Table 5.13: Summary of Items Loaded on Each Theme.

1 **Active teaching methods**	**2** **Active teaching aids/materials**	**3** **Teacher-centred**	**4** **Passive teaching aids/materials**	**5** **Student-centred**
Debate	Model	Chalk & talk	Slide presentations	PBL
Demonstration	Specimen/real objects	Lecture	OHP	Project
Contention	Video & TV	Discussion		
Inquiry	Chart/graph/map	Tutorial		
Simulation	Picture/photograph			

To analyse the strength and level of the association amongst paired variables, a correlation coefficient test was then conducted.

The next section presents the SPSS output of the correlation matrix between the new components after rotation, and discusses how each teaching and learning strategy, as defined from the factor analysis procedures, are related.

5.3.4.3 Analysis of the Relationship between the Teaching and Learning Strategies

This section looks at how the teaching and learning strategies constructed from the factor analysis procedures (active teaching methods, active teaching aids/materials, teacher-centred, passive teaching aids/materials and student-centred) are related to each other by using the SPSS method of Pearson's Correlation Coefficient (bivariate). For the purpose of this study, only variables which are significant at the 0.01 level (marked **) will be considered as having possible relationships among the variables. According to Field (2009), the lower the significant value, the stronger the evidence we could have about the link between methods of delivery of a lesson by lecturers in these polytechnics. Table 5.14 provides information on the correlation coefficient among the five variables analysed from the factor analysis.

Table 5.14: Component Correlation Matrix for Teaching Approaches

Correlations

		activemthds	activeaids	probase	passvaids	teacherce
activemthds	Pearson Correlation	1	.382**	.278**	.297**	.111
	Sig. (2-tailed)		.000	.000	.000	.126
	N	192	191	192	191	192
activeaids	Pearson Correlation	.382**	1	.179*	.382**	.006
	Sig. (2-tailed)	.000		.013	.000	.931
	N	191	192	191	192	192
probase	Pearson Correlation	.278**	.179*	1	-.017	.400**
	Sig. (2-tailed)	.000	.013		.819	.000
	N	192	191	192	191	192
passvaids	Pearson Correlation	.297**	.382**	-.017	1	.106
	Sig. (2-tailed)	.000	.000	.819		.145
	N	191	192	191	192	192
teacherce	Pearson Correlation	.111	.006	.400**	.106	1
	Sig. (2-tailed)	.126	.931	.000	.145	
	N	192	192	192	192	193

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The table shows there are several relationships among the variables that can be explored. The relevance of the individual variable in the table in most cases is a modest, positive correlation (average of r = 0.30). For instance, active teaching methods are consistently positively related to almost all the variables, except for teacher-centred approaches. There is a strong relationship between active teaching methods and active teaching aids/materials, with a coefficient of r = 0.382. Active teaching methods are also positively related to student-centred and passive teaching aids/materials, with a coefficient of r = 0.278 and r = 0.297 respectively.

However, there is no significant coefficient between the presence of active teaching methods and teacher-centred approaches. Hence, this finding suggests that there is a genuine relationship between active teaching methods and other active approaches. It can be said that when active teaching methods are applied in a classroom, along with the active teaching aids/materials, it is often the case that student-centred and passive teaching aids/materials are sometimes involved in the learning process.

However, teacher-centred approaches do not seem to be associated with active teaching methods, as there is no significant relationship between these two approaches. Thus they are seldom found together in a course of study. However, active teaching aids/materials has a modest and positive correlation with passive teaching aids/materials ($r = 0.382$).

This result indicates that active teaching aids/materials are employed in a classroom alongside more passive teaching aids/materials. It may therefore be assumed that lecturers might utilise both of these strategies in their practice, as lecturers attempt to match their teaching techniques to student learning styles (Glover and Law, 2002). Therefore, it might be necessary for lecturers to use a variety of teaching and learning approaches to suit the needs of their students. This result also suggests that student-centred approaches only exist when teacher-centred learning takes place during the learning process. However, when the students-centred approach takes place, fewer passive aids/materials will be associated with the teaching and learning process.

Overall, the findings reveal that, as active teaching methods are applied in a classroom, there is a tendency for active teaching aids/materials to also be used with student-centred and passive teaching aids/materials to accompany them in the teaching and learning process. It appears that the teaching and learning process is not *always* didactic, as lecturers are incorporating *some* of the active strategies into their practice. However, it is difficult to measure how constantly and regularly these methods are used during the learning session. In addition, one or more other factors might be affecting the relationships that appear in the correlation. The nature of this influence might somehow be related to the four factors explained by the lecturers. These factors are the characteristics of lecturers, the backgrounds and characteristics of the students, the design of the syllabus and curriculum, and the availability of teaching facilities and resources.

5.3.5 Students' Perceptions of Lecturers' Teaching Strategies.

There are twelve items included in this section which have been formulated with the intention of examining the modes of delivery of lessons by lecturers. Strategies C1 to C3 particularly focus on how lecturers deliver a lesson. How lecturers assess and evaluate learning is considered by questions C4 to C7. Three questions (regarding strategies C8, C9 & C10) require feedback on activities that are conducted while learning in a classroom, and the two final questions are intended to identify how the current teaching strategies help students to build up their learning performance. These findings will also help to provide information on whether the teaching and learning processes employed at the polytechnics studied are orientated towards a teacher-centred or student-centred learning approach, as been identified from the above analysis.

(a) Lecturers' teaching delivery modes

Table 5.15 presents the findings on how lecturers used the listed strategies while performing their teaching. From the table, it can be seen that the mean level (of strategies C1, C2 and C3) for the overall samples is greater than 3.50, which suggests that a high level of these strategies are employed in polytechnic teaching sessions. However, there are contradictory results given by all student samples, insofar as not many students agree that their lecturers apply all these strategies. The single most frequent strategy used by lecturers in all three polytechnics is C2 – the lecturer presents and writes all the important points.

Nonetheless, the majority of the students also agreed that their lecturers always use a variety of teaching methods when delivering a lesson (C3) with $M > 3.50$, except for Experimental group in polytechnic A, with $M = 3.38$, $SD = 0.775$, indicating a more moderate level of agreement. Meanwhile, for C1, lecturers using appropriate teaching aids, all Control groups from all three polytechnics replied that this strategy was always used by their lecturers. The remainder of the sampled students rated this strategy as moderate, with a mean level below 3.50.

Table 5.15: Variety of Strategies Utilised while Teaching

STRATEGY	OVERALL SAMPLES		POLY A				POLY B				POLY C			
			CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
C1. Lecturer uses appropriate/suitable teaching aids.	3.51	0.895	4.00	0.910	3.17	0.711	3.61	1.227	3.37	0.786	3.63	0.833	3.35	0.716
C2. Lecturer presents and writes all the important points on board.	3.83	0.985	3.87	1.074	3.66	0.721	3.96	1.138	4.05	0.899	3.84	0.987	3.59	1.040
C3. Lecturer uses a variety of teaching methods while delivering lecture.	3.74	0.953	4.03	0.928	3.38	0.775	3.71	1.117	3.82	0.955	3.78	1.128	3.70	0.740
Valid N (listwise)	194													

(b) Methods of assessment and evaluation

Questions C4 to C7 were aimed, in particular, at identifying how lecturers assess and evaluate their students' learning performance, and identifying how lecturers used their preferred teaching techniques during the teaching process. The analysis provides information on how lecturers manage and control the learning session. Table 5.16 presents the mean for each of these questions. For this category, methods of assessment and evaluation score highly across all the techniques. The highest is for strategy C7 - conduct a paper test (M = 3.77, SD = 0.916), followed by C4 - regularly asking students (M = 3.68, SD = 0.841), and finally C5 - giving some exercises after completing certain topics, with M = 3.61 and SD = 0.944.

Student responses from each of the polytechnics also indicated their high agreement that lecturers regularly assess and evaluate them both during and after the learning session, by pen and paper tests as well as by written assignments. Nonetheless, Experimental group from polytechnic A reported only a moderate level of use of the majority of these strategies. Experimental group from polytechnic C gave a lower reading for two of the strategies (C5 and C6), which indicates that the lecturer gave moderate consideration for the use of written assignments and exercise methods for assessment purposes.

Table 5.16: Methods of Assessment and Evaluation of Students' Learning Performance

STRATEGY	OVERALL SAMPLES		POLYTECHNIC A				POLYTECHNIC B				POLYTECHNIC C			
			CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
C4. Lecturer questions regularly while teaching.	3.68	0.841	3.97	0.850	3.31	0.806	3.75	0.799	3.55	0.828	3.84	0.847	3.65	0.824
C5. Lecturer likes to give/have some form of exercise after finishing a lesson	3.61	0.944	3.87	1.106	3.45	0.948	3.61	0.956	3.71	0.802	3.66	0.865	3.41	0.985
C6. Lecturer requires students to complete assignments about the taught lesson.	3.65	0.863	4.00	0.830	3.24	0.830	3.50	0.923	3.82	0.801	3.88	0.833	3.46	0.803
C7. Lecturer regularly sets a paper test after certain topics.	3.77	0.916	3.97	0.928	3.52	0.949	3.86	0.932	3.76	0.852	3.75	0.842	3.78	1.004
Valid N (listwise)	194													

Table 5.17: Some Activities Conducted During the Learning Session

STRATEGY	OVERALL SAMPLES		POLYTECHNIC A				POLYTECHNIC B				POLYTECHNIC C			
			CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
C8. Lecturer organises students into groups to complete learning task.	3.72	0.855	4.03	0.928	3.69	0.850	3.50	0.793	3.71	0.732	3.81	0.859	3.59	0.927
C9. Lecturer has good relationship/communication with students.	4.05	0.847	4.37	0.809	3.79	0.774	3.82	0.819	4.03	0.822	4.22	0.941	4.03	0.833
C10. Lecturer encourages students to know the role of every member and fully co-operate.	4.05	0.847	4.33	0.758	3.86	0.743	3.89	0.832	4.00	0.870	4.06	0.878	4.11	0.936
C11. Lecturer uses teaching methods that encourage students to talk with more confidence.	3.81	0.844	4.23	0.774	3.66	0.721	3.96	0.693	3.61	0.855	3.91	1.027	3.62	0.794
C12. Lecturer uses teaching methods that encourage students to think creatively.	3.88	0.822	4.23	0.858	3.79	0.620	3.71	0.897	3.76	0.714	4.13	.942	3.70	0.777
Valid N (listwise)	194													

(c) Dimensions of active learning that are organised in a classroom

Table 5.17 displays descriptive analysis on dimensions of active learning that are organised in a classroom. These questions (regarding strategies C8, C9, C10, C11 & C12) focussed on how lecturers conduct activities that could invite active participation from students. The findings provide ideas on factors that inhibit or promote students participating actively in classroom learning sessions. From Table 5.17, it can be seen that lecturers from all three polytechnics regularly conduct some activities during the learning process, as this category has the highest mean level (up to M = 4.050). Students from all three polytechnics also agreed that lecturers regularly conduct group activities during the learning session (C8), and always encourage them to understand their role and work together cooperatively (C10) with mean level of $M \geq 3.50$.

In terms of relationships and communication between lecturers and students (strategy C9), all student samples agreed that their lecturers can communicate well during the teaching process. This question is not directly related to the lecturers' delivery modes. Nonetheless, it can be considered that good relationships and communication between lecturers and students is important to the success of every aspect of student learning (Glover and Law (2002, p. 31), as good teacher-student relationships are fundamental to the effectiveness of every learning situation. Lecturers should have a good relationship with their students, but there need to be limitations. Both students and lecturers should know the boundaries between the lecturer and the student. Lecturers should know how to control their emotions as well:-

> *"I have a good relation with students. Quite close indeed, but not really close until they can step on my head(!). I meant, if they did something wrong, we need to tell them and correct them. We also need to balance our mood. If you get angry in the morning, make sure you can calm down after that. If you are always not in a good mood, students will not happy to learn as well"* (Farrah).

It is not surprising to see the highest mean for this item was provided by Control group from polytechnic A (M = 4.37, SD = 0.809), perhaps as these are students who are under the care of Farrah.

As displayed in Table 5.17, students also agreed that the current teaching strategies encouraged them to talk more confidently (C11) and think more critically (C12), with a mean level greater than 3.80. With reference to each sample from the three polytechnics, the highest mean was provided by Control group from polytechnic A (with M = 4.23 for both statements). However, Experimental group from polytechnic C rated the lowest usage for strategies C11 and C12. Nonetheless, this is still a high level of application, as the means rank was above 3.50. The rest of the sample groups also provided a high mean level for both strategies.

5.3.5.1 Discussion on the Teaching Delivery Strategies

Findings in this section concern the pattern for delivery of lessons by lecturers. The analysis focuses on how teachers conducted the Concrete Technology subject during the classroom learning process. There are three broad categorieidentified in this part: lecturers' delivery modes, methods of assessment and evaluation, and dimension of active learning while delivering the subject.

For the first category, the most common way of delivering a lesson is by presenting and writing all the important point on the white board. This means that lecturers are more traditional in orientation. This finding strengthens the earlier findings that lecturers do indeed take traditional system approaches in their teaching practise. This finding also confirms that transmissive approaches, as termed by Glover and Law (2002), which focused on lecturing, appear to be the most dominant approach used while delivering this subject.

Besides the transmissive approaches that limit students' involvement, an emphasis on active students' engagement is also found. Lecturers are regularly conducting some activities during the teaching and learning process especially group work.

According to one lecturer, they conduct this part of the course by working in groups as this is a theory-based subject and otherwise students could easily drop their attention levels if they were just learning the subject without applying it. Group work is therefore conducted in situations where the lecturer wishes to actively engage the students' attention and participation:-

> *"At certain parts in the topic, we have to do group work. Students will divide into group, distribute the topic, then they have to find the material to perform the task, and finally present the work. Everybody needs to participate in this activity"* (Rania).

The activities encourage students to communicate with confidence and think critically. Despite the dominant roles of lecturers, these findings suggest that the current teaching strategies help to encourage students to actively participate in the learning process. To help identify further the dimension of active learning, a factor analysis as in Section 5.3.5.2 was conducted.

Data provided by all students also suggest that lecturers and their students have a good relationship with each other. The need for good communication and relationships between lecturers and students was also one of the suggestions given by students regarding how to improve their learning, and this will be discussed in the final part of this chapter in the section on 'students' views on improving learning'.

For the method of assessment and evaluation, the high level of response for 'using a questioning session' and 'pen and paper tests' was reflected in the current practice of assessment (which is more content driven), while a written assignment or exercise is not seen as the favourite choice for some lecturers. This indicates that both informal and formal evaluations are employed in the classroom. However, the traditional test method appears to be the preferred method by lecturers. This is a normal phenomenon in a setting where central examinations are taking place (Embi and Hwang, 2007) as lecturers drill learning toward preparing students for the examination purposes.

5.3.5.2 Factor Analysis of Lecturers' Teaching Strategies

The dimensions of active learning can be further identified with the help of a factor analysis for the responses provided. It is interesting to examine whether there are any relationships between teaching, learning and the level of students' involvement. This section explores further how the lecturers' teaching strategies can be clustered into themes, and examines any relationships between each theme which could reveal dimensions of students' active involvement. A factor analysis using Varimax Rotation was undertaken to validate student responses to their lecturers' teaching strategies. Table 5.18 presents the component matrix after rotation.

As can be seen from the table 5.18, that all twelve items were loaded onto two factors, which constructed two themes for those strategies. There were six variables with loadings greater than 0.4 that were loaded onto the first column (i.e. C6, C8, C9, C10, C11 and C12). All these variables seem to relate to strategies that require students' involvement. The first component then might be labelled as a '*student-centred'* teaching approach. The rest of the variables that were loaded onto column 2 were more focused on the lecturers and how they taught; which was therefore labelled as being a '*teacher-centred*' teaching approach. A correlation coefficient test was then performed to identify any association with the new components of the teaching approaches that have been extracted from the factor analysis.

Table 5.18 : Rotated Components Matrix (a)

Strategy	Component 1	Component 2
C1. Lecturer uses a variety of methods.	0.058	**0.719**
C2. Lecturer teaches and writes important notes on board.	0.164	**0.678**
C3. Lecturer's delivery uses a variety of approaches.	0.295	**0.733**
C4. Lecturer regularly asking students.	0.471	**0.546**
C5. Lecturer gives some exercises after explanation.	0.391	**0.593**
C6. Lecturer regularly giving extra exercises.	**0.559**	0.452
C7. Lecturer conducts paper test after each topic.	0.427	**0.569**
C8. Lecturer organises students into groups.	**0.645**	0.192
C9. Lecturer has a good relationship/communication with students	**0.812**	0.155
C10. Lecturer encourages students to know the role of every member and fully co-operate.	**0.769**	0.223
C11. Lecturer uses teaching methods that encourage students to talk with more confidence	**0.703**	0.264
C12. Lecturer uses teaching methods that encourage students to think creatively.	**0.753**	0.275

Table 5.19 presents the output of the correlation matrix for the student-centred and teacher-centred teaching approaches

Table 5.19: Correlations of New Component Matrix

		Student-centred	**Teacher-centred**
Student-centred	Pearson Correlation	1	.440(**)
	Sig. (2-tailed)		.000
	N	194	194
Teacher-centred	Pearson Correlation	.440(**)	1
	Sig. (2-tailed)	.000	
	N	194	194

** Correlation is significant at the 0.01 level (2-tailed).

As can be seen in table above, the existing correlation tells us that there is actually a strong relationship between student-centred and teacher-centred approaches, as they are positively correlated with r = 0.440 and p < 0.01.

This means that in courses with student-centred approaches it is significantly likely that one will also find teacher-centred approaches. The student-centred and teacher-centred approaches represent strategies utilised among the six lecturers from the three polytechnics under investigation. The earlier analysis (section 5.3) also suggested that lecturers incorporated teaching methods and materials associated with both students and teacher centred approaches. Even though student-centred learning may be poorly applied in polytechnic education system, it is a step in the right direction by aligning skills from the workplace to classroom learning setting (Ibrahim, 2007).

The findings suggest that while the lecturer plays a major role in the teaching process, the students also have the opportunity to take part in the process. Students are given some choice in the way learning is conducted and they are likely to be given some space to conduct their learning as well. However, the analysis cannot reveal how active the students are regarding their participation in the process.

5.3.6 Analysis on the Element of Students' Generic Competences

This section provides students' reflections on their learning using specific strategies. The analysis focuses on their preferred learning techniques and how the institution's environment might help the learning process. The questions were developed in order to examine how strategies in the current learning environment could enhance students' generic competences that focus particularly on teamwork, communication, problem solving and critical thinking skills.

Questions D1 to D4 were particularly intended to examine teamwork and communication skills among students. In order to identify how students engaged in problem solving and critical thinking skills, questions D5 to D10 were constructed. These questions also helped to determine how students can work both individually and independently without reliance on their lecturers for support. Finally, questions D11 to D13 were constructed with the intention of ascertaining how students feel about the polytechnic itself and how effective it is in helping students to develop a good attitude towards their future working life. Comments and suggestions on how to improve teaching and learning are included in the final part of this section.

Table 5.20: Level of Teamwork and Communication Skills

STRATEGY	OVERALL SAMPLES		POLYTECHNIC A				POLYTECHNIC B				POLYTECHNIC C			
			CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
D1. Comfortable to do any learning task individually rather than in a group.	3.03	1.040	2.97	0.999	2.93	1.016	2.96	1.201	2.74	0.921	3.09	1.058	3.46	0.989
D2. Will accept and respect opinions and contributions from friends.	4.03	0.789	4.13	0.900	3.93	0.663	3.64	0.911	4.21	0.622	4.03	0.695	4.11	0.854
D3. Will be able to be a good leader.	3.27	0.908	3.40	0.894	3.39	0.786	3.11	1.133	3.45	0.828	3.13	0.976	3.16	0.834
D4. Will have no problem to communicate well with other group members	4.03	0.921	4.17	0.986	3.96	1.036	3.57	0.997	4.13	0.741	4.19	0.738	4.05	0.970
Valid N (listwise)	191													

(a) Teamwork and communication skills

In these questions, students were asked to rate themselves regarding being a member of a group and how well they are able to communicate and contribute to group work. As can be seen from Table 5.20, student responses from Control and Experimental groups from all three polytechnics indicated that they were not comfortable with learning individually (D1), as the overall means rank was M <3.50. The results show that students have no problem when working in a group or team, as many of them (mean average M >3.57) provided feedback that they can accept and respect the opinions and contributions from friends (D2) and they have no problem in communicating with other group members (D4). These findings indicate that students have no problems working together cooperatively. However, all student samples replied that they did not consider that they would be a good leader, as the mean rank was M < 3.50.

(b) Students' evaluation of their problem solving and critical thinking skills

Questions on items D5 to D10 were particularly constructed with the intention to explore students' perspectives on their own learning and to determine how regularly they engaged in activities that involved solving problems and critical thinking processes. From the analysis, it was also hoped to establish how students might be more able to learn by themselves, without having too much continued dependence on their lecturer. Table 5.21 provides the detailed readings for these items.

Table 5.21: Elements of Problem Solving and Critical Thinking.

STRATEGY	OVERALL SAMPLES		POLYTECHNIC A				POLYTECHNIC B				POLYTECHNIC C			
			CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
D5. Try to relate everything that have learnt to existing knowledge.	3.67	0.825	3.90	0.803	3.54	0.999	3.25	0.967	3.79	0.622	3.84	0.723	3.62	0.758
D6. Can solve a given problem without help from the lecturer.	3.02	0.807	3.20	0.887	2.86	0.705	3.29	0.976	2.97	0.854	3.00	0.622	2.84	0.727
D7. Be able to accomplish a task in a given time.	3.70	0.837	4.03	1.098	3.43	0.742	3.68	0.772	3.66	0.745	3.47	0.671	3.89	0.843
D8. Have the initiative to understand a taught lesson without reliance on the lecturer's notes.	3.24	0.839	3.50	0.974	3.25	0.887	2.93	0.900	3.00	0.697	3.44	0.619	3.32	0.852
D9. Like to explore and simplify the taught lesson in your own way.	3.52	0.990	3.77	1.006	3.39	0.832	3.36	0.870	3.53	0.922	3.44	1.216	3.62	1.037
D10. Do revision by referring to many sources.	3.35	0.941	3.43	1.073	3.32	0.945	3.29	0.897	3.32	0.904	3.66	0.937	3.14	0.887
Valid N (listwise)	191													

For item D5, students were asked how regularly they try to relate everything that has been learnt so far to their existing knowledge, which might be a useful technique to help better understand these learnt topics. Students from both Control and Experimental group from all three polytechnics gave a high mean ($M > 3.50$) indicating the frequent use of this strategy. However, Control group from polytechnic B only used this strategy to a moderate degree ($M = 3.25$, $SD = 0.967$). The higher mean was also seen for item D7 (be able to accomplish a task in a given time) at $M = 3.70$, $SD = 0.837$.

Even though students replied that they can usually complete a given task, nonetheless they still often needed their lecturer's help to enable them to solve the task or problem given (D6), as this item gave a low mean result ($M < 3.20$) for this category. Many of the groups also replied that they can only 'sometimes' learn without any reliance on lecturer's notes (D8) with $M = 3.24$, $SD = 0.839$, which indicates that students consider that they cannot learn independently without assistance from their lecturer.

From the results presented in Table 5.21 for item D10, students were found not to regularly refer to relevant sources (such as the internet, library etc.) to help with their learning. The majority of the groups rated this item (D10) with $M < 3.50$, which indicates that these students preferred to depend principally on the learning materials supplied at the polytechnics by their lecturers. Even though it was not common practice for them to refer to other learning materials, nonetheless some of these groups (Control groups from both polytechnic A and polytechnic B, and Experimental group from polytechnic C) regularly explored and simplified the taught lessons in their own preferred way, with $M > 3.50$, whilst the rest of the respondent groups only sometimes preferred to use this learning strategy.

Table 5.22: Influence of the Institution's Environment on the Future Life of Students

STRATEGY	OVERALL SAMPLES		POLYTECHNIC A				POLYTECHNIC B				POLYTECHNIC C			
			CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL		CONTROL		EXPERIMENTAL	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
D11. The institution's environment helps to develop my self-confidence.	3.78	0.850	3.83	1.020	3.86	0.803	3.54	0.881	3.87	0.777	3.84	0.677	3.73	0.932
D12. The institution's environment prepares me for the real workplace.	3.78	0.945	3.90	0.995	3.64	0.870	3.43	0.997	3.82	0.834	3.97	0.933	3.84	1.014
D13. The institution's environment encourages me to build up positive attitudes.	3.94	0.905	4.13	0.937	3.68	0.772	3.68	1.124	3.95	0.743	4.31	0.693	3.86	1.004
Valid N (listwise)	191													

(c) Influence of the institution's environment upon students' behaviour

The final three questions were constructed to evaluate how the polytechnic environment helps students to build up a better work ethic and thus better prepare them for their future life. As seen in Table 5.22, the Control and Experimental groups from all three polytechnics gave very positive feedback that their institution's environment helped them to develop their self-confidence (D11), prepare them for the real workplace (D12), and encouraged them to build up positive attitudes (D13). All samples agreed strongly that the polytechnic environment helped them to prepare for their future working life, with a mean level greater than 3.50, and up to M = 4.31 and SD = 0.693 for D13, as rated by Control group from polytechnic C. Despite this positive feedback from all the student samples, Experimental group from polytechnic A nonetheless felt that the polytechnic had not really helped them to prepare for employment, with M = 3.43 and SD = 0.997.

5.3.6.1 Discussion on the Elements of Students' Generic Competences.

In this section, students' responses concerning their learning strategies is a sign as to which teaching strategies students tend to be bound. Findings from the analysis provides information on students' perspectives on their learning practices which could aid lecturers in selecting appropriate teaching strategies and structuring the academic environment to better serve students' needs in learning.

Students generally perceived that team building, communication, critical thinking, and problem solving skills were presented in the polytechnic classroom. From the results shown in Table 5.20, it can be summarised that many students prefer to learn in groups rather than individually. They are able to work cooperatively, as they can communicate effectively and have discussions harmoniously. Nevertheless, they need to gain more experience in regular group working, in order to gain confidence and increase their leadership skills. Results also indicate, it seems that students are able to think critically.

However, they are not good problem solvers as students were also found regularly to ask for assistance from their lecturers in the learning process, not only in a classroom but also outside of the classroom. According to the lecturers, students do indeed rely too much on the lecturer, especially their PA (academic advisor), to help them in their studies.

> *"Students in general, from what I can see… maybe this is a tradition in this polytechnic or whatever it is… I can say that 99% of students are too much dependent on their PA — very, very much indeed."* (Noreen).

Overall, the study results indicate that students consider that they will be able to solve a given task. However, overall student confidence will need to increase, with decreased direct involvement from their lecturers. Wee (2004) contended that, if we want to successfully aid students to learn independently, the lecturers' role in the learning process should be decreased. In other word, lecturers need to shift their role from 'teaching' to 'facilitating'.

The finding draws attention to the element of independent learning. Results show that elements of learning independently received a lower score from the students which suggests that students consider that they cannot learn independently without help from the lecturer. Hence, this element of learning requires greater emphasis by the lecturers during the teaching. Teachers will have to enhance their teaching effectiveness by aligning their teaching strategies to suit the students' learning needs for independence and competence.

The discussion was further expanded using correlation coefficient analysis to identify whether there is any association between each variable and to what degree a relation exists between two or more variables. Correlation tests help to determine relations among variables and to use these relations to make predictions (Field 2009), as in this case, on the current pattern of teaching and learning in polytechnics.

5.3.6.2 Analysis of the Relationships between the Variables

A correlation coefficient test was undertaken on this data because the factor analysis method is not adequate for this type of data. As shown in Appendix 5-A, only a few of the variables have a coefficient correlation of less than 0.3. As suggested by Field (2009), these variables need to be excluded from the analysis in order to obtain a coherent dataset. However, it is important to see the relationship between all variables, and any exclusion might not be helpful in producing a reliable finding, as necessary for this study. Pragmatically, then, I conducted a correlation analysis with all variables.

By referring to appendix 5-A, it can be seen that all thirteen strategies are positively related with each individual strategy. However, the statistical relationship for each individual variable (strategy) is, in most cases, modest, especially for variables under the theme 'students' problem solving and communication skills'. For example, variable D6 (I can solve a given problem without help from the lecturer) seems to be related only with variable D8 (has the initiative to understand a taught lesson without relying on a lecturer's notes), as $r = 0.272$ and $p < 0.05$. This relationship shows that the fewer students depend on their lecturers to solve a given problem, the more initiative they personally take to understand the lesson. On the other hand, D6 has no direct relevance to D2 and D9, as the Pearson correlation coefficient is negative ($r = -.083$ and $r = -.089$ respectively). Friends may not welcome other students learning independently; therefore students might wish to understand the taught lesson in their own way. D5 provides the highest correlation coefficient under this theme ($r = 0.470$) with D4. However, this has no relationship with D1.

As students can work cooperatively and communicate well, learning individually is not related to this kind of strategy. The rest of the variables (D7, D8, D9 and D10) are positively related with all the other strategies, although the correlation is slightly lower. Students can study independently as they rely less on their lecturers, they are able to seek out different ways of learning and involve other sources of information to help with their understanding. According to Boud (1995), it is important for students to find strategies that are appropriate for their learning in order to develop effective learning.

Variables D1 to D4 have been grouped under the theme of 'teamwork and communication skills'. D1 shows little correlation with the other variables. D1 seems only related to D2, D3 and D7, and the lowest coefficient correlation obtained in this dataset is r = 0.196. This result suggests that, if students learn by themselves, they might have difficulty respecting each other, being a good leader, or finishing the task in a given time.

It is essential that students are able to talk with other people, listen to their opinions and work effectively with them. Teamwork and cooperative learning helps to strengthen what students have learned and to help them to practise the learning that can prepare them for future real-life situations (Tilestone, 2000). Thus, group learning might be a good technique. The rest of the variables on this theme are constantly positively related to the other variables. The data indicates that if students are regularly working in groups and can communicate effectively, the other variables (ability to control and monitor learning, and influence of institution) are associated with this. Glover and Law (2002) consider that learning in a cooperative way will promote a greater level of participation and engagement than that achieved by an individual learning alone. Therefore, teamwork helps all members to quickly move towards better learning and increased understanding.

The last three variables (D11, D12 and D13), under the theme 'influence of the institution', appear important as they have the highest coefficient (up to r = 0.700), especially among variables within the same theme. D11, D12 and D13 also positively correlated with the remaining variables. This reading gives a hint that the institution's environment also plays a significant role in preparing students for their future life. As the students' environment cannot be controlled while they are outside of the classroom, therefore the inside environment becomes critically important as the lecturers are able to develop and enrich this environment to promote active learning (Tilestone, 2002, p.5). We need to consider how the surrounding ambience could be important in developing students' behaviour and attitudes - the fact that students' learning behaviour could be largely influenced by the current teaching and learning situation they find themselves in. The existence of one or more elements 'on their own' is unlikely to lead to success in every learning situation (Glover and Law, 2002, p.6).

5.4 STUDENTS' VIEWS ON IMPROVING LEARNING

At the end of the questionnaire, students were asked their opinion on how teaching and learning could be improved when learning the Concrete Technology subject. This part was asked as an open-ended question in order to explore the students' perspectives of the teaching and learning process, and to explore other factors that might perhaps influence the process. For this section, the written feedback given by the students was transcribed, coded and grouped together into themes. From Table 5.23, it can be seen that six distinct themes emerged from the students' responses which were considered to be important to improve learning as well as teaching. Presenting the qualitative findings in this way assists in identifying which factors have been the most problematic to the students' learning process.

Table 5.23 presents the six themes as transcribed from students' comments and provides suggestions on how to improve their learning, and the total number of students who gave the feedback.

Table 5.23: Comments & Suggestions to Improve the Teaching and Learning Process

Comments and Suggestions	POLYTECHNIC A		POLYTECHNIC B		POLYTECHNIC C		TOTAL
	CONTROL	EXPERIM -ENTAL	CONTROL	EXPERIM-ENTAL	CONTROL	EXPERIM-ENTAL	
1. Teaching delivery strategies.	1	1	3	6	-	5	**16**
2. Number of exercises and revision.	-	1	-	3	1	3	**8**
3. Relationship and commun-ication skills.	1	-	3	1	-	2	**7**
4. Teaching management.	1	-	1	1	-	1	**4**
5. Restructuring learning period/ duration	-	-	-	2	1	-	**3**
6. None/no comment.	27	27	22	25	30	26	**157**
TOTAL	**30**	**29**	**29**	**38**	**32**	**37**	**194**

It is immediately apparent that many of the students preferred not to give any comment or suggestion to this open question, as 157 of the 194 respondents did not write anything or just wrote ‘no’ and ‘no comment’ to this section. Cohen *et al.,* (2007) has warned that when questionnaires with open-ended items are used, respondents might not be willing to write their answer for one or another reason (i.e. limited literacy and time constraimts). Whilst I was aware of the probability that I would not have systematic feedback to this question when constructing this section of the questionnaire, I considered that it was good for the students to have at least one space that would allow them to express their personal feelings, especially as such feelings could not be expressed elsewhere in the questionnaire. It was considered that such input would be beneficial to expand upon other factors that might relate to the teaching and learning issues raised elsewhere in the questionnaire or in this study.

From their (limited) comments, as presented in Table 5.23, elements that were of concern in improving learning were (with exception of element No. 6); teaching delivery strategies, number of exercise and revision, relationship and communication skills, teaching management and restructuring learning period/duration. Element no.6 which included none/ no/ no comment are considered unrelated.

Teaching delivery strategies: The main factor that was raised was the need for lecturers to improve the teaching and learning process by increasing the variety of teaching delivery modes. This factor appeared as the top suggestion given by those students who responded to this question. Their suggestions included that the lecturers need to be more creative to avoid students becoming ‘bored and sleepy’, the need to conduct more physical activities, the use of a variety of teaching methods and multiple teaching techniques, and the need for the lecturers to put some entertaining elements into the learning. This element requires lecturers to vary their teaching techniques so as to make learning meaningfully, fun and lively. According to Ibrahim (2007), it is important for lecturers to understand and master teaching techniques as to increase their teaching effectiveness.

More exercise and revision: The second factor stressed by those students who responded was the need for more exercise and revision to be set, in order to help students understand the learnt topics better. Some of their comments included;

“Lecturers should give more assignments”. (Sample in Experimental group, polytechnic A).

“... the lecturer needs to conduct more quizzes”. (Sample in Experimental group, polytechnic B).

“... do revision with past exam questions”. (Sample in Control group, polytechnic C).

“... provide and supply a handout as a ‘supplement’.” (Sample in Experimental group, polytechnic C).

Relationship and Communication skills: Students also required that their lecturers to have a good relationship with them, while at the same time having good communication skills to help them understand the lesson and to learn in a more comfortable environment, as one student wrote:

"The teacher should be happy and not to be too formal while delivering a lesson". (Sample in Control group, polytechnic A)

Students would appreciate it if lecturers could conduct their teaching activities in a more informal environment, instead of talking too much within a traditional classroom learning session, which probably culminates in the students feeling bored and unable or unwilling to concentrate on their new learning. Students also expressed disapproval of lecturers who did not know how to communicate well with them. Lecturers were also requested to speak at a more moderate and acceptable tone and speed of delivery, as it is sometimes difficult for students to follow their words if they are spoken too fast or indistinctly, which may then lead to misunderstandings and misconceptions. As expressed by one student:

"don't talk too fast... it is difficult to understand". (Sample in Experimental group, polytechnic B)

According to Glover and Law (2002), it is a common comment from students that they cannot make good progress in a given topic as they cannot understand what the teacher actually wants. They add that communication is fundamental to the learning process, and teachers need to have a good level of vocabulary, along with a balanced use of language. The above student's suggestion provides a further indication that good communication skills are important in helping to enhance the student's understanding of the subject being taught, and a good student-teacher relationship will also help students to learn in a more comfortable and non-threatening environment.

Teaching management and restructuring learning period/ duration: The final comments include the suggestion that lecturers need to manage their teaching schedules better, as students are not happy when they have to postpone the scheduled and already allocated learning session due to the lecturer cancelling, as they will need to replace it some day in the future, which could become a burden to them and it could affect other components of their life (such as revision). Lecturers are therefore requested to manage their time more efficiently. Other comments given by the students included:

"... plan for more holidays [term break]". (Sample in Control group, polytechnic C)

"Start class a bit late...". (Sample in Experimental group, polytechnic B)

These comments indicate that students require more leisure time and space for themselves. Polytechnics have one to two weeks for their mid-term breaks, and four weeks holiday before the new enrolment session. The class sessions normally start at 8.00am and finish at 5.00pm, with one hour for the lunch break (see Appendix A-1). Students would appreciate having longer holidays and being able to come to the classroom later than the current commencement time. Nonetheless, this may not be such a positive suggestion for how to improve learning in the polytechnic classroom. More holidays mean that more lessons may have to be postponed (or perhaps simply cancelled) and problems might be encountered trying to reschedule postponed lectures in the reduced time available. The designed and scheduled learning plan should of course also suit the polytechnic, so more amendments due to shorter working days or increased holidays might not be a good idea, as many factors need to be taken into consideration.

Generally, statements given by students reflect the type of teaching approach that should be employed by the lecturers were of the type where students would like various teaching strategies to be incorporated into a classroom learning session. This means, the students prefer other various teaching strategies to be applied by their lecturers rather than what they are practicing presently.

Lecturers therefore should plan several teaching strategies to accommodate the requests of these students. Razak, et al., (2007) suggested that using a variety of teaching modes ultimately may encourage adaptability and life-long learning in the teaching and learning process, and hence be able to develop students' generic competences. However, both lecturers and students have a responsibility to adapt to the use of new modes of delivery in their teaching and learning with the means available to them in order to improve student learning. A varied mode of delivery would be most welcome in the learning process, and students would appreciate it if lecturers developed a better rapport with them.

5.5 SUMMARY

Semi-structured interviews and a questionnaire were employed to help identify the more preferable teaching approaches that are currently used by lecturers in three polytechnics (A, B and C) in Malaysia. Feedback from the questionnaire showed that many of the lecturers do not use active teaching strategies while delivering their lessons. Many of them use 'chalk and talk' as the most common choice of teaching delivery mode besides lecture sessions. This situation has been confirmed by the lecturers' comments. The reason for these didactic teaching strategies is due to four main factors: lecturers' enthusiasm, students' backgrounds and characteristics, the designed syllabus and curriculum, and a general lack of appropriate and available teaching facilities. Additionally, from the questionnaire, students responded that many of the activities conducted in the classroom were not really helping them to enhance their communication, critical thinking, problem solving and team building skills. They did have some group work and a few activities that allowed students to perform in the classroom, but the lecturers poorly identified what skills or outcomes were required from the activities. Overall, it can be seen that the pattern of teaching and learning largely adopted in the three polytechnics under investigation was of the typical traditional classroom teaching approach although there were a few exceptions.

As suggested by the students surveyed, they need more space to learn on their own. They are not given sufficient opportunities to 'show off' their mastery of learning content, since lecturers still control the classroom environment and assert their dominance in the learning process.

More sophisticated analysis of the data through data reduction (factor analysis) resulted in five sub-scales being selected, which are 'active teaching methods', 'active teaching aids/materials', 'teacher-centred', 'passive teaching aids/materials' and 'student-centred'. It was shown that lecturers in polytechnics do apply varied methods of teaching but *alongside* didactic methods. The correlation coefficient analysis suggests that lecturers combine didactic approaches (teacher-centred and passive teaching aids/materials) and more active approaches (active teaching methods, active teaching aids/materials, and student-centred) into their teaching practice. The kinds of strategies which each lecturer might use are diverse. Some may only apply one technique (for instance, teacher-centred) while others might use a number of other approaches in conjunction (e.g.; active teaching methods with student-centred and passive teaching aids/materials). However, the approaches to teaching applied by lecturers varied according to circumstances, such as the individual lecturer themselves, the subject being taught, teaching facilities available and other circumstances.

The data in the first set was further supported by the data in the second set, which shows that in the teaching practices of these lecturers, they utilised both teacher-centred and student-centred approaches. The results also suggest that there is a high degree of relationship between the teacher-centred and student-centred approaches. This finding indicates that student learning can indeed be influenced by the lecturers. Lecturers may also have an impact on promoting an active learning process as their actions and expectations tend to have a significant influence on their students (Boud, 1995, p.15). However, it is difficult to determine how regularly these active approaches take place within a classroom learning session.

From these results it may be suggested that even a small uses of active methods may begin to reduce the teacher's role in the polytechnic classroom learning process, whilst starting to increase the student's autonomy in their own learning process. Furthermore, from the analysis of the final section, the findings reveal that students have indeed been exposed to collaborative learning and that they do have some ability to use their metacognitive skills. Students can learn with each other and from each other, along with monitoring and planning their own learning. It is important to develop these kinds of learning strategies, because they are an essential feature of professional practice in future life (Boud, 1995).

From these survey results, it may be assumed that polytechnic students might have few problems adapting to new alternative teaching and learning strategies, as they already have had some exposure to help them deal with the required strategies (collaboration and metacognition). However, there is a need to plan and design the new alternative strategies in a proper and systematic manner that could help them to achieve their own successful learning. This is because students who were studying in these polytechnics experience difficulties when trying to learn on their own, and have become too dependent on their lecturers. From the survey, as revealed in Section 5.3.3, students agreed that they still choose to rely on their lecturer for many aspects of their study. The findings also revealed that, while the institutional ethos emphasises the need to prepare students for the future, the classroom learning environment is not encouraging them to do that. With an emphasis placed on competence, lecturers should minimise their 'teacher' role in the classroom and become instead more of a facilitator.

The next chapter will look at how the use of selected learning strategies actually affected the relevant groups at the three different polytechnics, and whether any improvements in achievement might be ascertained. It will present the collated findings after one group experienced the new learning and teaching process, administered by means of the instructional module for the HybCoMet strategy.

It is hoped that the chapter will provide evidence on how this strategy might help students improve their learning behaviour, as well as their generic competences. As this chapter has shown, although there is some evidence of active learning in Malaysian polytechnics there is a need for more structured and designed interventions.

CHAPTER 6

FINDINGS 2: THE EFFICACY OF THE HybCoMet STRATEGY IN IMPROVING GENERIC COMPETENCES AND LEARNING PERFORMANCE.

6.1 INTRODUCTION

In the previous chapter, I considered that, whilst students and teachers are open to new approaches (and that there is evidence of active teaching approaches even alongside didactic ones), lecturers are often constrained in terms of the approaches they use. This chapter considers whether, if there were resources available, the introduction of a new approach would benefit students and lecturers. Therefore the main focus of this chapter is the analysis of findings from the second series of questionnaires – the post questionnaire. The post questionnaire was distributed to the experimental groups after the treatment process using the developed intervention teaching module- the HybCoMet Strategy. The purpose of this analysis was to consider what the specific benefits of the HybCoMet module might be.

This chapter also contains the analysis on a pre and post paper assessment tests, and diary method using log sheets. The pre and post tests were conducted with both control and experimental groups in all polytechnics. However, the log sheet was only being reflected by the experimental group at the end of every treatment process. As the control group were not exposed to the hybrid learning, the post questionnaire and the log sheets were not relevant to them.

The findings from all methods and instruments are important to achieve the following research objectives;

(i) To determine the effectiveness of the HybCoMet Strategy compared to the more 'Traditional Approach'.

(ii) To identify how the HybCoMet Strategy may help students to improve their generic competences and learning attitudes.

The analysis starts with the post questionnaire to provide students reflection on their own learning practice after the introduction of the HybCoMet Strategy and the perceived effectiveness of the strategy in promoting an active learning climate compared with the more traditional approach. It also considers how such an approach could help to improve students' generic competences, specifically communication, problem solving, critical thinking and team work skills. The analysis also includes the triangulation from the diary method using the log sheet. Data provided from the log sheets would help to examine students' level of improvement of the stated competence skills and to determine overall level of generic competences of students in each polytechnic.

Section three of the chapter is the analysis on the open ended question which discusses the positive and negative qualities of the HybCoMet Strategy as the new alternative teaching approach.

The analysis on pre and post tests to consider the findings on students learning achievement before and after the treatment process is in the fourth section of the chapter. The analysis is to determine whether there was a significant difference between the test scores between control groups who underwent the traditional teaching mode and the experimental groups who received treatment with the HybCoMet Strategy. Data from both control and experimental groups were compared to examine the level of improvement and then to confirm whether the HybCoMet Strategy will improve students' test scores. The analysis is performed using paired sample t-tests from the SPSS analysis package.

6.2 ANALYSIS OF THE APPLICATION OF THE HybCoMet STRATEGY TOWARDS IMPROVING STUDENTS' GENERIC COMPETENCES.

To identify the benefits of HybCoMet Strategy on generic competences, the post questionnaire was given to students from the experimental groups, who completed them anonymously at the end of the intervention. 92 students took part in the survey. The initial number of students in the experimental groups was 103.

However, a total of 11 students from all the groups were eliminated from the survey because they were absent, when the survey took place, and some of them did not participate in the first set of questionnaire. This resulted in a final sample size of 92 students. The drop out rate was not considered to be sufficient to negatively impact on the validity of the data. The questionnaire was divided into four sections. The details of those sections are illustrated in Table 6.1. A copy of the questionnaire is provided in the appendix 4-B.

Table 6.1 : The Structure of the Questionnaire (Set 2).

PART A	Demographic details.
PART B	Students' evaluation on the influence of the HybCoMet to the development of generic competences.
PART C	Students' evaluation on the effectiveness of the HybCoMet Strategy.
PART D	Open ended question emphasizes on how to improve the HybCoMet Strategy.

Both parts B and C asked students to rate their preferences using four (4) types Likert scales. The weighting of the scale is given in Table 6.2.

Table 6.2 : Level of Agreement.

No	Level of Agreement	Likert Scale
1.	Strongly agree (SA)	4
2.	Agree (A)	3
3.	Disagree (DA)	2
4.	Strongly disagree (SDA)	1

6.2.1 Students Demographic

In this section, students were asked to give details of their gender, ethnicity and their religion. These elements are discussed in detail in Chapter 5. This data were used only to trace back which student participated in both sets of questionnaires.

6.2.2 Influence of the HybCoMet Strategy to the Improvement of Students' Generic Competences.

There were 13 questions asked in this part in relation to students' experience of learning with the introduction of the HybCoMet Strategy. This section examined how the strategy influenced students' choice of their learning practice and how it helped students to actively participate in their learning. Some of the questions in this section were similar to the questions in the first set of questionnaire (pre questionnaire). The same question was asked with the purpose of identifying any differences in the feedback obtained between the previous approach (traditional approaches) and the alternative new approach (the HybCoMet Strategy). The collated data was useful in evaluating the effectiveness of the new strategy in helping students in their learning. Findings from both pre and post questionnaire are discussed later in this section.

To analyse the data for this section, descriptive statistics were used with the help of the Statistical Package for Social Science (SPSS) computer package. The analysis helped to find the mean level and standard deviation for every group and also the mean level for overall groups. The t-test was also used to determine whether there was evidence of significantly different between polytechnics, to identify possible differences in teaching approaches.

(a) Teamwork and communication skills

Similar to the pre questionnaire, item B1 to B6 asked how well students can work as a team and how effectively they can have a good conversation between peers as well as with the whole class. Data on these items considered the extent to which students agreed about group work and their participation as a member of the group. It also included how they can communicate and contribute ideas to all group members. Table 6.3 illustrates the average scores for all items of all groups.

From Table 6.3, the students' evaluation of team work and communication skills showed the high level of agreement with mean levels greater than 3.00 ($M<3.00$). The highest rating is for the ability of students to be a good team member (B2), with $M = 3.37$, $SD = 0.56$ which indicates that students strongly agree with the application of this strategy in which they have quality of group work parallel to that required by employers as indicated from the analysis of data by Martinez *et al*., (2007). In term of each polytechnic, two elements were rated low on the scale which are to be a good leader (B3) with M= 2.89, SD = 0.676, and contribute idea with confidence (M = 2.91, SD = 0.702). Both items were rated by Poly B. The rest of polytechnics gave a fair mean average for every items (M > 3.00) and the highest mean (M = 3.58, SD = 0.564) rated by Poly C on item B1- that is they prefer group learning.

The overall means in general, suggests that this group of students have gained good experiences while learning collaboratively and can deal with group members very well as they have no problem in terms of their ability to communicate with each other. A further discussion is provided at the end of this section.

Table 6.3 : Students Abilities on Teamwork and Communication.

No.	Question	OVERALL MEAN		POLY A		POLY B		POLY C	
		M	SD	M	SD	M	SD	M	SD
B1	I prefer to do any learning task in a group rather than individually.	3.35	0.582	3.35	0.562	3.14	0.550	3.58	0.564
B2	I can accept and respect opinions and contributions from friends even if they think it is not correct.	3.37	0.590	3.42	0.578	3.23	0.646	3.50	0.509
B3	I am able to be a good leader.	3.35	0.663	3.19	0.567	2.89	0.676	3.03	0.706
B4	I can accept and be responsible for a given role	3.20	0.451	3.27	0.452	3.03	0.382	3.32	0.475
B5	I can communicate wellto each other while working in a group	3.26	0.532	3.27	0.533	3.09	0.507	3.45	0.506
B6	I can contribute my ideas with more confidence	3.20	0.667	3.38	0.496	2.91	0.702	3.35	0.661
V	Valid N (listwise)	92		26		35		31	

(b) Critical thinking and commitment towards learning.

Items B7 to B10 explore students' ability to administer their own learning to gain better understanding and their commitment to accomplishing a given task without depending too much on lecturers. These items were particularly constructed to identify students' level of critical thinking and commitments towards learning. Table 6.4 provides the findings for these items.

As can be seen in the Table 6.4, the results suggested that student are able to learn using their thinking strategy with mean level greater than 3.00 ($M<3.00$), however many of the students did not really try to understand what was learnt using their own initiative, as this element is the lowest rated in this section, with $M = 2.68$, $SD = 0.678$. This finding suggests students need assistance from the lecturers to solve the learning task. The rest of the elements under this section have fairly equal means between each other, and suggest a high agreement with the benefits of HybCoMet strategy. One immediately observable result was that Poly B provided the lowest reading for all four items.

Table 6.4: Critical Thinking and Commitment towards Learning.

No.	Question	OVERALL MEANS		POLY A		POLY B		POLY C	
		M	SD	M	SD	M	SD	M	SD
B7	I try to relate everything that is learnt to existing knowledge to help to gain a better understanding about the topics.	3.01	0.638	2.92	0.560	2.80	0.719	3.32	0.475
B8	I have initiative to help myself understand a taught lesson rather than rely on a lecturer notes.	2.68	0.678	3.04	0.662	2.89	0.676	3.29	0.643
B9	I like to explore and simplify the taught lesson in my own way rather than memorize it.	3.17	0.567	3.42	0.578	2.86	0.879	3.29	0.693
B10	I like to do revision by referring to many sources to help my understanding about the topic.	3.16	0.560	3.12	0.653	3.06	0.639	3.32	0.541
V	Valid N (listwise)	92		26		35		31	

(c) Students' capability to solve the given task

The data obtained in this section as presented in table 6.5, are important as an indicator of the existence generic competences, specifically the problem solving skills. These questions (B11 to B13) enabled me to determine how students can solve and organize a given task systematically. As can be seen in table 6.5, all items have been rated at the higher level with $M > 3.00$. This result suggested that students are able to solve the given task without help from the teacher (B11), are able to complete a task in a given time (B12) and are able to plan and organize a given task in a more systematic way (B13). However, when looking at every polytechnic, item B11 has provided the lowest score ($M < 3.00$).

The lowest score, almost close to disagreement, was provided by Poly B with $M = 2.51$, $SD = 0.612$. The other two polytechnics also showed lower scores for this element with $M = 2.62$, $SD = 0.752$ by Poly A, and $M = 2.94$, $SD = 0.629$ by Poly C. What is interesting was, even though all groups in all polytechnics were rating their capability to solve a task on their own as lowest, they rated their punctuality to complete the task as the highest with a balanced mean between every polytechnic.

Table 6.5: Students Capability to Solve the Given Task

No.	Question	OVERALL MEANS		POLY A		POLY B		POLY C	
		M	SD	M	SD	M	SD	M	SD
B11	I can solve a given task accurately and faster without help from the lecturer.	3.07	0.676	2.62	0.752	2.51	0.612	2.94	0.629
B12	I can accomplish a given task in the given time.	3.16	0.774	3.23	0.652	3.06	0.482	3.26	0.575
B13	I am being able to plan and organize a given task more systematically	3.16	0.616	3.19	0.491	3.03	0.618	3.29	0.529
V	Valid N (listwise)	92		26		35		31	

6.2.2.1 Discussion on the Influence of the HybCoMet Strategy in Improving Students' Generic Competences.

A study by Martinez *et al.,* (2007) contends that the ability to learn and understand is considered as one of the important competences required by many types of employment, from the self employed to public employees, and to private employees. Results from this study suggested that with the introduction of the HybCoMet Strategy, it is possible to help students to systematically improve their own learning practices.

It was apparent from these findings that all students agreed that they were committed towards their learning and had the ability to administer their own learning orientated towards improving and developing the level of generic competences.

With the introduction of the HybCoMet Strategy, students in all polytechnics showed their interest in learning and working collaboratively as they show their responsibility and their ability to be a good group member, and can communicate well with each other. They may also develop leadership skills. Leadership might be an important skill in the workplace. This is consistent with Martinez *et al.*, (2007), which report that leadership is one of the important characteristics that is required by many types of employer (eg; entrepreneurs, public employers, private employers). Analysis from their study showed that many types of employment rated the importance of leadership skills. Even though leadership skills have not been a major concern in my study, nonetheless, there is some evidence that the results obtained show that students are able to gain this skill. This learning experience might be helpful to prepare them to work with others in a real world situation.

Students also demonstrated their ability to solve a given task without help from the lecturer. Nevertheless, one of the polytechnics (Poly B) reported that help was required from the lecturer to solve the learning task. This finding was quite worrying as working independently was one of the most highly required skills by many employers as seen in the data analysed by Martinez *et al.*, 2007. It may therefore be necessary to plan a lesson / lessons that incorporated more students' participation in the classroom activities to build their confidence to learn independently.

Many studies have showed that learning is enhanced when students actively participate in the learning process (see Harvey and Mason, 1996; Tilestone, 2007; and Yusof, 2003). Instructional strategies that engaged students actively in learning could stimulate critical thinking and a greater awareness of their learning context (Tilestone, 2007). The HybCoMet strategy is found to have the currency to provide an active learning environment, and the regular application of this strategy, it is hoped, could help in producing students who are more independent in their learning.

Besides that, students are able to plan and organize the given task more systematically. The study by Martinez *et al.,* (2007) also showed that knowing how to plan and organize job tasks was also one of the highest competences required by many employers especially by entrepreneurs and non-profit organisations. By introducing hybrid learning, students showed their potential to improve their planning and organisation which can be better suited to the job market. To further examine the improvement of generic competences with the help of the HybComet strategy, the results were then compared to the traditional approaches.

6.2.2.2 Comparison of Students Level of Generic Competence Before and After the Intervention with the HybCoMet Strategy.

To identify any differences in the elements of generic competences using the traditional approaches and the HybCoMet Strategy, items in this section are compared to the items in the pre questionnaire (items D1 to D10). To make a comparison, the 5- point likert scale has been altered to the same type likert scale as in this set (4-point likert scale). The SPSS computer analysis helps to transform and re-code those items into 4-point type scales. Likert responses are non parametric ratings and the attributed numbers have no parametric [measurement] value. Thus, as long as the ordinal ranking is preserved- i.e.' Strongly Agree', 'Agree', 'Disagree' and 'Strongly Disagree' remain in sequence, Likert scale data can be transformed- i.e. re-scaled.

Dawes (2008), for instance, reported when "five and seven-point scales were re-scaled to a comparable mean score out of ten" that "the five and seven-point scales produced the same mean score as each other, once they were re-scaled" (p. 61).

Therefore, there is evidence that the use of different scales, when transformed to the same scale format has no affects on the resultant data in term of mean scores and variances.

The new mean scores and standard deviations for these items and descriptive statistics for both traditional approaches and HybCoMet Strategy are displayed in the Table 6.6.

Table 6.6: Descriptive Statistics of Traditional Approaches and the HybCoMet Strategy

	Traditional Strategies			HybCoMet Strategy		
	N	M	SD	N	M	SD
1. Comfortable to do any learning task individually rather than in a group.	103	2.330	0.692	92	3.350	0.582
2. Will accept and respect opinions and contributions from friends.	102	2.796	0.878	91	3.370	0.590
3. Will be able to be a good leader.	103	2.660	0.823	92	3.350	0.663
4. Will have no problem in terms of ability to communicate well with other group members	103	2.524	0.827	92	3.260	0.451
5. Try to relate everything that has been learnt to existing knowledge.	103	2.544	0.872	92	3.010	0.638
6. Can solve a given problem without help from the lecturer.	103	2.534	0.838	92	3.070	0.676
7. Be able to accomplish a task in a given time.	103	2.718	0.912	92	3.160	0.774
8. Have the initiative to understand a taught lesson without reliance on the lecturer's notes.	103	2.679	0.782	92	2.680	0.678
9. Like to explore and simplify the taught lesson in your own way.	103	2.961	0.816	92	3.170	0.567
10. Do revision by referring to many sources.	103	3.000	0.863	92	3.160	0.560
Valid N (listwise)	102			91		

From the Table 6.6, in general, we can see there are different mean scores between the traditional approaches and HybCoMet Strategy. Obviously, the pattern for all items suggests that the HybCoMet Strategy provided higher mean scores than the traditional strategies. The t-test Paired Sample Statistics method then was used to compare the different modes of learning and to confirm if there are statistical differences between the means of the HybCoMet Strategy and the traditional approaches. Results were obtained as shown in table 6.7.

Table 6.7: Paired Samples Statistics and Paired Sample Test for HybCoMet Strategy and Traditional Approaches.

Paired Samples Statistics				
	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 HybCoMet Strategy	3.036	100	0.437	0.044
Traditional Approaches	2.661	100	0.506	0.051

Paired Samples Test								
	Paired Differences					T	Df	Sig. (2-tailed)
	Mean	Std. Dev.	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 HybCoMet Strategy – Traditional Approaches	0.375	0.639	0.064	0.248	0.502	5.868	99	0.000

From the Table 6.7, the mean score for the HybCoMet Strategy, M = 3.036, SD = 0.437 is different statistically and significantly (t = 5.868, 2-tailed value, $\rho = 0.000$) from that of the traditional approaches (M = 2.661, SD = 0.506). This result tells us that the HybCoMet Strategy is significantly different when compared to the more traditional approaches with the difference between pairs being M = 0.375. The HybCoMet Strategy gives higher values on self rated competences than traditional approaches, indicating that the HybCoMet Strategy was able to help students improving generic competences compared to the traditional approaches.

To summarise, the overall findings showed that, in general, communication and team work seemed to have been improved through the hybrid learning environment. On the other hand, students' commitment towards their learning and problem solving skills displayed rather different mean values across all elements for all polytechnics. Major differences are found in terms of competences regarding working independently. Students, in general, were able to solve the given task/problem that was assigned to them but although the scores with regard to students' abilities to complete any task/problem in the given time, as well as plan and organise systematically were high, they nonetheless, felt it was important to have assistance from the lecturer to successfully solve the task/problem.

In support of this, a study by Brown (2003) suggested that students believe that success or failure was caused by their own effort rather that by other factors e.g. teachers and the learning environment. Thus, they argued that it was necessary to build up students' sense of control over their own work, giving them opportunities to exercise responsibility for their own learning, and helping them to develop self management skills rather than depending on other factors. Findings from my study suggest that the HybCoMet Strategy could also be said to have supplied the necessary generic competences, and also help to make students more confident, which could be beneficial to their future working life.

6.3 THE EFFECTIVENESS OF THE HybCoMet STRATEGY IN IMPROVING GENERIC COMPENTENCES AND ATTITUDES TOWARDS LEARNING.

This section consideres the contribution of the HybCoMet Strategy to the empowerment of generic competences. This part of the questionnaire listed 19 possible outcomes in relation to the students' experience while going through the hybrid classroom learning sessions. Basically, the questions were formulated to evaluate how the new alternative teaching approach helped student empowerment in terms of the level of competences that are highlighted in this study which are critical thinking, problem solving and communication skills.

This section also considered any improvement of students' behaviour and attitude towards learning and their future life. How the HybCoMet Strategy helps students move towards independent learning is also discussed in this section. The following sub sections present the average scores for improvement of behaviour and attitude and the enrichment of competences as perceived by the students.

6.3.1 Students' Attitudes towards Learning.

Items C1 to C6 as displayed in Table 6.8 particularly focussed on how the HybCoMet Strategy might invite students to be actively engaged in every activity conducted during a learning session and improve their attitudes towards the learning. It is apparent from Table 6.8 that the new approach had a significant effect on student's participation levels in classroom activity since item C2-, on participation – had the highest score. as strongly agreeing with a mean M = 3.30, SD = 0.659. The result tells us that the strategy encourages them to be involved in any activity conducted in the classroom.

Table 6.8 : Students Attitudes Toward Learning

		Overall Poly		Poly A		Poly B		Poly C	
		M	SD	M	SD	M	SD	M	SD
C1	The teaching strategies encourage me to be involved actively in every learning activity	3.24	0.618	3.42	0.578	3.00	0.728	3.55	0.506
C2	The teaching strategies encourage me to fully participate in every learning activity	3.30	0.659	3.15	0.675	3.06	0.539	3.52	0.570
C3	The teaching strategies help me to be more precise and think positively about learning	3.29	0.584	3.46	0.582	3.03	0.514	3.45	0.568
C4	The teaching strategies help me to be more prepared and excited to learn about something	3.28	0.561	3.38	0.496	3.09	0.507	3.42	0.620
C5	The teaching strategies help to divergent my knowledge and sharing ideas about learnt topic through group discussion	3.30	0.569	3.38	0.496	3.17	0.618	3.39	0.558
C6	The teaching strategies help me to contribute and exchange ideas more effectively.	3.28	0.599	3.38	0.496	3.06	0.684	3.45	0.506
	Valid N (listwise)	92		26		35		31	

As well as C2, item C5 also shows high agreement (M = 3.30, SD = 0.569) which indicates that students strongly agree that the HybCoMet Strategy helps to share divergent students knowledge and ideas about learnt topics through group discussion. For the rest of the items, the results in Table 6.8 show that the majority of students also rate those items at the higher level of agreement (M > 3.00). In term of feedbacks from each polytechnic, Poly C provided the highest rates in all items (up to M = 3.55), and the lowest scores were provided by the Poly B. However, all the means are greater than 3.00, which meant a high level of agreement as well.

The overall findings indicated that the strategy helped to actively engage students in learning.and adopt a positive attitude about learning.

6.3.2 Students' Level of Generic Competences

In this section, the items are divided into two categories; communication skills, and students' ability in solving problems and thinking critically. Table 6.9 displays the detailed result for these categories.

(a) Communication

As shown through items C7 and C8 in Table 6.10, almost all of the students in every polytechnic fully agreed that for item C7 the strategy helped them to be more confident to talk in front of the class with average mean, M=3.29, SD =0.603, and it also helped to improve their non verbal communication skills (item C8, M= 3.18, SD= 0.678). The highest rated was Poly A with M = 3.50, SD = 0.510 for item C7. Whilst, the lowest score is for item C8 (M = 3.03, SD = 0.707) provided by Poly B. Nonetheless the reading score is greater than M > 3.00, which is considered to be the highest level of agreement. It was a surprise to see that the strategy was helpful to improve their non verbal skills as the focus of competence in this study is more on oral communication skill.

Table 6.9: Students Level Empower Of Generic Competences

		Overall Poly		Poly A		Poly B		Poly C	
		M	SD	M	SD	M	SD	M	SD
(a). communication									
C7	The teaching strategies encourage me to communicate orally with confident to the whole class	3.29	0.603	3.50	0.510	3.06	0.684	3.39	0.495
C8	The teaching strategies help to improve my non verbal communication skills (writing, drawing).	3.18	0.678	3.15	0.613	3.03	0.707	3.39	0.667
(b). critical thinking and problem solving									
C9	The teaching strategies help me to be more creative	3.25	0.625	3.44	0.507	2.94	0.639	3.45	0.568
C10	The teaching strategies encourage me to think more critically	3.23	0.613	3.35	0.562	2.97	0.568	3.42	0.620
C11	The teaching strategies help my brain to respond and generate ideas quickly in solving given tasks	3.35	0.619	3.38	0.571	3.11	0.583	3.58	0.620
	Valid N (listwise)	92		26		35		31	

(b) Critical thinking and Problem solving.

Statement C9 to C11 in Table 6.9, showed high agreement on how the strategy helps students to generate and share ideas more effectively, improving their problem solving skills, being creative and becoming more critical thinkers as the average means, $M > 3.00$. This finding suggests that the HybCoMet Strategy is able to improve those skills. However, two of the items (C9 and C10) have been rated below 3.00 by Poly B, nevertheless the mean ($M = 2.97$ and $M = 2.94$, respectively) is close to 3.00, which is considered a high level of agreement.

(c) Students' independent learning

Almost all of the students in every polytechnic gave a high rating to statements C12 to C15 as shown in the table 6.10. The highest mean is for item C15, that students strongly agree the HybCoMet Strategy helps them in searching for and exploring information from a variety of sources ($M=3.33$, $SD=0.557$). The lowest rating was for statement C12, students were not really aware of their team mates and of full cooperation with the group ($M=3.22$, $SD=0.608$). However, the mean is greater than 3 ($M>3.00$) which suggests strong agreement for this item. Nonetheless, Poly B provided the lowest mean for this item, $M = 2.97$, $SD = 0.568$. One of the possible reasons for this result might be due to the problem that students are not familiar with working in groups, which indirectly influences their behaviour whilst working with other students in the group.

The previous finding (as section 6.2.2) suggested that students still require help from the lecturer when they are learning on their own. However, when they are directly involved and guided with the HybCoMet module, it can be seen that the new strategy was helpful in terms of its ability to promote students to be independent towards their learning.

Table 6.10: Independent Learning and Life-long Learning.

		Overall Poly		Poly A		Poly B		Poly C	
		M	SD	M	SD	M	SD	M	SD
(c). Students Independent Learning									
C12	The teaching strategies helps me to be more aware of my friends which helps me to fully co-operate with the group	3.22	0.608	3.38	0.571	2.97	0.568	3.35	0.608
C13	The teaching strategies help me to be more responsible in terms of the given task	3.29	0.655	3.35	0.689	3.11	0.676	3.45	0.568
C14	The teaching strategies help me to be more independent without too much reliance on the lecturer	3.27	0.557	3.42	0.504	3.11	0.631	3.32	0.475
C15	The teaching strategies encourage me to search and explore information from many sources efficiently in solving the given task.	3.33	0.557	3.35	0.485	3.11	0.583	3.55	0.506
(d). Students Life-Long Learning									
C16	The teaching strategies give me a chance to increase my skills in using a relevant/appropriate techniques and equipment that relates to a lesson	3.29	0.621	3.50	0.510	3.06	0.684	3.39	0.558
C17	The teaching strategies help me to develop self confidence	3.34	0.560	3.50	0.510	3.03	0.514	3.55	0.506
C18	The teaching strategies prepare me to be involved in a real work place.	3.27	0.577	3.38	0.571	3.06	0.539	3.42	0.502
C19	The teaching strategies encourage me to build up positive attitudes	3.35	0.619	3.50	0.510	3.09	0.702	3.52	0.508
	Valid N (listwise)	92		26		35		31	

(d) Students' life-long learning

As can be seen in table 6.10, a high degree of agreement was shown for every item (C16 to C19) in this category. Apparently, item C19 -the teaching strategy is most helpful in encouraging students to have positive attitudes with M= 3.35, SD=0.619. Item C18- how the strategy prepares students to get involved in a job, is the lowest rated (M=3.27, SD=0.557). Even though the result obtained was the lowest in this category, it nonetheless indicated high agreement. It can therefore be assumed that the HybCoMet Strategy was helpful in supporting students' life-long learning that is beneficial in preparing them for their future working life.

6.3.3 Discussion on the Effectiveness of the HybCoMet Strategy in Improving Generic Competences and Attitudes towards Learning.

This section considers the contribution of the implementation of HybCoMet Strategy as an alternative teaching approach to the more traditional approaches on classroom learning process. The concern of this strategy is to increase the level of generic competences among students who underwent the intervention process. Categories that are of interest include attitudes towards learning, communication, critical thinking and problem solving skills. Independent learning and life-long learning are also included in this section. Table 6.11 provides a mean (average) for each categoryand to give clear explanation in which category could improve better.

Table 6.11: Descriptive Statistics for Overall Categories.

Category	N	Mean	Std. Deviation
1. Attitude towards learning	92	3.284	0.474
2. Communication skill	92	3.239	0.567
3. Critical thinking and problem solving skills	91	3.275	0.555
4. Independent learning.	92	3.277	0.494
5. Life-long learning.	92	3.313	0.501
Valid N (listwise)	91		

These categories are familiar in the analysis of generic competences. For example, data analysed by Mustapha and Abdullah, (2001, 2004) addressed perceptions of educators and employers on how vocational graduates possessed favourable competences and attitudes towards employability which included preparedness to enter the workforce, having necessary communication skills, possessing social and interpersonal skills, being self motivated and having technical skills, critical thinking skills, problem solving skills, entrepreneurial skills and a good attitude toward work.

As can be seen from the table above, the average mean scores for those categories were above 3.00 ($M>3.00$) suggesting a significant contribution being made by the HybcoMet Strategy towards the formation of those competences. The maximum contribution of the new strategy is to the element of life-long learning which provided the highest mean score, $M = 3.313$, $SD = 0.501$. Life- long learning is important in any education and curriculum design in terms of its ability to raise the quality of life and as a tool for employment restructuring (MDG2 Full Report, 2004). To enable successful employment and career paths, there is a need for graduates to have life-long learning skills and the capability for continuously updating their knowledge (Ong, 2007).

The strategy proved helpful to improve communication skills, both verbal and non verbal. Even though there were limited tasks on written communication, students showed how they can apply the skills very well. The study by Martinez *et al.*, (2007) revealed that written communication indeed was one of the most desirable skills needed by many types of employment. Communicating effectively is considered one of the important competences for jobs in perfroming many different tasks (NCVER, 2003). A study by Zaharim *et al.*, (2009) on the perception and expectations toward engineering graduates by employers in Malaysia, discovered that employers presume local engineering graduates lack of oral and written communication skills. This strategy nonetheless, helps to improve students' communication levels in both areas. With exposure to, and experience, with hybrid classroom learning, at least students have a chance to improve their written communication through the tasks and projects given.

Overall findings also indicated that students were able to manipulate existing knowledge and develop more lasting knowledge which might be very useful to apply in the real work place. With the average mean level greater than 3.00, students indeed showed they possessed sufficient skills that could help them for employability. However, the results also suggested that there is difference in the feedback given by every polytechnic. It is useful to find out which polytechnics have a negative perception of the adoption of HybCoMet strategy compared to the others. This is also important to figure out the reason for such different and any suggestion for action to be taken.

6.4 THE DIFFERENCES IN RESPONSES BETWEEN POLYTECHNICS.

As the previous chapter has shown there were some differences in practices between lecturers and there are also some institutional differences between polytechnics. It is therefore important to consider whether there were significant differences between polytechnics in terms of the introduction of the new strategy. To analyse this data, I have used both (a) descriptive statistics (looking at the mean values) and (b) Analysis of Variance (ANOVA) tests.T

hese have been considered in section B and section C in the questionnaire, to explore the significance of levels of students learning with their own strategies and with the influence of HybCoMet Strategy. The comparisons are made between the three polytechnics (Poly A, B and C).

Table 6.12: Descriptive Statistics for Students Learning Strategies and the HybCoMet Strategy**.**

Poly		Students Strategies	HybCoMet Strategy
PolyA	Mean	3.275	3.390
	N	26	26
	Std. Deviation	0.436	0.377
PolyB	Mean	2.960	3.056
	N	35	35
	Std. Deviation	0.393	0.482
PolyC	Mean	3.302	3.450
	N	31	31
	Std. Deviation	0.330	0.382
Total	Mean	3.165	3.283
	N	92	92
	Std. Deviation	0.415	0.455

Table 6.12 shows that students in all polytechnics agree about their learning strategies (I take the range from 2.5 until 3.49 to be in the agreement range). However, according to the mean values, Polytechnic C (M= 3.302, SD=0.330) is ranked first, followed by Polytechnic A (M= 3.275, SD=0.436) and than by Polytechnic B (M= 2.960, SD=0.393).

From the table, it is also can be seen that all polytechnics agree about the evaluation of the HybCoMet Startegy (I take the same agreement range). However, according to the mean values, Polytechnic C (M = 3.450) is ranked first, followed by Polytechnic A (M = 3.390) and than by Polytechnic B (M = 3.056). It is noted that the mean values are higher for the HybCoMet Strategy than for the students' own learning strategies for all polytechnics. This finding indicates that students learn best when they are directly involved in the HybCoMet Strategy compared to learning with their own strategies, even after they have experienced the hybrid learning process. Poly C and Poly A have similar levels of agreement when compared to Poly B.

A further analysis using the one-way analysis of variance (ANOVA test) is conducted to discover the impact of both students own practices and HybCoMet Strategy on the three polytechnics.

An ANOVA test is important to identify if there is a statistically significant differences between the polytechnics in students' own learning strategies and between the polytechnics on the HybCoMet Strategy. The ANOVA test was suitable because there were only two dependent variables (students' strategies and HybCoMet Strategy) and more than two independent variables (Poly A, Poly B and Poly C) involved in this case study (Cohen, *et al.*, 2007).

Table 6.13: ANOVA Test for Learning Strategies and HybCoMet Strategy

		Sum of Squares	Df	Mean Square	F	Sig.
Students strategies	Between Groups	2.366	2	1.183	7.931	0.001
	Within Groups	13.277	89	0.149		
	Total	15.643	91			
HybCoMet Strategy	Between Groups	2.969	2	1.485	8.335	0.000
	Within Groups	15.853	89	0.178		
	Total	18.822	91			

Table 6.13 shows the ANOVA test for the students own learning strategies and for the HybCoMet Strategy. Analysis of variance found that there was a significant difference between the polytechnics regarding learning strategies (F = 7.931, $p = 0.001$). There was also a significant difference between the polytechnics regarding the HybCoMet Strategy (F = 8.335, $p = 0.000$). Since there are differences between these variables, a post hoc test (Duncan's Multiple range test) was conducted to find out which group(s) is / are different from each other. The results are given in Tables 6.14 and 6.15.

Table 6.14 : Post Hoc Test for Student Learning Strategies

Poly	N	Subset for alpha = 0.05	
		1	2
PolyB	35	2.960	
PolyA	26		3.275
PolyC	31		3.302
Sig.		1.000	0.784

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 30.214.
b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Table 6.14 shows the result of the post hoc test using Duncan's Multiple Range test to test whether there are significant differences in opinions between the three polytechnics regarding the students learning strategies. From the table it can be seen that the Poly A and Poly C are placed together in the same column labelled '2' and Poly B is placed in a column labelled '1'. The findings suggest that Poly A and Poly C were not statistically signficantly different from each other as they form a similar homogenous subset (group2), and these polytechnics have higher means regarding learning strategies (M= 3.275 and M= 3.302, respectively). Meanwhile Poly B forms another subset (group1) with the lowest mean, M= 2.96. The post Hoc Test for the learning strategies reveals that these two groups (group 1 and 2) were distinctly and statistically different from each other in respect of this variable. Thus, it can be concluded that, Poly A and C have no differences in agreement from each other but they are different from Poly B.

To test whether there are differences in opinions between the three polytechnics regarding the HybCoMet Strategy, the post hoc test using Duncan's Multiple Range test was also conducted. Table 6.15 shows the result of the test.

Table 6.15 : Post Hoc Test for the HybCoMet Strategy

Poly	N	Subset for alpha = 0.05	
		1	2
PolyB	35	3.056	
PolyA	26		3.390
PolyC	31		3.450
Sig.		1.000	.581

Means for groups in homogeneous subsets are displayed.
a Uses Harmonic Mean Sample Size = 30.214.
b The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

From the above table, Poly A and Poly C, again form a same group and these polytechnics have similar agreement regarding the HybCoMet strategy with mean, M= 3.390 and M= 3.450, respectively. Poly B forms the other group with M=3.056. It can be seen that Poly A and C have similar and higher agreement regarding the HybCoMet Strategy than respondents from Poly B.

Thus, it can be concluded that students in Poly A and Poly C are not that different from each other in terms of both the learning strategies and the HybCoMet Strategy when compared to respondents from Poly B. One reason for this could be, as stated earlier, that Poly B has the reputation of being a ‘super active polytechnic’ and students may already believe that they have access to active teaching (although there was diversity of teaching approaches across all of the polytechnics). However, it can be suggested from the findings that students in all polytechnics can improve their learning strategies after they have gone through and experienced the HybCoMet learning environment. Nonetheless, they are found to learn best if they are directly involved in the HybCoMet learning process. The ANOVA test does indicate that there are different results from introducing this new approach between institutions.

6.5 STUDENTS LEVELS OF GENERIC COMPENTENCES THROUGH THE HybCoMet STRATEGY: TRIANGULATION FROM THE DIARY METHOD

As discussed in Section 6.3, students considered that the new strategy improved their generic competences. To examine further the level of improvement, the log sheet is used as a cross check, to get a clearer indication as to which competences are increased. While implementing the HybCoMet strategy, students were asked to reflect on their learning experience in the log sheet that was distributed at the end of every learning task. The log sheet was formulated with the aim of recording their observations, reactions and perceptions to help to obtain a systematic record of the reflections of the learning process. In this sheet, questions were constructed in a structured form to focus on the topic under study. One of the items asked students '*What skills have you improved on today and to what level*?', which required students to rate on four Likert scales ranging from Low (1) to High (4). This question had been asked at every learning session for every task. Besides the four competences skills that are highlighted in this study (communication, problem solving, critical thinking, and team work skills), other skills are also being considered as the desirable skills that are required by employers as highlighted in the literature (i.e, Mustapha and Abdullah, 2001).

Table 6.16 presents the detailed findings from the log on every competence that has been mastered by students with the help of HybCoMet strategy.

Table 6.16: Descriptive Statistic for the Level of Generic Competencies of Students in Every Learning Task.

Generic Competencies	TASK 1		TASK 2		TASK 3		TASK 4		TASK 5	
	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.	Mean	Std.
1. knowledge	3.00	0.632	2.68	0.619	2.85	0.422	3.17	0.408	2.71	0.651
2. cognitive_thinking	3.19	0.543	2.86	0.594	2.95	0.545	3.00	0.632	2.82	0.630
3. oral_communication	3.26	0.682	2.66	0.712	2.95	0.590	3.17	0.408	2.91	0.575
4. written_communication	3.10	0.597	2.82	0.620	2.66	0.617	3.00	0.894	2.65	0.712
5. action_planning	3.03	0.657	2.92	0.651	2.98	0.570	3.17	0.408	2.91	0.717
6. presentation	3.10	0.944	2.92	0.686	3.05	0.631	3.33	0.516	2.86	0.677
7. questioning	3.26	0.682	2.72	0.710	2.83	0.543	3.17	0.753	2.67	0.536
8. reflecting	3.32	0.702	2.77	0.694	2.80	0.601	3.17	0.408	2.73	0.669
9. problem_solving	3.45	0.506	2.86	0.668	2.80	0.641	3.33	0.516	2.68	0.705
10. team_building	3.52	0.570	3.25	0.575	3.10	0.490	3.33	0.816	3.53	0.751
11. lifelong_learning	3.23	0.617	2.94	0.635	2.76	0.538	3.17	0.408	2.80	0.706
12. self_organizing	3.26	0.815	2.95	0.569	2.90	0.490	3.17	0.408	2.77	0.780
13. leadership	3.48	0.811	-	-	3.05	0.590	3.33	0.516	2.89	0.704
Valid N (listwise)	90		87		84		65		66	

From table 6.16, it can be seen that the level of competences in every task has a different pattern. The mean level is higher in Task 1, then it decreases in Task 2, and gradually increases until Task 4, and yet become lower in the final task. This pattern of achievement might be due to the difficulty level of every task which was designed according to Bloom's Taxonomy level, where Task 1 is required for the lower level of thinking (knowledge) and Task 5 is the highest thinking order (synthesis and evaluation).

Obviously, students experience a great enhancement of generic competences in Task 1 with means levels greater than 3.00 (M>3.00). This result is not surprising as Task 1 is the activity that required students' lower levels of thinking skill which included knowledge and the comprehension of each cognitive level. Therefore students might have fewer problems in dealing with this task. Task 4 also had greater levels of agreement. This task focuses on the application stage where the learning is designed in a form of game activity that required students to apply their prior knowledge to accomplish the task.

Students' competency levels are found to increase in mean levels for every task that follows after Task 1. It is interesting to see that students improve their level of competences in every level of learning. Nonetheless, studens levels of competence become lower in the final task. This might be due to the reason that the final task is the most challenging task that required students to be involved in higher order thinking levels including analysis and evaluation. This result indicated that students have limited abilities to work in activities that are associated with higher order thinking. However, if a similar activity was regularly conducted, students might be able to improve their competences to the highest level.

Of the 13 skills, team building is found to be the highest mean in all teaching tasks. This data suggests that students celebrate learning in cooperative and collaborative environments and this speaks more to a student- centred approach (Panitz, 1996), which would focus on students' active participation throughout the learning process.

The development of team skills is crucial at the formal education phase as the majority of the job tasks in work places are usually assigned as team tasks. It is good to find out that students have experienced some improvement in this skill.

All of all, tudents were able to master the skills that might be desired in the job fields. The HybCoMet Strategy, at least, has introduced students to generic competences that related to working experience, and they have the opportunity to experience and develop these competences.

6.6 COMMENTS AND SUGGESTION TO IMPROVE THE HybCoMet STRATEGY

At the final part of the questionnaire, students were asked to respond to the following questions:

1. What do you like about the new teaching strategy?
2. What do you dislike about the new teaching strategy?

These questions were constructed to explore any other factors which may need to be considered and that might be important in influencing the learning process and which may require further action. A detailed description of the analysis is presented (see Tables 6.17 and 6.18) along with a brief discussion. The findings derived from this part of the survey were used to represent differing dimensions of the quality of the alternative teaching strategy- the HybCoMet Strategy.

6.6.1 The Positive Qualities of the HybCoMet Strategy

From the feedback, there are 10 themes emerged (with exception of the last theme) as presented in Table 6.17. From the table, it can be seen that one aspect that students liked the most about the new teaching strategy was that it offered a variety of creative ways of presenting the teaching and learning process. Of the students surveyed, 23 stated that this approach did not just rely solely upon one teaching and learning strategy, but employed a number of different modes of teaching and learning, which invited participation from both the lecturer and students. This indirectly attracts the students' interest in learning, as many activities and programmes are designed to encourage students, during the learning process, to actively take part and, to a certain extent, 'show off' their talents in the process.

Eleven students rated this criteria highly, while, on the other hand, twelve students enjoyed the hybrid learning environment as they were able to learn as a group within many of the learning sessions. Group learning encourages them to share, exchange and contribute ideas in a more confident manner, and this way of learning helps them to understand the subject matter more easily, enabling them to gain a deeper knowledge of the subject and one which is more lasting, through clarifying and justifying the new knowledge. This process also appears to improve their communication skills.

Table 6.17: What Students Liked About the HybCoMet Strategy

	Comments and Suggestions	**Poly A**	**Poly B**	**Poly C**	**TOTAL**
1	An easy way to understand the subject matter and help to gain better knowledge.	2	6	-	**8**
2	A varied and creative way of delivering the lesson/information.	7	8	8	**23**
3	Lots of activities that attract students' interest in learning.	3	6	5	**14**
4	Learn as a group/team.	2	5	7	**`4**
5	Help to improve skills in using technologies and aids while presenting a given task.	4	1	-	**5**
6	Good style of teaching.	-	-	5	**5**
7	Encouraged to share, exchange and contribute ideas more confidently.	3	-	-	**3**
8	A harmonious way of learning (informal classroom climate).	-	-	2	**2**
9	Helps to improve communication skills.	2	-	2	**4**
10	Helps to be more independent.	-	-	2	**2**
11	No comment.	3	11	4	**18**
	TOTAL	**26**	**37**	**35**	98

Besides the positive quality of the strategy, one other aspect that also contributes to the success of the learning process is that of the teacher. Few students claimed that one of the reasons they liked this leaning strategy was because the lecturer had a good style of teaching, which included having a credible personality. These comments indicate that the success of every learning situation, indeed, is really dependent upon how the lecturer personally manages and organises the teaching and learning process rather than connected with the charisma of the lecturer.

However, students feel that it is necessary for the lecturer to be more linear when delivering a lesson, being less formal and possessing a good relationship with the students. “The relation between lecturer and students should involve respect and support and students would welcome this” (Chapman *et al*., 2001,p. 174). The lecturer should have the type of attitude and characteristics which would help students to feel safe and enjoy the learning session, which should in due course create a more harmonious classroom climate.

6.6.2 The Negative Qualities of the HybCoMet Strategy.

Students were also asked on the negative sides of the HybCoMet strategy. Table 6.18 presents themes that emerged from their feedback.

Table 6.18: What Students Disliked About the HybCoMet Strategy

Comment/Suggestion	**Poly A**	**Poly B**	**Poly C**	**TOTAL**
Less cooperation from a team mate.	4	**-**	**-**	**4**
Difficult to understand elements in the Action Table.	1	-	4	**5**
Have a problem with the use of English language as a language in teaching.	1	1	-	**2**
Presentation sessions - problematic, sometimes difficult to understand some of the groups when they made a presentation.	2	-	3	**5**
Too many assignments which is burdensome.	1	-	-	**1**
Too time-consuming.	-	2	1	**3**
No proper use of aids.	1	-	-	**1**
A spot quiz.	-	1	-	**1**
No comment.	16	33	27	**76**
TOTAL	**26**	**37**	**35**	**98**

Very contrasting feedback was obtained for this section, as the majority of the students preferred and opted not to write any comments (with 76 students) in this section compared to the previous part (on positive qualities). From the table, it can be seen that Poly A contributed more comments to this question compared to the other two polytechnics, with Poly B contributing the least number of responses to this question.

The feedback indicates that there were not many declared problems faced by the students who had gone through the hybrid learning process. The two main concerns about this approach were the Action Table and the presentation session, as these two aspects accounted for the highest number of responses. Students, especially from Poly C, stated that they experienced some difficulty in understanding every element contained in the Action Table. The Action Table is the table that helped students to plan their learning more efficiently and helps them to engage in, and manage their work systematically and keep them from engaging in irrelevant steps (details of Action Table as in table 4.0, Appendix A). The origin of this problem lies in the fact that this group was only introduced to the Action Table over a short period. With the time constraints imposed, I then had to compress both Tasks 1 and 2 into just a single learning session, resulting in only the first part of Task 1 being properly completed. However, it should be noted that all the elements had been explained during each learning session, in order to ensure that they would all understand the Action Table. However, this appears not to have been the case. As a result this limitation (both in time and in ensuring that the Action Table had been understood) might have led to the negative feedback received about this strategy.

With regard to the presentation session, the comments included that some of students could not fully understand the input presented by members of the other groups. This then made them concentrate less on this session, and also the method of delivery for this presentation. Although this problem does not really reflect negatively on the effectiveness of the HybCoMet approach, nonetheless it is important to acknowledge this weakness as a factor that needs to be considered for improvement in designing a new teaching module/learning task.

Another complaint that needs to be seriously addressed concerns the group members, as some individual students received little or no cooperation from other members of the various groups. They therefore had to accomplish the given task on their own, which they claimed limited their ability to widen their knowledge. This may have been due to the student(s) not being assigned to a group of their own choice, as group members were either randomly selected or based upon the lecturer's personal selection. Randall, (1999) has considered that one of the weaknesses of group work is that sometimes too much burden is place on some of the students.

To circumvent this problem, he suggested that teacher needs to negotiate with students to determine how they learn best and apply this idea to the way the teacher structures class learning. In addition, the task students' work together on must be clearly defined (Neo, 1995) to make sure everyone can contribute equally.

Students also claimed that the new learning system was time-consuming and that the use of too many assignments was burdensome. Remedios (2008) suggested that students are often happy to work with a teacher who does not make them work hard. However, Remedios, (2008, p. 92) believed that students should be given a "high workload" to help them learn more and gain a better understanding of the subject. The findings here suggest that there is a middle ground, giving a relevant workload to the student which enables the student to control their own learning.

The final negative comments concerned the use of English as the teaching language used, the improper use of teaching and learning aids, and giving the students a quiz without advance notification. Although some of the students stated that they either did not like or could not understand the English language, through my personal observations, I saw that they, nevertheless were .trying very hard to utilise that language in every learning task, which has really impressed me. However, intrying to master this competence, this topic may need further investigation in a follow up study.

6.7 ANALYSIS ON THE APPLICATION OF THE HybCoMet IN IMPROVING LEARNING PERFORMANCE.

The aim of this research study is to investigate the effectiveness of the HybCoMet Strategy in helping students improve their generic competences and attitudes when learning civil engineering subjects at polytechnic level, in Malaysia. However, the benefits of the HybCoMet Strategy must also be considered in terms of the extent to which it can help students in improving their learning achievement (attainment). Hence the pre and post paper test were conducted to examine the improvement of the test score after the intervention process, compared to the more traditional approaches. In the quasi-experiment a single intervention was used as is usual in experimental treatments (Cohen *et al.*, (2007)).

The same questions were constructed for the pre-test and post test groups and a copy of the test can be found in appendix 4-C. The pre test was conducted to both control and experimental groups before the adoption of the HybCoMet Strategy (please refer to figure 4.1 in Chapter 4 for the pre and post test process). The control group had undergone a ‘normal’ learning session using the common teaching strategies (traditional approaches). The experimental group underwent the treatment process using the HybCoMet Strategy within six week time. The post test then was conducted on both groups after the treatment process. For the purpose of analysis, any student who did not sit either pre test or post test, was excluded, as he/she would otherwise have been given a 0% score for the assessments which will affect the reliability of the findings. Both tests were evaluated and marked, and the scores is presented in percentage (%) to examine their achievement in the tests. Example of raw test data for one of the groups can be found in Appendix 6-A. For the purpose of the analysis, the difference in score between pre and post test is presented. This is helpful to identify how much improvement has been made with the implementation of HybCoMet strategy.

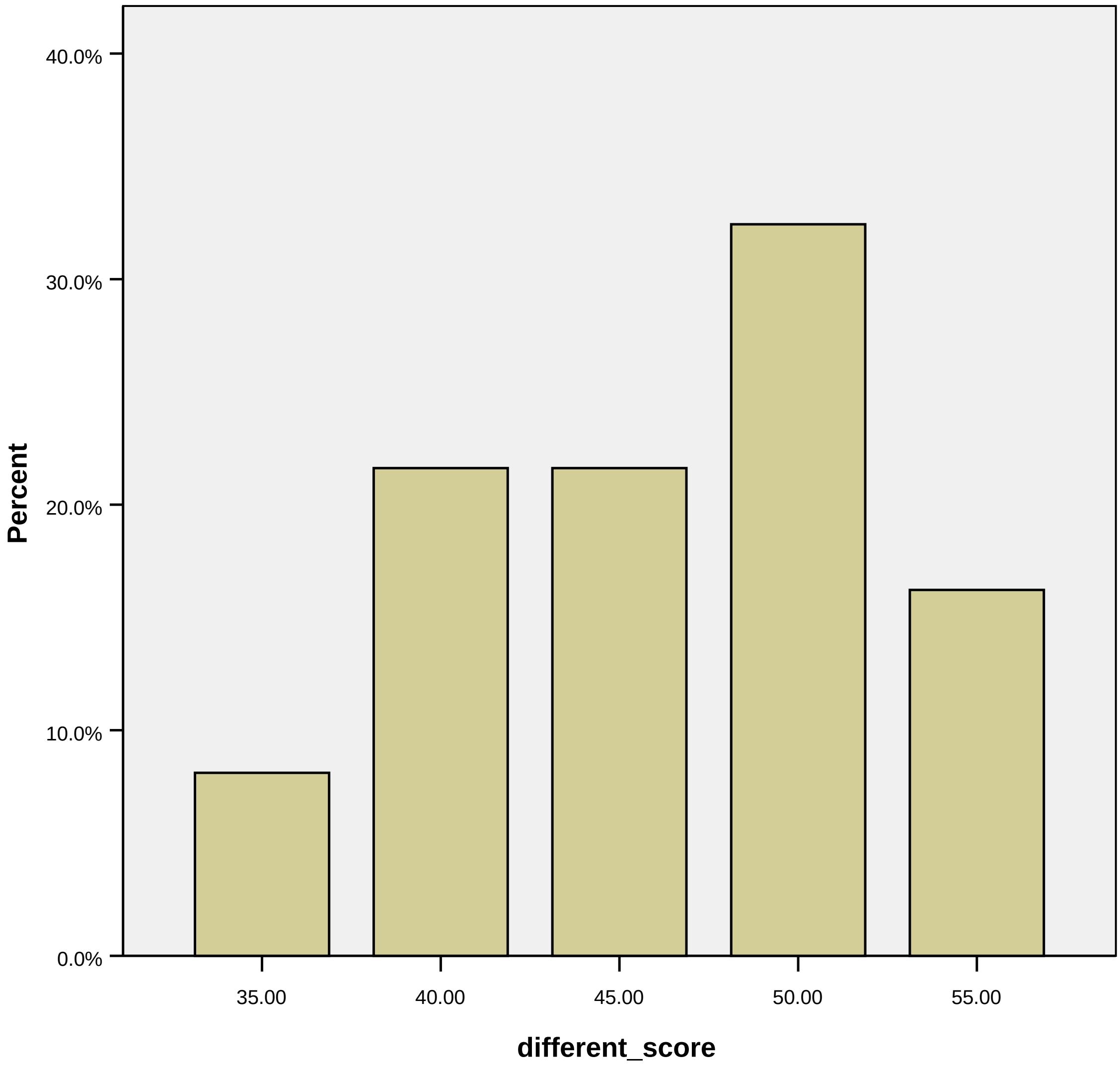

Figure 6.1: The Different Score between Pre and Post Test in Control Groups.

Figure 6.1 illustrates the rank of different score and percentage of students' achievement in pre and post test in control groups. It can be seen that the average difference in score of both tests is between 35 marks to 55 marks. The majority of the students score in both tests with 50 marks difference. This bar chart suggests that students' improvement in test scores using the traditional approaches are at a moderate level.

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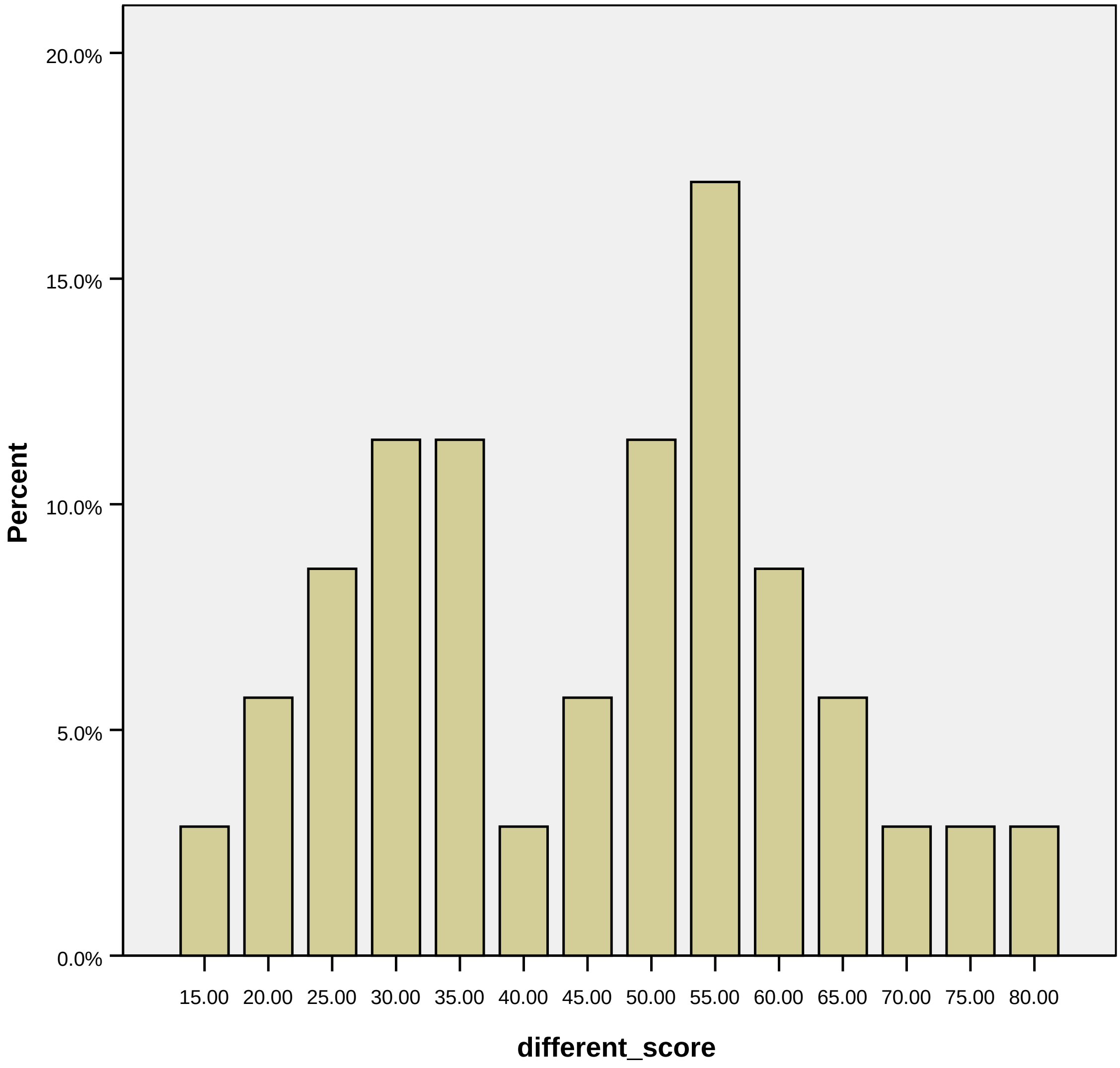

Figure 6.2: The Difference in Scores between Pre and Post Test in Experimental Groups.

When looking at Figure 6.2, the differences in scores for experimental groups are very varied.. It shows that the different score of pre and post test are between 15 marks to 80 marks. The majority of students score with 55 marks difference, which is higher than the students in the control group. Overall, it can be suggested that the application of HybCoMet Strategy is helpful for students to gain higher scores, up to 80 marks in difference.

The example of score of pre and post test for one of the experimental group can be seen in Appendix 6-A.

However, it is also useful to discover whether there is a statistically significant difference between students' achievement in the pre and post test in every control and experimental groups. Thus, the paired sample t-test is used to examine further whether there are statistical differences between the means of achievement in both tests. The paired t-test is useful to use where the same group scores on two variables (Cohen, *et al.*, 2007), on a pre test and pre test in a quasi-experimental design as conducted in this study.

Table 6.19 and Table 6.20 present the students' results in both tests in all groups.

Table 6.19: Paired Samples Statistics and Paired Sample Test for Control Groups

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PreTest	31.00	91	6.945	1.174
	PostTest	76.29	91	13.792	2.331

Paired Samples Test								
	Paired Differences					T	Df	Sig. (2-tailed)
	Mean	Std. Dev.	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 PreTest – PostTest	-45.286	16.801	2.840	-51.057	-39.514	-15.946	91	.000

From Table 6.19, it can be seen that the 91 respondent (N) in control group who scored on Pre-test (mean= 31.00) is statistically significantly different from the mean of the same group scoring on the Post-test (mean= 76.29). In the second row (Paired sample test), it is found that t = - 15.946 in which the negative value indicates the increase of score in the post-test compare to the pre-test. Whilst in the final column ('Sig. (2-tailed'), it is also found that ρ = 0.000 (ρ < 0.05), which confirms that there is a statistical different between students achievement (Cohen, *et al.*, 2007) in the pre and post test. It should be noted that this is an incredibly high level of statistical significance (p<0.001), significant at the 0.1% level of significance which is very high for an educational intervention.

Table 6.20: Paired Samples Statistics and Paired Sample Test for Experimental Groups

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre Test	45.54	94	6.850	1.126
	PostTest	91.89	94	5.184	0.852

Paired Samples Test								
	Paired Differences					T	Df	Sig. (2-tailed)
	Mean	Std. Dev.	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 PreTest - PostTest	-46.351	6.084	1.000	-48.380	-44.323	-46.344	93	0.000

Table 6.20 also shows a similar pattern. It can be seen that there is an increase of mean scores for experimental groups. The mean score for the pre test, M=45.54 and post test, M= 91.89, with t = - 46.344 and ρ = 0.000.

The level of difference between the mean scores for both control and experimental groups are, M= - 45.29 and M= - 46.35, respectively. These results suggested that HybCoMet approaches, as well as traditional approaches, did help students in improving their learning scores. However, this finding indicates that the hybrid approaches can help students achieve significantly better scores compared to the traditional approach. The difference is very slight, however it is statistically significant (at the 1% level) therefore one can say that, from this quasi-experimental setting, that there is evidence that the new approach produces an increase in test scores, and the difference is significant.

Overall, it can be said, that the HybCoMet Strategy was able to help students enhance their test scores. The result is significant even though the effect size is small. However, as the focus of the HybCoMet strategy is to help improving generic competences and attitudes, the test score is not a major concern for the purpose of this study. Nevertheless it is beneficial to find out that the strategy also helps to increase students learning achievement in this subject, although the effect size is slight.

6.8 SUMMARY

The second set of the questionnaire, discussed in this chapter, considered the contribution of the HybCoMet Strategy to students learning practices and to the development of generic competences. The findings obtained and the data analysed in this section illustrates the students' perception on their own learning strategies and their experiences of the changed learning and teaching environment as a result of using the HybCoMet Strategy instead of remaining with the more traditional teaching approach normally used. The HybCoMet Strategy can be shown to have a significant effect on enhancing students learning strategies and in developing/improving generic competences compared to the more traditional approaches. The effect on achievement although significant, is small in its effect. The main strength of this approach may be in terms of the building of generic competences rather than in terms of achievement. Nevertheless, this new teaching strategy has the potential to help in terms of increasing students' learning achievement as well.

Of the four generic competences (communication, critical thinking, problem solving and team building), communication and team building skills appear to be the most affected in this study. Students from all three polytechnics agreed that the strategy helped them to improve in these two key skills. The other two competencies (problem solving and critical thinking) could perhaps have been expected to be the main two competences to improve. These were improved, but not to such a marked extent. Besides, the HybCoMet Strategy has a currency to promote life-long learning as this skill also appeared at a high level.

The most important finding is that the HybCoMet Strategy helps students to be more independent in their learning when they are directly involved in the process. Students indicated that the new strategy helped them to become more aware and independent of their learning and to take on more responsibility for their own learning. For example, when students were asked about how they managed their learning on their own (item B8, from Table 6.4), it seems they were not really aware of their own learning ($M = 2.68$, $SD = 0.678$). Then, after they had been guided with the help of the new strategy, and asked a similar question in Part C of the questionnaire (item C14 in Table 6.10), the mean had increased ($M = 3.27$, $SD = 0.557$).

This finding indicates that students are able to learn more independently and become more aware of their own learning if they are guided with a good teaching strategy which could help them in handling tasks in their future work.

However, it is possible that the students' responses, as presented and discussed earlier, may also reflect some beliefs regarding the negative side of the HybCoMet Strategy. It is important to note that it is definitely not recommended that this teaching approach should be the only method used. It is simply hoped that the positive responses that have been given regarding this hybrid instructional module may help lecturers to incorporate some of these approaches into their regular teaching.. I also intend and hope that it will encourage students to improve their learning as well. It is also noted that there are differences between outcomes between polytechnics (particularly in Poly B). One important feature of this new teaching strategy is the value of sharing, exchanging ideas and views and, at the same time, encouraging students to work cooperatively with each other. Students will then have been exposed to some of the important elements to be encountered in the social climate which they will later face when they commence their future employment. However, despite their interest shown in working collaboratively, for most students the ability to work independently is still not clear, and some of them seem in need of help to become independent learners, at least from their lecturers.

CHAPTER 7

REFLECTIONS ON THE RESEARCH STUDY: DISCUSSION AND CONCLUSIONS

7.1 INTRODUCTION

This research study focused on the creation of a hybrid learning environment in a technical subject in Malaysian polytechnics to enhance students' achievements, problem-solving skills, critical thinking and communication skills and team building - their generic competences. These skills are critically needed in the workplace of the 21st century and Malaysian polytechnics are striving to ensure that their graduates are competent for the workplace. There is therefore need to explore and describe the current, as well as new approaches to teaching that will promote a learning environment that will help students improve their learning achievements as well as their skills and attitudes (Sipon, 2003). Accordingly, collaborative learning and metacognitive strategies were combined and integrated to form a vocational innovation, being a hybrid system (HybCoMet) in this study that would supplyas a new, alternative, teaching approach to help students improve in those generic competences.

This chapter concludes by reviewing the most salient aspects in the development of this study. The study is significant in that it aims to establish an alternative pedagogical approach to the teaching of engineering subjects at polytechnics and to produce students who are active, competent and ready to enter the job market. However, the important contextual factors with regard to research method, implementation and wider implications are also examined in the conclusion.

I examine the importance of a hybrid approach in learning before addressing the extent to which the aims of the study have been met. I then turn to the implications for policy and practice. In particular, the problematics of introducing a hybrid system into a centralised education system and the practice implications for teachers and students in a 'lifelong' model of generic competences development.

7.2 RESEARCH OVERVIEW: THE IMPORTANCE OF A HYBRID APPROACH.

As a general principle of the research, hybridity is particularly important. As stated in chapter 2, TVE subjects differ from core academic subjects that have traditionally had a strong theoretical emphasis, as the contents are more relevant to the world of work. The TVE curriculum and teaching methodology, in theory, focuses on students' interest in tasks that have direct relevance to real-world practices (Ministry of Education - MOE, 2004). The delivery methods should, arguably, be reformed from traditional 'paper and pencil tests' to a modular assessment and a "competency-oriented system to indicate favourable outcomes" (*ibid*, p. 12). These competences have been highlighted as central to the TVE programme, hence consideration should be given to including these elements in designing and planning the TVE programme and curriculum. Thus, there is a need to incorporate elements of generic competence into pedagogical contents at polytechnic level to help students acquire the necessary skills. Sipon (2003) has suggested including elements of competence in planning, designing and communication, and methods of problem solving, teamwork and social networking into the TVE syllabus. It is important to integrate theoretical knowledge and practice, as well as to relate learning and the working environment. In the traditional way of teaching and learning that separated theoretical knowledge from the practical aspects, a merger of these is unlikely to take place. Accordingly, a hybrid of collaborative and metacognitive (HybCoMet) strategies was proposed in this study as a comprehensive teaching approach employed to help students' learning and to develop and improve their generic competences, which could prepare them for future working life. This approach used both collaborative and metacognitive learning strategies.

Collaborative learning, by which students are working in a group or pair to solve learning problems, has been widely adopted in the teaching and learning process, particularly relating to improving students' learning through active engagement (Barkley *et al.,* 2005). Learning in a group and with teammates has a significant effect on students' learning and is used as an effective strategy, especially for achievement of learning outcomes (Slavin, 1995). The need for collaboration has been stressed by the Malaysian Ministry of Education to familiarise teachers and enable them to employ this strategy within their classroom teaching practice (Ong, 2007).

Metacognition refers to a mental operation, which directs the cognitive functions of a person and supports a learning conceptualisation (Mevarech and Kapa, 1996). As a teaching approach, metacognitive strategies with their components being awareness, monitoring and regulating have a good prospect of enhancing students' independent learning and have the potential of sustaining their interest for a longer time (Ponnusamy, 2006).

However, a comprehensive review of the literature in the chapter 3 showed that metacognitive functions alone are insufficient to describe how mental activity is progressing during the learning process. There is a need for other methods to help to translate the mental activities that occurred. I have explored in this research study how collaborative learning could be helpful in transforming the mental processes and how these two strategies can optimise the learning output if they are integrated into one single approach. Very few studies have identified the benefit that could be brought by the integration of both of these strategies into the teaching and learning process. This study is original in that it introduces these ideas into TVE in Malaysia. Furthermore, the conceptions associated with particular approaches or strategies have rarely been the focus of research. Studies tend to investigate teaching and learning which focuses on improving test scores [e.g.Wiener (1986); Gokhale (1995); Walker (1997)]. Also, much of the research has been carried out in non-technical disciplines [Idrus (1993); McMurray and Dunlop (1999); Simoff (2001); Neo (2003)]. But there is limited research that concerns students’ attitudes, self-esteem and social development, which is the concern of this study.

As a whole, the review on literatures are important in helping to explore research into the relation between teaching, learning and the approach to teaching in the TVE programme and the needs of graduates who not only have good qualifications, but who are also competent to fulfil the job description.

Therefore, the aim in this study was to provide knowledge on collaboration and metacognition that would work together as a new teaching approach to help students develop their competences by being actively involved and committed in their learning. The capacity to bring together knowledge, attitudes and generic competences as being practised in a workplace is the aim of the integration of both teaching concepts. Hence, the positive aspects of collaborative learning and the characteristics of the metacognitive strategies identified in this study could provide a new direction for the delivery of teaching with the means to improve students' level of competence, attitudes as well as learning achievement.

The HybCoMet Strategy is seen as an alternative approach to teaching towards more independent learning which provides basic experiences in preparing students with sufficient knowledge and competences to prepare for their future life. Thus, this study has been paramount in exploring the benefits of the hybrid approach and establishes an alternative pedagogical approach in teaching engineering subjects at the polytechnic level. The importance of hybridity in developing pedagogies for generic competences has not been particularly addressed in research, especially in the Malaysian context.

7.3 DISCUSSION OF THE FINDINGS WITH REGARDS TO THE RESEARCH OBJECTIVES.

Hybidity, then, provided an original conceptual orientation for this research. This section provides a summary of the findings that have been obtained from the collated data. The key purpose of this section is to discuss the findings focusing on the three objectives set in the research. Firstly, in terms of the current teaching approaches in Civil Engineering Programmes in three polytechnics that have been selected. Secondly, the effectiveness of the Hybrid Approach *versus* Traditional Approaches, and thirdly on how the HybCoMet Startegy may help to improve students' generic competence, attitudes and learning achievement.

7.3.1 The Current Teaching Approaches in Polytechnics.

For the data collection process, a first set of questionnaires (pre-questionnaire) was given to all first semester students undertaking a three-year Civil Engineering Course in 3 polytechnics in three different states in Malaysia. Semi-structured interviews were also conducted with teachers to gather additional insights regarding teaching approaches and strategies, subjects/course value and the extent of students' learning.

Findings from the interview transcripts show that many of the lecturers did not variety their teaching strategies while delivering lessons. Many of them used ‘chalk and talk’ as a common choice of teaching delivery mode. All of the lecturers attempted to talk and write on the board while delivering a lesson. Teachers’ feedback was then triangulated with students’ responses in the questionnaire. Both sets of data suggest that teachers as well as students showed similarities regarding their perceptions of the teaching approaches adopted in a classroom. The findings revealed that the most common teaching approach currently employed in the polytechnics under study was the lecture mode of delivery. These findings are supported by the study conducted by Ibrahim (2007) who found that teaching styles at TVE institutions are largely based on Grasha’s Model, with elements of the expert and formal authority styles being the most commonly used in teaching and learning process.

Lecture modalities were the teaching strategy preferred by most teachers. It was most popular for its ease of use and access, and also because it needed less preparation. It is nonetheless interesting to discover that despite traditional modes of delivery the teaching was sometimes conducted in a more active and student-centred learning mode. Students were given an opportunity to take part in class activities and diversify their knowledge.

It should be noted that this result could only be revealed in the data through the use of factor analysis. In particular, the exploratory factor analysis conducted revealed a variety of learning and teaching configurations which would have remained invisible in an analysis that had relied on descriptive statistics.

Lecturers nonetheless, retained the main role in providing and controlling the curriculum content, and students were expected to receive and assimilate the knowledge delivered by the lecturer. However, lecturers should realise that teaching and learning process is not only a matter of transferring information from one who is knowledgeable to one who is not. The learning should be far more than that. Learning should be perceived as a personal, reflective and transformative process where information, experience, and point of view are shared and this should lead to the construction of new understanding (Sandholtz *et al.*, 1996) particularly if generic competences are to be fostered.

Important findings of this study are the factors that have been identified as the limitations in the teachers' teaching practice. The factors are (1) the desire and enthusiasm of lecturers for their teaching career, (2) background and characteristics of students, (3) the setting of curriculum and syllabus, and (4) availability of teaching facilities. These four factors contribute to the constraints for lecturers to perform their teaching in more active and creative teaching practices which indirectly impacts on students' learning processes.

Notwithstanding the above limitations, the lecture method has indisputable strengths as a teaching method of choice as it is very helpful in delivery of theory and knowledge (Motsudi *et al.*, 2009). The lecture method has been found to be a successful method in increasing students' test scores in subjects such as reading and maths (*ibid*). Students at this level of education, however, besides acquiring good scores, need to acquire knowledge and skills that might help them in real future life. Students thus need to be more involved in more active learning.

7.3.2 Traditional Approaches *versus.* HybCoMet Strategy

The hybrid of collaborative and metacognitive (HybCoMet) Strategy was introduced with the intention to help students to learn in a meaningful way, by facilitating the assimilation of their knowledge prior to transferring it into real-world situations. The purpose of developing the instructional module of HybCoMet Strategy was to provide a foundation for using the strategy as a new pedagogical approach and to provide practical guidelines for designing a hybrid classroom. Accordingly a second set of questionnaires was distributed to all students to identify the differences between traditional approaches and the HybCoMet Strategy.

With reference to the traditional approaches, students reported they did not have much space to be active in the classroom, as they had to listen carefully and take down the notes given by the lecturers. Many activities conducted in the classroom were not really helping them to enhance communication, critical thinking, problem solving and team building skills. While the institutional ethos emphasizes the need to prepare the students for the future, the learning environment was not encouraging them to do that.

By implementing the HybCoMet Strategy, students were given a chance to actively engage in the learning process. Students gave very positive feedback in almost all items that reflected the application of this new strategy. They can work cooperatively and they know their role very well. The strategy helped them to be more responsible for their learning and less dependent on the lecturer. They became more confident when talking in front of the class and felt more comfortable working as a group and this helped them to share and generate ideas and at the same time handle criticism. They strongly agreed that the approach widened their knowledge in learning new topics as they had to refer to many sources outside the lecture room and thus they felt ready to be involved in a real workplace. This is parallel with Young, (2002) who found that the hybrid teaching model is superior compared to the traditional approaches and it can be applied to suit the varied needs of students' future life.

Besides that, pre and post assessment test were also conducted to evaluate the effect of the HybCoMet strategy on students' learning achievement. The results indicated only modest improvement in the test scores. However, despite the limited improvement in the learning achievement, the attempts to link knowledge, competences and attitudes was successful. There is a reason to suggest the implementation of HybCoMet Strategy has the potential to help develop the generic competences desired by employers. It is likely that other combinations of teaching concepts (techniques) for successful learning achievement could be suggested for hybridity in future research.

7.3.3 The Contribution of Hybcomet Strategy to the Development of Generic Competences.

The findings indicate that lecturers in polytechnics adopt a predominantly didactic, traditional approach to teaching although they do sometimes use active approaches (in conjunction with this) and that there is variation between polytechnics and lecturers' practices. This means that the new teaching concepts are not completely alien to the Malaysian education system. However, they are often not introduced due to pressures of time, curriculum setting and examination system. Although the introduction of a HybCoMet Strategy achieved only modest (if significant) improvement in test scores, it nevertheless was found to produce the kinds of generic competences desired by employers. It could also potentially change student and lecturers behaviours.

Generic competences as defined in this study refer to the ability to perform group work roles for specific learning tasks, in a proper way to achieve the overall job function and achieve set goals in order to be able to act in a real future working environment. This study examined generic competences required of polytechnic graduates, and points to the increasing emphasis on personal attributes (including oral communication, problem solving, critical thinking and team building skills) rather than mere technical skills.

The HybCoMet strategy was designed with the expectation that students would become active participants in their learning. It supports the acquisition of generic competence as a result of their activities and engagement. This strategy offers students' opportunities to learn valuable attitudes enhance knowledge and develop important skills that will prepare them for the work place. With regard to the research questions, the HybCoMet Strategy, applied in a specific context, has been found to increase the generic competences and learning outcomes of students. The best contribution of the new approach was in terms of the development of communication and team building skills. However, group learning processes also helped to support metacognitive functions that led students to become good problem-solvers and critical thinkers. Students' awareness of their own use of competences can be a powerful tool in helping them for future employment. The ability to master the competences appears to occur through their active involvement in the learning process.

Nevertheless, problem solving and critical thinking skills showed a lower ranking than communication and team building skills. This could indicate that the application of metacognitive strategies in engineering subjects needs further development, even though it has been well applied in the areas of literacy and numeracy. There is a need for further research into effective teaching concepts to be integrated to support the required competences. At the same time, the development of teaching modules should pay more attention to activities that focus on metacognitive skills.

Lecturers are not necessarily opposed to new teaching approaches. Their possible resistance to the introduction of the HybCoMet Strategy in classrooms is grounded in terms of time and curriculum constraints. There is, however, a continuum of lecturers' views. The subjective attitudes of students to the introduction of the HybCoMet Strategy are largely positive although they do have some suggestions concerning implementation. For example, this approach has a critical time constraint compared to the traditional teaching approaches as it relies on group work. It is necessary to plan and manage time effectively since it can easily slip from the planned timetable. The majority of students commented that there was not enough time to complete the learning tasks and they felt burdened by many activities. It is a common complaint in education when there are too many activities and not enough time, which could cause a failure to learn (Glover & Law, 2002). However, if the teaching is well-organized and the objectives clear, then it is not impossible to succeed in any teaching and learning process (*ibid).*

One issue that might be of concern in the adoption of the HybCoMet Strategy is the readiness of lecturers and how they can be supported in the implementation. As discussed in section 4.8 a teacher refused to adopt this strategy due to unfamiliarity with the approach. Furthermore, the teacher was worried about her ability to cope with the new teaching task (which involved a variety of skills and knowledge), whilst at the same time she also needed to perform current teaching tasks. Therefore, this is an issue around lecturer Continuing Professional Development and it could be suggested that institutions need to organise training workshop session prior to the implementation of HybCoMet to help lecturers well prepare for the hybrid teaching process and ensure it is successful. Findings in the interview give a clear indication that the administration of polytechnics will always try to support their staff in professional development, which give a greater prospect for the introduction of the HybCoMet Strategy

Finally, assuming that HybCoMet Strategy can support improving specific generic competences that are important for students, it may be necessary for the institution to adapt the learning environment to successfully achieve such competences. If the continuing exercise of the HybCoMet Strategy can be done, it will be able to establish a standard set of guidelines to aid teaching and learning processes by giving attention to specific generic competences perceived as important by industries. In addition, a follow-up survey of employers once students have undergone their industrial training would be useful to determine whether the HybCoMet teaching strategy has produced change in students' competence in the actual workplace.

It is important to emphasise that designing effective teaching and learning approaches for generic competences is not an easy task. It is suggested for further study to identify the right combination of teaching concepts/methods for the optimum output. However, if teachers themselves are unlikely to adopt approaches to teaching that are more relevant, then improvement in their teaching is unlikely to occur and the output of students' learning is hardly likely to increase.

7.4 POLICY IMPLICATIONS: THE USE OF THE HybCoMet STRATEGY IN A CENTRALISED SYSTEM.

The Malaysian education system is centralized in its implementation requiring students to take the same subjects, learn the same syllabus and sit for the same exams. The centralized system has indirectly influenced teachers' classroom practice and the choice of teaching delivery modes. Teachers have to concentrate on completing the teaching of all syllabuses to meet the examination requirements and ensure students can gain good scores (Embi and Hwang, 2007). To help their teaching and to ensure the syllabus can be completed in a given time, teachers tend to use a didactic way of teaching and learning (commonly known as the traditional approach) as their preferred method of instruction as indicated by Glover and Law, (2002). The traditional approach was also found to be the preferred approach in the polytechnics (but with elements of active teaching, and some heterogeneity), as polytechnics were also centralized in Malaysia's education system.

The traditional approach is concerned more with the teacher-centred way of teaching and learning. Studies conducted by Razak *et al*., (2007) and Ibrahim (2007), have revealed that the expert teaching style and formal authority style highlighted in Grasha's Model were the most preferred styles by many teachers in the TVE sector, and this included the polytechnics in this study. Both of these styles tend to focus more on content and teacher-centred approaches where teachers are responsible for delivering and disseminating the content and knowledge, whilst students are expected to receive and assimilate the information provided. Many studies also found that the current teaching approach is essentially teacher-centred and uses rote and fact-based learning (Tilestone, 2000; Meng, 2003; Yusof, 2003).

Through the use of these content-driven and teacher-centred delivery approaches, students were seen as lacking the knowledge and practical activities applicable to the world of work (Ibrahim, 2007). Students emerging from this system might face difficulties, especially when they get involved in a changing job market in their future life. Students who excel in the exam system are often found to be lacking in soft skills and competences (Motsidi *et al*., 2009). Soft skills and competences are probably the most desirable skills required by employers and industries. However, many studies revealed that many graduates lack the competence skills necessary for the workplace and many employers complain that the school system does not prepare young people for employment (Zemsky, 1994). Among the skills needed, are communication skills, analytical reasoning, lateral thinking, practical orientation, interpersonal sensitivity, motivation, planning, decision-making, leadership and emotional sensitivity (Cheung and Wong, 2006). The significance of the issue of students' insufficient generic competences is not just an issue for Malaysia, and can be seen in other countries from the cross-national literature associated with it (e.g.: Zemsky, 1994; Motsidi *et al*., 2009). Worldwide, teaching and learning strategies employed in the TVE system have difficulty in terms of their ability to equip students with adequate competences to enter the job market. All countries are now faced with a reassessment of how education should be delivered to meet the needs of a changing economic order that will create demand for:

> *'more skilled workers (so-called knowledge workers); more flexibility and therefore lifelong learning skills; more self-starters in a more autonomous and team spirited working environment (independent learning and key skills)'.*
>
> (Maier and Warren, 2000, p. 3)

Despite the centralised nature of the Malaysian education system, a change in Malaysia's economy has brought about a similar demand. Because of changes in production processes resulting from advanced growth in technology and industries, the nature of the demand for skills also changes, which requires highly qualified middle- and lower-level skilled personnel. It is believed that TVE can produce exactly this kind of manpower, as contended by Tilak (2002). The Malaysian Polytechnics, as one of the TVE sectors, were originally developed to provide this kind of manpower, focusing on broad-based, industry-oriented, technical education and training to post--secondary school-leavers to impart the necessary competences to the technicians and technical assistants in the various fields of engineering, or junior- and middle-level executives in the commercial and services sectors (Sipon, 2003).

As the demand for labour changes to reward generic skills there is an economic incentive which might be powerful enough to alter the 'centralising' tendencies in the Malaysian education system that might lead to change. As this study has shown, lecturers are (when not subject to constraints) eager to adopt new methods (many integrate these with didactic approaches) and students similarly benefit. This study therefore shows at least the possibility of introducing new teaching approaches in what is, still, a centralised system. This may also apply to other centralised education systems, particularly at a time of rapid economic change and reform of education systems.

7.5 PRACTICE IMPLICATIONS: GENERIC COMPETENCES FOR LIFE-LONG LEARNING

Tilestone (2000) considers that:-

> *" It is unrealistic to believe that students who are constantly stimulated by the multimedia world will sit for hours each day passively listening to lectures, taking notes and preparing for a pencil-and-paper exam without dropping out mentally."* (p.13)

The words reflect the curriculum practice in the classroom nowadays where students are still dominated by their lecturers and learn for one main reason - to sit for an examination.

This concept of teaching appears to be concerned with the assessment of knowledge and understanding whilst allowing students only minimal involvement and limited opportunities to be active and creative in their learning. Even though the technology has changed, the pedagogical approach remains very largely unaltered. This traditional way of teaching and learning may no longer be effective in a globalised world that requires higher analytical and cognitive skills (Meng, 2003), as discussed above, but also in a world where student demands have changed. The most desirable skills among students/graduates are work/technical skills and personal attributes, which includes communication skills, interpersonal skills, lateral thinking and the ability to work in a team.

Teachers have been identified as one of the factors that contribute to the insufficient competence of students. Different students have different styles of learning and it is important for teachers to use a variety of approaches that can suit their students' learning needs and their variety of preferred styles and that can best engage students actively in their learning. The teaching and learning environment needs to be transformed to embrace more active and inductive styles and approaches.

This study is important in evaluating current teaching practices and considering responsive action to overcome the problem. A new teaching strategy, the HybCoMet Stategy has been proposed in this research study as an alternative to the current teaching approaches. This strategy is considered that could help students to become physically and mentally active during the learning process. A hybrid of both teaching concepts/elements should lead to students being aware and determined in their own learning, which could be beneficial to their future life, and specifically to master some of the competences required in the workplace.

An interesting finding of this study was that a variety of approaches have been employed by lecturers in the polytechnics involved in this research. Besides their traditional teaching style, they were also delivering lessons in more active and inductive ways with group work activities including discussion, problem-based learning and some other techniques. Active and inductive teaching and learning are usually referred to as student-centred approaches; however, in this learning context the process is more teacher-centred as the teacher is still the dominant figure in the process.

There is also an essential point that an understanding of teaching culture and context are also important to the way of teaching is conducted.

In terms of students' perception of the current traditional teaching approach, it can be concluded that the approach is related to what Glover and Law (2002) termed 'transmissive approaches'. These approaches describe a learning process in which students rely too much on the teacher for social control and also for formal classroom management. Students were rarely found to be involved actively in the learning process. They were given a space to participate in the teaching and learning process and they had an opportunity to take part in the learning process as the teacher also applied active ways of teaching. Nonetheless, the level of dependency of students on their teacher cannot be denied, as they prefer it if the teacher is to be relied upon. Even during the early stage of the application of the HybCoMet Strategy, one of the groups made a complaint as in the extract below:-

> Student: *We didn’t learn anything. You do not teach us anything. We have to find out everything by ourselves.*
>
> Me: *Yes. I didn’t teach you anything, because I want you to find it by yourselves. If I give you everything, you are not learning. Now, you did something and you find something. Right??*
>
> *Students show their agreement and continue completing the learning task*

It is becoming a worry at this stage of education if students always rely on somebody to help with their learning and other aspects of their education. If this situation is not prevented, it will lead to the same problem when they enter the workplace. As such, it is important to start to direct students to control their own learning and stress the importance of learning independently with less assistance from the teacher. Hence, the HybCoMet strategy is proposed with the intention of helping students to become more independent, which, indirectly, could help develop the necessary generic competences through lifelong learning. Velde (1999), for example, considers that, despite the behaviouristic routes of competence, we should move away from this conception towards a more holistic conception which includes attitudes and cognitions throughout the life-course.

The intervention has, to some extent, reduced the involvement of teachers in the process of teaching and acknowledged students as having a major role in driving this process. Through increasing student participation, the levels of their competences have also increased. Group activities allow students to communicate, give and share ideas and take responsibility for their teammates, as well as themselves. Glover and Law (2002) have demonstrated that learning in a cooperative way would invite a greater level of participation that cannot be achieved by learning individually. Therefore, this kind of learning helps all group members to be prompted to move toward better understanding in their learning. Learning collaboratively also helps to support metacognitive functions that lead students to become good problem-solvers and critical thinkers. Those aspects are important for students, who will be employed as technicians when they have graduated.

In a very simple way, the conclusions are presented as the diagram in Figure 7.1.

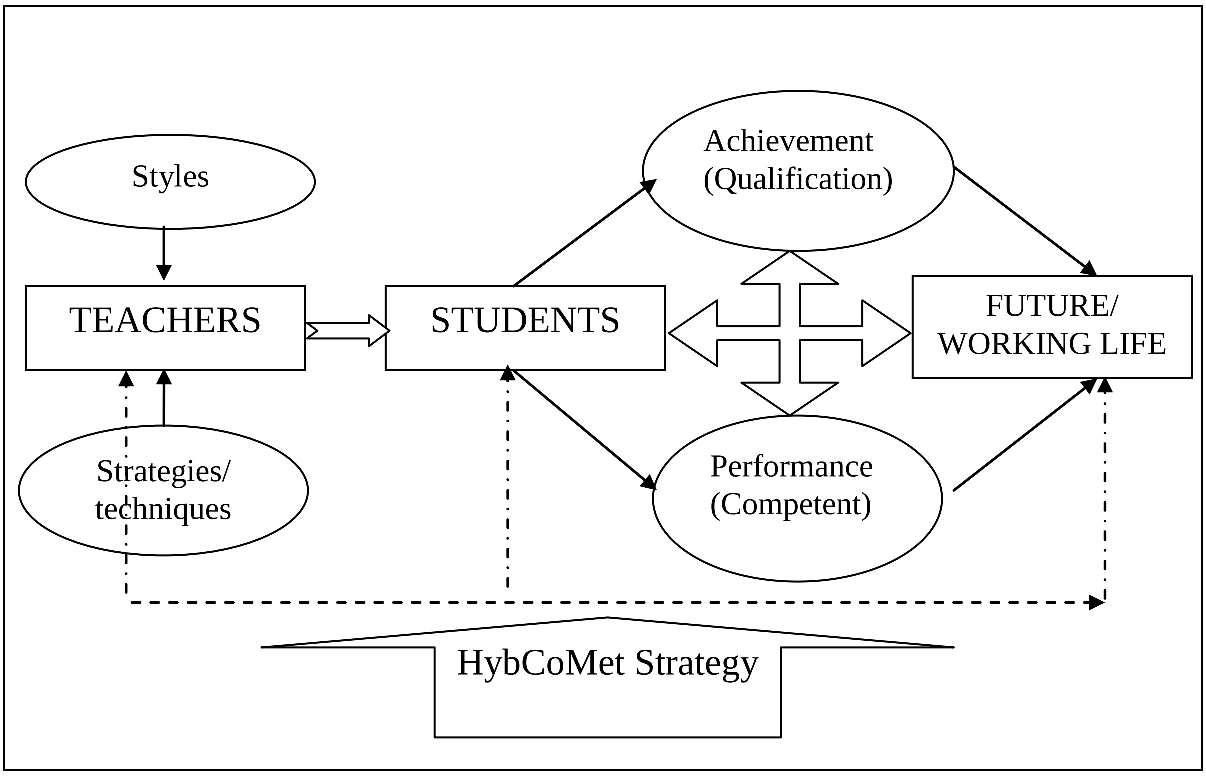

Figure 7.1: The Relation between Teachers, Students, Future Life, and the HybCoMet Strategy.

As indicated in the diagram (Figure 7.1), teachers have their own styles and preferred teaching strategies which indirectly could have an impact on students' learning, achievement and performance, which will shape their future prospects. Whilst the HybCoMet Strategy lies beneath both variables (teachers and students) it was developed to help them see the variation within both their teaching and learning experiences as a way of helping them change the approaches to teaching and learning that could help to reshape students' future lives. Learning can be enhanced in a hybrid learning environment which requires students to work collaboratively and metacognitively. In this situation, the role of students transforms from the traditional passive recipient to that of active participant in generating information and knowledge, and solving problems. As a result, students are potentially required to constantly engage in practising skills that are necessary for the future workplace. As this diagram shows, this is a life-long process of generic competence development.

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APPENDIX A:

THE HYBRID INTERVENTION INSTUMENT: DESIGNING AND DEVELOPING A HYBRID INSTRUCTIONAL MODULE

1.0 INTRODUCTION

This appendix offers a description of the design, development and implementation of the hybrid instructional module. The complete information on how to conduct and deliver the lesson using the hybrid strategy was written and compiled in one booklet entitled "A Hybrid Approach Using the Collaborative and Metacognitive (HybCoMet) Strategy: An Instructional Module for Polytechnic Lecturers". The strategy is intended to help students to learn in a meaningful way, to provide a foundation for using the strategy as a new pedagogical approach and to provide practical guidelines for designing a hybrid classroom. It has been organized to make it possible for the module to be used as a practical reference for lecturers and other interested parties.

This module provides the teacher with step by step instruction for engaging students in hybrid learning. The aim was to make each strategy clear and comprehensive, and therefore teachers who are new to HybComet strategy could follow the instructions precisely and be able guaranteed prospect of success in the implementation.

2.0 TOWARDS THE DEVELOPMENT OF A HYBRID INSTRUCTIONAL MODULE

The instructional module of the HybCoMet Strategy is developed as a new Technical and Vocational Education (TVE) innovation that will guide teachers in delivering the learning content in a more systematic manner in an engineering subject. In the process of developing a module of HybCoMet Strategies, several core aspects have been taken into account. The first thing to consider is the purpose of the development of this teaching innovation which is to promote students learning process and help to enhance competence skills and attitudes. Each activity that is included in the module clearly defines and carefully explains to the teachers and readers how to achieve the identified learning goals.

The module is focused on the existing syllabus/curriculum. For more specific guidance, the ADDIE instructional model is referred to help with planning and designing a desirable teaching approach.

2.1 Planning for an Instructional Module of the HybCoMet Strategy

The ADDIE instructional model stand for the following; A= Analysis, D= Design, D= Develop, I= Implement, and E= Evaluation. This model is a generic, systematic approach to designing an instructional module, which provides a framework that will ensure the module is as effective and efficient as it can possibly be (College Station, 2001). The detailed explanation on how this model can be a useful guide in planning and designing the HybCoMet Strategy is given in the next section.

The Table 1.0 shows how ADDIE is used as the systematic approach in planning and designing the instructional module.

Table 1.0: The Use of ADDIE Model in Planning and Designing HybCoMet Instructional Module

ADDIE Phase	Explanation	Consideration and Tasks
Analysis	– the process of defining the needs and what is to be learnt	– Who are students, what subject, which classrooms, what are constraints?
Design	– the process of specifying how content is to be learned.	– What is learning objectives, how to plan instruction, what method and material can be used?
Development	– the process of producing the booklet.	- how to obtain and create a task, how to present information, what format to be used?
Implementation	– the process of employing the booklet to the real classroom learning process.	- what preparation to be made, what precaution to be taken?
Evaluation	- the process of identifying	- how to assess, what strategies

ADDIE Phase	Explanation	Consideration and Tasks
	the effectiveness of the approach and the HybCoMet strategy.	can be used, what standard to be achieved?

The following section explains in detail how all elements in the ADDIE contribute to the development of the HybCoMet Strategy.

2.1.1 Analysis of Needs.

The selection of topics is based on the polytechnic curriculum. The subject that has been chosen is Concrete Technology which is offered to First Semester Students in Civil Engineering Course, focusing on Topic 3- A Concrete Mix. An understanding of this topic is critical as it forms the basis of competent performances in the world of work thus it is necessary for students to understand the topic in as best a way as possible prior to their employment. It is also a prerequisite subject that needs to be passed before students can continue to the next level of their study. Being a critical component of the TVE curriculum, it becomes vital that teachers use innovative approaches that break the traditional cycle of under-performance in this area owing in part to the failure of traditional teaching approaches. What follows below is an explanation of how HybCoMet Strategy can be applied in teaching the topic cited above. In all, four sub topics in this topic were covered with each learning unit comprising one hour in length. Accordingly, five learning activities (tasks) are designed to perform all the sub topics.

To appropriately ground the learning tasks, it is essential that lecturers become sensitive to the level at which the respective students to be taught are at. Attention should given to students who are new to the subject and the Civil Engineering Course. They may have a limited knowledge and experience about the subject content and it will be necessary for me to put these considerations in mind while constructing the tasks. Davis, cited in Barkley, *et al.*, (2005) raises five very useful general considerations that need to be put into account.

Firstly, the task should be relevant and integral to achieve learning objectives. Next, the tasks should be suited to students with different skills and abilities. Thirdly, the task that is constructed should invite equal participation from every member, with each one assuming ownership for the assigned part. Fourth, consideration should be made on how to evaluate and assess students' performance as individuals and as a group. And finally, there is need for holistic planning on how to implement the task properly and systematically, starting from planning the activity through preparing the material until closing activity. Therefore, it is necessary to give step by step instructions on how to implement the tasks successfully.

2.1.2 Designing the Learning Tasks

At this stage I have to consider what the objectives of the learning tasks are and how they can be achieved. The tasks presented are attempts to encourage the development of communication, critical thinking, problem solving and team building skills, skills that are hallmarks of the HybCoMet Strategy. Accordingly, I try to design each activity with a different level of learning abilities ranging from Lower Order Thinking (LOT) to Higher Order Thinking (HOT). According to Newman and Wehlage (cited in Tilestone, 2000), LOT occurs when students are asked to receive or recite factual information or to employ rules and algorithms through repetitive routines. On the other hand, HOT requires students to manipulate information and ideas in ways that transform their meaning and implications. HOT skills, such as critical thinking, creative thinking and problem solving, are important if students are to be successful. For me, all students should have the opportunity to work at higher levels to gain best achievement in their study and success in their working life.

To help me to design the tasks taking into account the different levels of ability, (i.e. LOT and HOT), I have referred to Bloom's Taxonomy as guidance to support the analysis of the cognitive levels and for creating activities for the tasks. Blooms Taxonomy that has published in 1956 is one of the most common tools used in design of pedagogy approaches (Waugh and Gronlund, 2003). Bloom and his colleagues created taxonomies of learning outcomes within the cognitive, psychomotor and affective domain (*ibid*). Each domain consists of multiple levels of outcomes which are arranged in hierarchical order from least to most complex.

Bringing Bloom's Taxonomy to bear at this stage would draw a focus on the various cognitive levels along with parallel students activities arranged from simple to complex. This cognitive domain is important while planning and developing a learning task. The levels and structure of Bloom's Taxonomy is shown in the Table 2.0.

Table 2.0 Bloom Taxonomy Level (source: Glover and Law, 2002)

	Bloom level	**Description**	**Words typically used**
1.	Knowledge	to know something and be able to recite back	define, list, outline, recall, locate and recognize
2.	Comprehension	to understand something and to be able to explain it	compare, interpret, demonstrate, and explain
3.	Application	the ability to use information and ideas previously learned to reach an answer.	apply, classify, organize, solve and use.
4.	Analysis	the ability to break something down into manageable parts that require students to think critically and in depth	differentiate, identify, analyze and simplify
5.	Synthesis	the ability that ask students to perform original and creative thinking	predict, produce, design, construct, generate and synthesize.
6.	Evaluation	the ability to judge the merit of an idea, a solution to a problem or an aesthetic work.	appraise, determine, evaluate, weigh and rank.

A well planned teaching approach would help students to learn at the higher levels where they can analyse, synthesize and evaluate. Accordingly, activities in the hybrid approach are designed taking into cognisance Bloom's hierarchical order of cognitive functioning and they are intentionally designed to give students ample practice of cognitive engagement at the different levels. Thus, five activities (tasks) are designed to suit all level of Bloom's thinking order. Table 3.0 elaborates in detail what students are expected to achieve at every level for every task.

2.1.3 Development of the Hybrid Teaching Strategy

For the development of the Instructional Module of HybCoMet Strategy, the sequence of each activity is designed according to the level of thinking abilities as required by Bloom's cognitive level.

Table 3.0: Bloom's Cognitive Level for Each Task

TASK	COGNITIVE LEVEL	CONTINUUM	OBJECTIVE(S) OF ACTIVITY At the end of every task, students are expect to be able to:
TASK 1	Knowledge		1. recognize each type of building/house they live in;
			2. find out how the building is developed and the material used; and
			3. identify the difference between each type of building.
TASK 2	Comprehension		1. define a concrete mix.
			2. describe characteristics of good concrete mix.
			3. explain factors that will affect concrete mix.
TASK 3	Application		1. apply knowledge to the other form of learning (drawing and sketching)
			2. solve a puzzle/problem in a specific time given
			3. use appropriate skills (drawing) to elaborate the task.
TASK 4	Analysis		1. classify two types of concrete mix design
			2. explain why mix ratio and mix design are important to concrete strength
			3. identify factors that affected workability.
			4. analyse a few types of concrete tests.
TASK 5	Synthesis and evaluation		1. differentiate a few types of concrete tests.
			2. develop and produce a sheet of procedure to conduct each concrete test.
			3. demonstrate how to conduct each concrete test in a proper manner.
			4. Evaluate the testing procedure.

As presented in Table 3.0, the first task is the lowest level of thinking (knowledge and comprehension), and then follows with the highest order thinking level (analysis, synthesis and evaluation).

Five learning activities (tasks) that have been designed in the instructional module giving an example of the core processes that HybCoMet Strategy entails. Table 3.0 gives a summary of the 5 tasks and the principal thinking level of focus for each of the learning task. For each level, there is a continuum that shows how students would gain the level of thinking abilities after finishing every task. Students will start with lower order thinking at the beginning of each task before moving on to the next thinking level at that stage, and then to the next level in a subsequent stage. For example, for Task 1, students are expected to gain the lower level thinking as Task 1(1), and gradually engage in more challenging work at the same stage as in Task 1(3) before moving on to the next cognitive level in Task 2. This step is repeated in every task till the highest level is achieved (Task 5(3)). This step could help students to become more self aware about their own knowledge and carefully lead their learning to the next level of thinking abilities. As such, students are directed/ trained to use their cognitive domain in a proper manner which could enhance and optimum output in their learning.

2.1.4 Implementation and Evaluation

In implementing the hybrid approach, all the designed tasks were compiled in one booklet form (the **HybCoMet Instructional Module**). This booklet focuses on inducting teachers to HybCoMet Strategy by taking them through the various processes with ample examples being given. The booklet has three main parts- pre face, overview and main body. Details of each part is further explained in part 3.0 and 4.0 respectively.

The teaching module was distributed to the teachers who are participants in the study with sufficient time being given for teachers to become familiar with the module and the objectives in learning states that it seeks to achieve. At the implementation stage, the views of the students will also be valued as they can lead to qualitative improvement of the module.

3.0 BODY STUCTURES OF THE HybCoMet STRATEGY.

To help teachers to apply this strategy effectively, the teaching module is designed with three main sections, starting with an introductory section in ‘From Me, To You, and For Us’ which is followed by the section “Get Ready to Start” which is subsequently followed by the third section which employs step by step coverage of the learning tasks and it is entitled “Let’s Start!!!!” (Yusof, 2010).

The first section; From Me, To You, and For Us, reflects my experiences and my nthoughts of students' learning today and is premised on my contention that it is time for teachers to implement some changes that would benefit both the teachers and students, and indeed anyone else involved in the teaching and learning experience. This section is to help teachers to reflect more dispassionately on contemporary pedagogical issues. The new role that teachers should adopt was flagged very well by Barkley *et al.,* (2005) who made the poignant observation that teachers today must not only know their subject matter, but they must also know how to involve students actively in their learning. Some suggestions on who will or can use the booklet, and a brief overview of how to use the booklet, and details of subject content are also covered in this section.

"Get Ready to Start" is intended to prepare teachers and users to implement a new approach to teaching- HybCoMet Strategy. This part explains in brief research and educational theories underpinning the HybCoMet Strategy.

The focal points are the elements that are integrated into the approaches, which are collaborative and metacognitive strategies. In the earlier section, a brief introduction and literature on collaboration and metacognition are included. One concern is that teachers and users who are unfamiliar with these two strategies may have difficulties in understanding, and finally they would simply not continue to adapt and implement the new teaching approach. For this reason, this section sets out all the information in a compact and accessible way for all levels of users: -beginners, intermediate, advanced and also students.

The final section introduces teachers to the HybCoMet Strategy which I called "Lets Start!!!!" The phrase is used to alert teachers and users that we are now ready to run the new approach. This part provides practical examples on how HybCoMet Strategy can be employed in a classroom. Before starting, a simple example is given to 'untangle' the approach to teachers and to help students to prepare for the new learning environment.

There are five tasks included in this section which presenting the HybCoMet Strategy. Each task is clearly set forth and the purpose of the activity is also explained. All activities are explained in detail to help teachers deliver the task with confidence and increase the prospect of success by the end of the day/learning session. The complete information on the tasks is explained in section 4.0.

Distinct from other instructional design, the instructional module of HybCoMet strategy is written in a short and simple, but yet is complete and clear enough to guide the teacher into practice, and gear students into active learning. The explanation is written simply so that the average teacher can easily understand and then adapt the concepts to their teaching practice. For additional 'effect', at the beginning of every section, and at the end of every task I have written 'magic' words or idioms that are intended to draw the attention of teachers and users to reflect on their role as a teacher and educator nowadays. The module is written in daily conversational language to make it accessible to most of the users for whom English is a second language. Some example for this part can be found at the end of this appendix.

4.0 DESIGNING THE HybCoMet ACTIVITIES/TAKS

There are five tasks are designed to demonstrate how the HybCoMet Strategy can be applied in a classroom learning session. All tasks are designed in order to achieve the different levels of cognitive functioning as proposed in Bloom's Taxonomy of objectives previously referred to in Table 3.0. All the tasks are constructed based on my own experience while perform teaching in my classroom. These tasks are explained more fully in subsequent section.

Prior to the implementation of the HybCoMet activities, students were introduced to the Action Table. At this stage, students are guided on how to work on the Action Table which is the essential element in this approach. This table contains FACTS, IDEAS, ISSUES and MISSIONS elements. This table has been adopted from the FILA template that was applied by Wee (2004) to conduct her Problem Based Learning. "FILA" refers to Facts, Ideas, Learning Issues and Actions. I have replaced the last two elements with Issues and Missions, but the purpose remains the same. Table 4.0 explains the elements of the Action Table.

Table 4.0: Elements of the Action Table

No.	Element	Explanation
1	FACTS	Students have the opportunity to deliver and comprehend the knowledge.
2	IDEAS	Students are given a chance to express their thought and then compare and contrast their understanding of concepts under review with each other.
3	ISSUES	Students are encourage to practice to question and give comment to the given problem.
4	MISSIONS	Students can plan action to be taken in order to find a relevant sources (i.e.: library, internet) to solve the problem.

This table helps students to plan their learning more efficiently and is useful to transfer knowledge in a meaningful way and help the teacher to 'see' some of the thinking that will be occurring during the learning process. The Action Table helps students to engage in, and manage their work systematically and keep them from engaging in irrelevant steps. Besides, the advantage of using this table lies in that it can be used as a short note for students to do a revision and to plan what to do next time to better support students' learning (i.e; provide guidance for further reading and searching for more information).

4.1 Task 1- SEMBANG MAK LANG

"Sembang Mak Lang" can be referred to as a 'chit chat' session. It is based on a popular radio program that invites listeners to talk, discuss, argue and share their ideas and experiences on the theme/topic that has been raised by the deejay/host. This concept has been applied to help to develop the task in such a way that the users can easily identify with the core concepts.

This task engages students in a group form that could easily be expanded to include more comprehensive instructional processes. The task is primarily a teacher directed and regulated session, which then gradually becomes a session for students to direct their own learning. The process begins with a pair conversation and is then followed by group discussion. The activity is aim to instigate class discussion with the intention of inviting a response from students as a starting point for further discussion. This has the potential of nudging students to activate their prior knowledge individually before being invited to share ideas with peer and others in a group. Following on from that, students are invited to reflect on their responses and observe the potential for communication of different points of view to generate new knowledge.

This strategy allows students to contribute and to share their knowledge/thoughts with peers and may provide an effective basis for plenary discussion. It is designed to help students to build confidence to speak and will help to increase their willingness and readiness to talk formally to the whole class.

During the process, students as a group should develop awareness of their own knowledge and responsibility for their learning. They should feel free to change ideas, and connect with others experience to incorporate new knowledge. Their metacognitive process could be revealed in the explaining, clarifying, questioning and justifying while they engage in as they try to respond to the Action Table.

4.2 Task 2 – PICK ‘n’ MATCH

This activity is designed in order to train students to derive answers from a written article from which answers should be retrieved and arranged in the appropriate columns in the Action Table. This task is different from Task 1 because students are fully responsible to direct their learning. The teacher becomes a facilitator and monitors the work progress without interruption, unless when necessary.

This task should be effective for discussion and the generation of many ideas because all members in each group are required to participate. The knowledge and information that have been generated should then be compiled in the Action Table which serves as the basis for the next step of the learning activity. To accomplish the task, students are assigned into groups by the teacher. To help form each group, a specific activity is designed. The ‘pick n match’ is specifically referred to the game in which students need to pick a card with a name of an animal on it.

They are required to make a sound of that particular animal to get a matching member for the group. This is quite an amusing game that should allow students to feel more comfortable with the group and group members and be ready to complete the task. One thing to take into account nonetheless is that not all students may be willing to make the sound. However, at the end of the activity all members in the group would be expected to cooperate and 'sing' a sound with passion to show the group's aspiration and commitment. This is an ice-breaker task.

4.3 Task 3 – NOW YOU SEE; NOW YOU DON'T

This task is an expansion of the activity in Task 2. In the previous task students have developed some working knowledge of some of the basic processes in the HybCoMet learning process. This task builds upon and extends the concepts introduced in Task 1. The term 'Now You See, Now You Don't', is an apt descriptor of the transformation that takes place in the information and knowledge that has been gathered by students, which, when shared with others, can be changed or modified to reflect deeper insights.

Exchanged information, ideas and opinions in open and thought- provoking discussion as suggested by Barkley, *et al.,* (2005) become the main purpose of this task. In this task, students are encouraged to find sources, prepare input, then present output and share what they have learned with all members in the class. During the presentation session, all key points raised in different groups are shared with any misconceptions corrected and modified by the teacher and peers. This task may help students to expand their knowledge for their own understanding and produce output that can be shared with the whole class, which may potentially profit other class members.

It is also designed to help students to develop good group dynamics among other things; they learn the value of giving their own views and respecting other class members' contributions. They become self aware of their thinking in the discussion about the topic and regulate their cognitive process to accomplished the set goal.

This task also gives students opportunities to be fully responsible for their own learning because they have to manage and direct their learning on their own without direct teacher involvement during the process. The teacher is engaged only at the very beginning of the process by giving sufficient instruction, and then leaves the groups independently to manage their learning. The teacher guides and assists students only when asked to. However, as rightly underscored by Barkley *et al.,* (2005), it is essential for the teacher to make sure the task is clearly defined and carefully explained to avoid misunderstanding which could lead to students failing to draw maximum benefit from the task under review.

4.4 Task 4 – WIN, LOSE @ DRAW

This task is similar to a popular television game show entitled Win, Lose @ Draw ('@' is pronounced as 'or'). The game is designed to help students to communicate in non-verbal language, by sketching as an alternative to talking with others in solving a given puzzle. This activity provides an active environment for students to experience a truly collaborative learning situation. Students can have fun, use their imagination and act confidently in unfamiliar situations. It thus could promote students to actively apply knowledge, skills, and understanding to solve the presented puzzle immediately, by creatively engaging their problem solving, critical thinking and working as a good team in unexpected circumstances.

This task provides some 'leisure space' for students before they continue to more complex and challenging learning processes. This is due to the full daily learning schedule that they have as this lesson is not the only one they will be having in the day. According to one polytechnic lecturer, in a regular polytechnic classroom time table, there are five to six subjects to cover in a day (see Appendix A-1). This activity therefore can serve as a 'welcome break' from the tight learning schedule. The game aims to release some pressure, make students feel fresh, more energetic and thus could facilitate more participation in the learning process.

In this game, five or more sets of puzzles were prepared, based on student numbers in class. Each set has five puzzles which also contain a printed word or short sentence about main topics that they have learnt in a previous learning session. The puzzles include all levels of difficulty, from least to more complex words or sentences and need to be solved in a given time. A person who has been nominated to do the drawing will play a major role to ensure his/her group accomplishes the task successfully.

This game will be considered as a part of the assessment for the learnt topics method. This technique tries to replace the common traditional styles where assessment is always pen-and-paper based as discussed in Chapter 2. This avoids memorisingorientated learning approaches which students tend to depend on. Even in this game some recall is appropriate, but it is supported by other actions in order to arrive at the answer. This game would help to identify students' engagement with the learning content and the use of other form of language to organize thinking about the content during the game playing process.

4.5 Task 5 – 'GET YOUR HANDS DIRTY'

The final task, 'Get Your Hands Dirty' refers to a hands-on activity that was conducted during the learning process. The task aims to persuade students to transfer knowledge to real work practice which is learning by doing, and might provide opportunities for students to broaden their learning experience and technical skills. It is designed with the intention of helping to minimise the gap between theory and practice, thus it may help students to feel 'true to life', which may lead to the development of competence skills that are critically needed in the work place.

The task outlines an activity that requires students, as a small group, to conduct a real life project that focuses on how to conduct a concrete test. In doing so, they are required to produce written instructions on how to conduct the specific test. Students then should present and demonstrate to the whole class how to conduct a task which is focusing on how to carry out the concrete tests.

This activity could be particularly effective in helping increasing student's ability in higher cognitive domain which emphasizes on application and synthesis. It may also help in developing all competency skills that are the principal focus in my research: communication, critical thinking, problem solving and team building skills, which can help students to be prepared for a real task that they will have in future.

This is quite a challenging task, therefore students are asked to remain in their previous groups. In this way it is hoped that students will feel more comfortable and it will be easy for them to accomplish the task, because they already know and understand each other, and thus, could build up more a dynamic and strong group. The group might have a difficulty dealing with more advanced group work projects if the members have never developed a capacity of understanding and closeness.

All activities are intended to engage students in a progressive learning process that encourage them to involve in planning and application, to ground them about the struggles that they would face in real working life in future.

After completing all the tasks, students' group work and learning progress are evaluated and assessed based upon the criteria that are set up in the section below.
Example of the designed activity can be reviewed at the end of this appendix.

5.0 ASSESSING AND EVALUATING THE HybCoMet STRATEGY

In developing a new approach to teaching, it is necessary to decide on how and what criteria is needed to assess and evaluate students and their learning performance. Assessment is important to serve as a benchmark to determine the development and progress of students' learning, educational outcomes and for further improvement, if any (Wee, 2004). The evaluation tool designed will be an essential component and can be regarded as an important bench mark on student achievement in the hybrid learning approach. Reflection and feedback from students on what they have learned could help to determine strengths and weakness of the new teaching strategies.

This section provides some idea on how to assess and evaluate students' learning performance in the hybrid learning classroom. In a regular teaching and learning cycle assessment in polytechnics, quizzes and tests administered during the learning process are usually paper and pen based. The final exam is conducted at the end of the semester and also in the same format. The exam questions however, are retrieved from the 'exam bank' by a specific committee which is responsible for setting the respective exam.

While largely following this relative assessment processes, consideration will be made on how best to assess students' ability to show and apply the acquired knowledge and their skills. According to Wee (2004, p.115), if skills such as problem solving, communication and collaboration skills were to be assessed, students should be asked to provide evidence of their proficiency level of the skills. The assessment tools then should be developed to reflect the achievement of these skills.

The proposed assessment system in HybCoMet learning process included an element of the ongoing classroom learning process as additional element. The assessment profile takes into account the development of positive attributes that include students' attitude, enthusiasm and commitment while going through the learning process. Bear in mind, because the HybCoMet is introduced as an alternative teaching approach within the traditional classroom setting, the final exam become one part of the assessments process which cannot be omitted, however the weighting is lower than the traditional system.

Whereas the traditional assessment regime has been teacher assessment, the new assessment format takes into account both teacher and peer assessment which draws students more into the learning process as they adopt new assessment roles which can facilitate greater mastery of the learning process.

Table 5.0: Aspects of Assessment

NO	ASPECT	ASSESS BY	TASK
1	Group work process	Teacher	Task 1,2 & 3
2	Group presentation	Teacher & peers/whole class	Task 4 & 5
3	Written report	Teacher	Task 4 & 5
4	Group effort & Creativity	Group members	All tasks

For the performance and attitude element, the student will be assessed by peers, as well as the teacher. This marking scheme may be not fair for the traditional classroom, but the hybrid approach tries to reduce as much as possible the use of 'mental energy to learn the information' as termed by Montgomery (1983, p. 11). Even though, 60% of the mark (test-20% and final exam-40%) which are pen and paper based assessment could be considered high on mental energy used, the HybCoMet Strategy it is hoped could brings a welcome break to traditional assessment as it gives more room for novelty in the way students' assessment is conducted. Whilst the traditional assessment format focused on subject content/knowledge, the HybCoMet Strategy set out to measure both knowledge and process skills. This will become one of the advantages of the hybrid learning process where students are not focused only on 'mental torture' but students are also given an opportunity to show their ability to apply knowledge and performance in other contexts of learning.

In addition, students are also required to reflect on their learning in a more creative and enriching way as they practise self-analysis in every task and also keep an eye on the development of specific skills (see as Appendix 4-E for some of the specific skills).

6.0 GROUP FORMATION

A relevant consideration on how to implement the HybCoMet Strategy is group size and how to form groups. This aspect is a major concern as all activities will be conducted in a collaborative learning context. Thus group size is also an important aspect that needs to be given attention in developing this module. It is essential to determine the optimum members in each group to facilitate effective participation and task completion in a given time.

Groups in different learning contexts can be of different sizes and a variety of methods can be employed to assign students into groups according to the goal, the nature of the activity and the duration of the task (Barkley *et al*, 2005). While this can hold true for group formation in traditional classrooms, for HybCoMet tasks, the group should be small enough to facilitate active involvement of students. Ideal group size should range from 4 to 5 students so that each student is afforded ample opportunity to participate in the designated learning activities. Kagan (1994) contended that groups of four are ideal because this will double participation and encourage active communication. On the other hand, Bean (cited in Barkley *et al.*, 2005) believed that groups of five are the most effective size for formal and informal classroom groups. Kagan and Bean raise useful rule of thumb suggestions on group size as larger groups have been perceived to be difficult to manage while also further fragmenting the learning task. Based on this argument, the group in the HybCoMet tasks will be constructed ranging from 4-5 members.

There are many ways and methods of group formation with some of the most commonly used being friendship or common interest; random selection and student or teacher determined (Barkley *et al.*, 2005). For implementing activities of HybCoMet Strategy, different methods were created in every task in order to assign students to a group with the watchwords being novelty and variety. Different approaches of group formation were preferred for a variety of reasons. One was to explore the types of group formation that would yield the best results in terms of drawing the most from the different group members. Another was that Malaysian polytechnics are heterogeneous in composition as they have students from different races, ethnicities, religions and languages, and also draw students with ranging level of ability, age and gender.

Table 6.0 listed the preferred methods for selecting group members for every HybCoMet task.

As can be seen from the table, for Task 1, students are randomly assigned to a group. Whilst for Task 2 and Task 3, I have determined the group which hoped could build up more heterogeneous groups. This could allow students to work with colleagues from different backgrounds who could contribute different ideas and experiences, thus developing more valuable learning. Varying the different group formations gave students a chance to mix with students of different backgrounds thus improving students' ability to form new relationships while at the same time improving communication skills, as interaction between students of different ethnic groups is found as competitive and superficial (Slavin, 1995). Group work learning is also recognized as an ideal solution to enhance intergroup relations among students of different ethnic groups (*ibid*).

Table 6.0: Methods of Member Selection for Every Task

TASK	METHODS OF MEMBER SELECTION
TASK 1	Random selection - Students group themselves by a near random selection method with students who sit behind and beside each other forming a group
TASK 2	Teacher determined - The teacher constitutes groups of students by making an animal sounds activity. Student with the same animal sound will be together and form a group.
TASK 3	Teacher determined - The teacher assigns groups by using a different colour of paper that is selected by students from a dark box. Students with similar colours go into the same group.
TASK 4	Friendship or common interest - students are free to choose their own

	group members with whom they feel comfortable to work.
TASK 5	Friendship or common interest - Students are asked to remain in the same groups as in Task 4. This task is quite challenging, therefore it is necessary for the student to establish good rapport with their group members to facilitate successful completion of the task.

For Task 4 and Task 5, students are allowed to choose their own team members. This technique is hoped could form homogeneous groups as I gave students the opportunity to freely choose their own group members with whom they were most comfortable to work with.

While self-selection may have its own problems of being exclusive, it nonetheless could ensure that more work is done as the groups could have a history of working together thus very little time is lost in settling down to the assigned tasks to be carried out, and this could guarantee a better prospect of success in accomplishing the tasks. In Task 2 and Task 3 it would appear that I am compelling some students to work with some people who might not be familiar to them; which may result a difficulty in cooperation, and finally may affect the outcome of the task. Nonetheless, with reference to Kagan (1994), this issue will not exist in group learning because of the 'power of teambuilding…(in involving)…initially hostile students to fully participate' (p. 3). There is merit in this approach as it accords students the opportunity to form new associations, a skill that is essential in the work place and in later life.

Whilst Kagan (1994), contended that this approach can also be justified from the point of view that team building can bridge positions of prior hostility as people work together on a task of mutual benefit, nonetheless it is important for me to measure on how students feel about those relationships. To help with the diagnosis of students experience and feelings, at the end of every task, a reflection sheet (log sheet) about the group and student's role as a group member is included. The log sheet is intended to measure students perception of both collaborative learning environment and the generic competences of students. The detail of the scale are given in Appendix 4-E.

The sheet was distributed at the end of the learning session and will be collected upon its completion. To underscore the importance of the reflection sheets, it will be needful for the teacher to pick up at least 2 of the reflection sheets and read them to the class to show students that their feedback is important.

7.0 CONCLUSION

There are a variety of aspects that should be considered when proposing a new teaching strategy. The HybCoMet Strategy appraised in this chapter is a new teaching approach that could be introduced to teachers and users to improve their pedagogical practice. While lectures, group work and project approaches have been used in traditional classrooms setting, the HybCoMet Strategy proposed here offers a much more broad-based methodology with one of its key emphasis being the need for collaborative and individual reflections during the learning process. The approach highlights the need for careful planning and execution of the learning task so that maximum benefit is derived from both group and individual activities. The teacher's main role in this approach is to facilitate the learning of the students under his/her charge. It is hoping that teachers could apply and consider this strategy as guideline and starting point to the more creative and active learning. However, teachers are not limit to solely follow this instruction. They are allowed to modify or add any elements that are best meet their teaching needs.

One major concern while implementing the HybCoMet strategy is a time factor. This approach could have a critical time constraint compared to the traditional teaching approaches as it relies on group work. According to Meyer (1988), modular instruction and the designated techniques are time consuming to produce and require considerable expertise and skills to design and develop the approach to become a reality. It is necessary to plan and manage time effectively since it can easily slip from the planned timetable. While module construction could be demanding, it provides a needed enhancement to the quest for more effective approaches that provide a way out from traditional approaches that indeed served their time but need to be re-visited in the light of discontinuities in practice that have created an increasing gap between the current product from Malaysian polytechnics and the more versatile practitioner that is required in the world of work.

Get Ready to Start....

PURPOSES OF THE TEACHING MODULE

The instructional Module of the HybCoMet Strategy is intended to give examples of ways in which to promote teaching and learning strategies that should motivate students and which may enhance their understanding in learning. To begin with, I would like to highlight a few objectives and purposes of the development of this module. This module was designed for you as a teacher with the intention of:

1. Exploring collaborative learning activities;
2. Creating more active and challenging classroom activities;
3. Encouraging students in the development of critical thinking skills;
4. Supporting students in the development of good communication skills and self esteem;
5. Helping students to be able to recall and apply their knowledge in the 'coming future'; and,
6. Preparing students for action – to get their brain into gear and move their body (becoming mentally and physically active).

WHO WILL USE THIS MODULE?

This module is designed specifically for polytechnic lecturers who are teaching technical subjects but, of course, it is not only limited to them. Anybody who is interested in implementing a new teaching approach and wishes to adapt the HybCoMet Strategy in the future would be most welcome. It is also suitable for any cadre of readers seeking information and guidance on innovative techniques in teaching and learning.

HOW TO USE THIS MODULE

I wish to invite you to be my guest and to join me in exploring a new experience in the teaching and learning process. I suggest that you start by reviewing the whole module and then decide how you should engage in the activities. Now, let me guide you on how to use this module efficiently. You will find that this module falls into three major parts as listed below. It is written in this manner to provide a practical guide that allows you to experience the central facets of the HybCoMet Strategies.

Part 1	Introduction to the theoretical basis, components, and the related instructional concepts of the HybCoMet Strategy. Here, the theoretical basis of the teaching approach and traditional approach will be explained briefly. Collaborative learning and metacognitive strategies which are the main components of the approach will also be discussed in this part.
Part 2	Brief explanation of subject, syllabus, learning and teaching strategies and also outline of activities and planning for classroom learning sessions. The topics that have been chosen will also be introduced in this part.
Part 3	Guide on how to implement the HybCoMet Strategy in the classroom. Here, the example of the HybCoMet Strategy will be outlined for the specific topics that have been chosen. This part is organized into five categories based on tasks. All of the tasks presented are intended to promote the development of generic skills; communication, problem solving, critical thinking skills and team building. At the end of each task, examples are provided on how to assess students and how to use the Marking Scheme.

This module should provide you with a simple and flexible method that can be applied to a variety of disciplines and may help to achieve learning goals. All activities were designed in such a manner that requires you to be engaged in it actively and enables you to experience being an active learner. This experience might help you to encourage your students to engage in the same way.

I definitely do not recommend that this module should be the only method used. I just hope that the examples that have been provided in this module may help you to incorporate some of the approaches into your regular teaching in order to become more ‘colourful’. I intend and hope it will encourage students to improve their learning achievements as well as their attitudes and generic skills.

The next part is intended to answer all questions in your head by providing further explanation and information about the HybCoMet Strategy which will guide your experience of this new technique of teaching.

SAMPLE OF THE HybCoMet ACTIVITY

TASK 5
GET YOUR HANDS DIRTY

TOPIC:
CONCRETE TESTS

LEARNING OBJECTIVES;

At the end of the learning session, students should be able to:

5. analyze a few types of concrete tests.
6. develop and produce a written procedure to conduct a concrete test.
7. demonstrate how to conduct each concrete test in a proper manner.

PRIOR KNOWLEDGE

1. Students have a basic knowledge on concrete tests.
2. Students should have explored information from many sources and find out answers that are related to the task.

PURPOSES OF ACTIVITY

The task aims to persuade students to transfer knowledge to real work practice which is learning by doing, and might provide opportunities for students to broaden their learning experience. It is designed with the intention of helping to minimize the gap between theory and practice, thus it may help students to feel 'true to life', which may lead to the development of competency skills that are critically needed in the work place such as communication, critical thinking, problem solving and team building skills.

The task outlines an activity that requires students, as a small group to produce written instructions which can help students to be prepared for a task that they will have in future. Students then should present and demonstrate to the whole class how to conduct a task which is focusing on how to carry out the concrete tests. This activity could be particularly effective in increasing student's ability in higher cognitive domain which emphasizes application and synthesis.

EXPECTED OUTCOMES FOR THE ACTIVITY

At the end of the activity, students are expected to be able to;

1. Knowledge Skills

a. learn how to use and operate appropriate testing equipment,
b. understand how to conduct concrete test for specific purposes,
c. demonstrate knowledge of different means of planning and developing learning,
d. produce correct procedures on how to conduct a specific test.

2. Critical Thinking and Problem Solving Skills

a. analyze, evaluate and present relevant information obtained through group work,
b. determine suitable materials and equipment used to run the test,
c. creatively generate ideas to solve the task given,
d. diagnose and make decisions.

3. Team Building Skills

a. allow members to present their findings and ideas to a group,
b. manage group dynamics to meet desired goals,
c. encourage and promote learning in collaborative mode,
d. be responsible to express task successfully.
e. understand professional and ethical responsibility,
f. defend decisions that have been made when challenged and questioned by teacher and colleagues.

4. Communication Skills

a. develop effective oral and written communication skills,
b. communicate effectively using a technology,
c. negotiate and communicate in a proper manner,
d. answer questions given by the teacher and colleagues with confidence
e. use technology to deliver the input.

5. Skills for Life Long Learning

a. develop hands-on and practical skills,
b. ability to use the techniques, skills, and engineering tools necessary for engineering practice,
c. be technologically savvy.

TEACHING AIDS

1. Appropriate equipment
2. Appropriate material
3. OHP & Transparencies
4. Computer & power point slides
5. LCD Projector
6. Lab Instruction sheet

Strategies used to enable the achievement of outcomes

1. Guided learning process
2. Independent study
3. Group study
4. Tutorials
5. Module reading

Assessment methods which enable students to display outcomes

1. Group work process using the Action Table (5%)
2. Written report- produce a laboratory instructions (Lab sheet) (5%)
3. Group presentation (10%)
4. Demonstration skill (10%)

HybCoMet Strategy

DURATION (minutes)	**INSTRUCTION**	**REMARK(S)**
5	**STEP 1 – GROUP FORMATION** **Before the task** • Asks students to stay with the previous group members as in **Task 3**. • Asks students if they are happy with the group or whether they need to change the group. • If any, ask the student(s) to see the teacher personally after distributing the learning task. • Discuss with student(s) particular reason why she/he needs to change a group. • Arrange a new group for her/him or ask her/him to choose their preferred group. • After new group members have been chosen, ask that particular group if they can accept and be happy with a new member. • After group formation has been settled, back to the class discussion. **After that,** • Ask students to get into groups and sit in a round table • Ask them to set ground rules for the group • Define a role of each member and use their own creativity to name the role. • State the role and who is responsible for that role and to include it in the written assignment.	**NOTE;** - Distribute the learning task as **Appendix T5 - 1**. - While other students are reading the task, make a discussion with the student(s) that need to change a group. **NOTE;** This role can be decided while students are planning for their learning. **REMINDER;** **Step 1 and Step 2 should be done earlier, ideally 2 weeks before presentation day.** .
5	**STEP 2- UNDERSTANDING LEARNING TASK.** • Ask students to read and understand the task. • Invite discussion on the given task. • Try to explain what the task was about and ask students if they have any queries before they can proceed to the task.	**NOTE;** If possible, ask one student to explain what they can understand from the task before you give any explanation.
	STEP 3- PLANNING FOR LEARNING **Before Presentation Day** • Book a concrete lab for running the tests. • Discuss with a technician for any assistance needed. e.g.; equipment, materials • Ask students to set up a room for presentations and demonstrations • Arrange to invite external judges/panels to assess and evaluate the presentation. (Perhaps teachers who are teaching or have wide experience of the subject). • Find out a caterer/cook to prepare refreshments for the day *(optional).* • Decide what can be used/gift as a reward. (scroll/ small gift/ stationery/ cash/ etc).	NOTE; This part should be done in advance (2-3 days) before the presentation day to make sure the session can be conducted successfully.

<table>
<tr><td>Self learning in 2 weeks duration.</td><td>Ask students to;
• start group discussion in their own time- make sure it is convenient time for everybody in the group.
• plan their learning by using the Action Table and prepare the table to be submitted along with the assignment.
• prepare for the lab sheet
- decide format of writing,
- take related photo,
- write the instructions/procedures,
- submit in the time given.
• prepare for presentation and demonstration.
- prepare input using appropriate aids.
- Prepare materials and equipments- rehearse once, if possible
- arrange for visual aid that need to be used – book in advance from department/unit in charge
- arrange and set up room that will be used for presentation.</td><td>NOTE;
Students should be reminded that;

• every member should participates equally while undertaking the task.
• Avoid any fragmentation/ segregation of job wherever possible.
• If necessary, meet the teacher for more explanation and to make sure they are on the right track.</td></tr>
<tr><td>70
(7-10 minutes for each group)</td><td colspan="2"><u>During the Presentation Day</u>

• Comes early and checks the room – makes sure it is fully set up and organized properly.
• Invites the teachers who have agreed to act as the judges.
• Plays the role of chair person for the presentation session.

Ask students to:
• counter check all equipment and materials, as well as the visual aids – make sure all is ready to use.
• distribute the procedure sheet to audience.
• take places and are ready to run the task.
• make sure the audience is ready and paying attention.

Start the presentation.
• Each group present and demonstrate the task in the time given.</td></tr>
<tr><td>5 mnts for each group</td><td><u>STEP 4 – EVALUATION AND ASSESSMENT</u>

• Evaluate and assess the presentation and demonstration of each group.
• Open floor for question and answer session.</td><td>• Use the assessment sheet to evaluate each group as T5- 2.
• Invite three students from different groups to become judges for every presentation slot as T5 – 3.</td></tr>
<tr><td>5</td><td colspan="2"><u>STEP 5 – SUMMARY & CONCLUSION</u>

• Summarize the main points of the covered topic.
• Signal to students that the topic has been completed.
• Ask students to prepare for their summative assessment.
• Celebrate their achievement and contribution to the task.
</td></tr>
<tr><td></td><td><u>STEP 6 - SELF MONITORING</u>

• Ask students to evaluate and reflect their own learning, e.g.;
- What is the most important thing I have learnt?
- How can I apply what I have learnt in the real world?
- What should I do for improvement of quality</td><td><u>Students Self directed learning</u>

• Individual learning and reading to gain better understanding of all topics that have been learnt.
• Preparation for a summative assessment.
• Group study.
• Discussion with other students.
• Preparation for the next lesson.</td></tr>
</table>

	of what I have done? - What additional information would be useful? Ask students to reflect their own learning performance as **T5-4.**	

PKPSA-KUR-001/LAM 002

APPENDIX A-1

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH
JABATAN : KEJURUTERAAN AWAM
JADUAL WAKTU SESI :JULAI 2008

KELAS : DKA 1C

TARIKH KUAT KUASA :14 JULAI 2008

NAMA PENASIHAT AKADEMIK: PN. DALIELA BT ISHAMUDDIN

PINDAAN : 0

HARI/MASA	8.00-9.00	9.00-10.00		10.15-11.15	11.15-12.15	12.15-1.15		2.15-3.15	3.15-4.15	4.15-5.15	5.15-6.15
ISNIN	C 1001 EMA LA 201		R	C 1005 JAZZ LA 201	PA DALI M.TAN		R	B 1003 AINI/ SARI CAM 1		B 1004 LINI LA 107	
SELASA	C 1005 JAZZ/ WANI M.UKUR				A 1003 JPAM LA 003	C 1004 HAZ LA 201	E	B 1001 JMSK LA 006		✓	
RABU	B1004 LINI/ ZURAH M. SC. KEJUT		H	C 1002 ZACK B. LK 1			H	R 1001 WANI/ JAZ M. STRUK	R 1001 AMALI		
KHAMIS	B 1001 JMSK LA 209	A 1003 JPAM M 1	A		* B1004		A	A 1001 JPAM LA 207			
JUMAAT			T	A 1002 JPAM LA 003		T					

KOD	MODUL	KREDIT
A 1001	PENDIDIKAN ISLAM	1.5
A 1002	PENDIDIKAN MORAL	1.5
A 1003	ENGLISH FOR TECHNICAL PURPOSE	1.5
R 1001	KO-KURIKULUM	1
B 1001	MATEMATIK KEJURUTERAAN	2
B 1003	APLIKASI KOMPUTER	1
B 1004	SAINS JURUTEKNIK	2

KOD	MODUL	KREDIT
C 1001	BAHAN & BINAAN KEJURUTERAAN	2
C 1002	LUKISAN KEJURUTERAAN	2
C 1004	TEKNOLOGI KONKRIT	1
C1005	UKUR KEJURUTERAAN	2.5

Diterima Oleh :

(DALIELA BT ISHAMUDDIN)

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH
TARIKH : 11/7/08

P. 01 01-07-2004

APPENDIX 2-A

THE COURSES THAT OFFERED AT MALAYSIAN POLYTECHNICS

CODE OF COURSES	COURSES IN ENGINEERING FIELDS	CODE OF OFFERING POLYTECHNICS																			
		PUO	SAS	MAS	PKB	PKS	PPD	PKK	PSA	PJB	PSP	PKM	PKT	PDT	PMM	PTM	PKU	PSB	PPP	PMS	PMU
D04	Civil Engineering	✓	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓	✓	✓			
D05	Building Services Engineering								✓												
D06	Wood Based Technology							✓	✓												
D08	Architecture		✓												✓						
D09	Quantity Surveyor				✓			✓													
D10	Land Surveyor		✓																		
D16	Electrical Engineering			✓				✓							✓	✓	✓				
D19	Control Electronic Engineering								✓	✓											
D20	Computer Electronic Engineering	✓						✓			✓			✓	✓	✓	✓	✓			
D23	Medical Electronic Engineering								✓												
D24	Electronic Engineering	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓		
D25	Information Technology	✓				✓				✓	✓			✓							
D30	Mechanical Engineering	✓	✓	✓		✓	✓	✓	✓					✓	✓	✓	✓				
D31	Mechanical Engineering (Automotif)				✓									✓							
D32	Mechanical Engineering (Agriculture)			✓							✓										
D33	Mechanical Engineering (Manufacturing)			✓		✓	✓	✓		✓	✓			✓	✓	✓	✓				

D34	Mechanical Engineering (Air Conditioner & Refrigerator)	✓																			
D35	Mechanical Engineering (Plantation)				✓																
D37	Mechanical Engineering (Packaging)								✓												
D38	Mechanical Engineering (Plastic & Polymer)			✓										✓							
D39	Mechanical Engineering (Textiles)										✓										
D40	Mechanical Engineering (Material)									✓											
D41	Mekatronic Engineering	✓		✓	✓		✓	✓		✓				✓	✓	✓	✓				
D70	Graphic Design									✓											
D71	Industrial Design									✓											
D80	Shipping Engineering	✓																			
D90	Foods Technology		✓																		
		PUO	**SAS**	**MAS**	**PKB**	**PKS**	**PPD**	**PKK**	**PSA**	**PJB**	**PSP**	**PKM**	**PKT**	**PDT**	**PMM**	**PTM**	**PKU**	PSB	PPP	PMS	PMU

COURSES IN FESYEN AND HOSPITALITY																					
D65	Hotel and Catering Management							✓		✓					✓			✓			
D66	Tourism Management									✓					✓			✓			
D67	Apparel & Fashion Design									✓											

COURSES IN COMMERSE AND STENOGRAPY																					
D50	Accountancy	✓	✓	✓	✓	✓	✓	✓			✓				✓	✓	✓				
D51	Insurances								✓												
D52	Banking and Finance	✓																			
D53	Marketing			✓	✓		✓	✓	✓						✓	✓	✓				
D55	Business Study (Management)	✓			✓	✓		✓	✓		✓								✓		
D57	Business Study (International Business)								✓												
D58	Stenography		✓				✓											✓	✓		

NAME OF POLYTECHNICS

PUO	: Politeknik Ungku Omar, Ipoh, Perak	PKM	: Politeknik Kota, Melaka	PSA	: Politeknik Sultan Salahuddin Abdul Aziz Shah, Shah Alam, Selangor
SAS	: Politeknik Sultan Haji Ahmad Shah, Pahang	PKT	: Politeknik Kota, Kuala Terengganu	PJB	: Politeknik Johor Bahru, Pasir Gudang, Johor
MAS	: Politeknik Sultan Abdul Halim Mu'adzam Shah, Kedah	PDT	: Politeknik Dungun, Terengganu	PSP	: Politeknik Seberang Perai, Pulau Pinang
PKB	: Politeknik Kota Bharu, Kota Bharu, Kelantan	PMM	: Politeknik Merlimau Melaka	PPP	: Politeknik Perlis, Perlis
PKS	: Politeknik Kuching, Kuching, Sarawak	PTM	: Politeknik Tanjong Malim, Perak	PMS	: Politeknik Muadzam Shah, Pahang
PPD	: Politeknik Port Dickson, Si-Rusa, Negeri Sembilan	PKU	: Politeknik Kulim, Kedah	PMU	: Politeknik Mukah, Sarawak
PKK	: Politeknik Kota Kinabalu, Likas, Sabah	PSB	: Politeknik Sabak Bernam, Selangor		

APPENDIX 2-B

POLITEKNIK -----------------------------
TEACHING PLAN

Name of lecturer:___________________________

Teaching Session: **July 2008**

code & Name of Modul e: : **C1004 - Concrete Technology**

Course : **SKA 1A**

Topic No.	Topic, Sub.Topic and Objektive/ Lecture/ Practical/ Ko-curriculum/ Soft Skills and Evaluation	Week	Date of Implementation	Material/Tool	Remark/Note
	ORIENTATION WEEK	W1			
1.0	**CONCRETE INTRODUCTION** Objectives: At the end of the lesson, students should be able to: 1.1 Define concrete according to materials composition and its types. 1.2 List out the factors that make concrete important in the construction industry compare to other materials. 1.3 Recognize the concrete structures 1.4 Describe the developments taken place in the concrete technology.	W2		1. White Board 2. Marker Pen 3. C1004 Module 4. Reference book i.Concrete Technology	
2.0	**CONCRETE MATERIALS** 2.1 Cement Objectives: At the end of the lesson, students should be able to: 2.1.1 Introduction to cement, describe the types of cement, the chemical composition and its uses.	W3		1. White Board 2. Marker Pen 3. C1004 Module 4. Quiz 1 question 5. Assignment 1 question	

Topic No.	Topic, Sub.Topic and Objektive/ Lecture/ Practical/ Ko-curriculum/ Soft Skills and Evaluation	Week	Date of Implementation	Material/Tool	Remark/Note
	2.1.2 Ordinary Portland cement: a. Rapid hardening portland Cement b. Low heat portland cement c. Sulfates resisting portland cement d. Modified portland cement e. Blast furnace portland cement f. High alumina portland cement 2.1.3 Describe the reaction (hydration) of water and the chemical substances consist in the cement and the function of the chemical substances in the cement. 2.1.4 List out the storage methods at the factory and at the construction site. 2.1.5 Identify and describe the types of tests to determine the properties and the quality of cement: a. Fineness test – Ridgen tool b. Cube compaction test – mortar cube c. Initial and final setting time test – Vicat tool 2.2 Aggregate Objectives: At the end of the lesson, students should be able to: 2.2.1 Define in general on the aggregate a. Fine aggregate b. Coarse aggregate 2.2.2 Describe the aggregate criteria, physical properties, appearance, shape and its texture. 2.2.3 Fine aggregate (sand) a. Describe the function of sand in concrete and its relation to the strength of the concrete. b. Describe the types of sand which is suitable to be used in concrete and its uses i. River sand ii. Mine sand iii. Sea sand c. Describe the types of sand cleanliness test			6. Reference book i.Concrete Technology	

Topic No.	Topic, Sub.Topic and Objektive/ Lecture/ Practical/ Ko-curriculum/ Soft Skills and Evaluation	Week	Date of Implementation	Material/Tool	Remark/Note
	which are carried out i. Silt test ii. Test in the palm using dry sand iii. Sand segregation test iv. Sand bulking test Evaluation : Quiz 1 Assignment 1				
2.0	**CONCRETE MATERIALS** 2.2 Aggregate Objectives: At the end of the lesson, students should be able to: Coarse Aggregate a. Describe the types of coarse aggregate and its uses. i. Lime stone ii. Granite stone iii. Sand stone b. Describe the methods of aggregate strength is carried out i. Impact test ii. Crushing test iii. Aggregate segregation test 2.2.4 Water a. Describe the types of water which is suitable to be used in concrete mixture and acidity and alkaline tests. b. Elaborate the role of water in the concrete mixture. 2.2.5 Additives a. Define the additives and its purpose b. Describe the types and the role of additives in concrete mixture	W4		1. White Board 2. Marker Pen 3. C1004 Module 4. Reference book i.Concrete Technology	

Topic No.	Topic, Sub.Topic and Objektive/ Lecture/ Practical/ Ko-curriculum/ Soft Skills and Evaluation	Week	Date of Implementation	Material/Tool	Remark/Note
	i. Catalyze substance ii. Retarding substance iii. Water decrease substance iv. Plasticizer substance v. Air trapping additive vi. Easy mixing additive				
3.0	**CONCRETE MIXTURE** Objectives: At the end of the lesson, students should be able to: 3.1 Introduction 3.1.1 Define concrete mixture and differentiate the mix ratios. 3.1.2 Elaborate the relation mix ratio with the strength and its uses suitability. 3.2 Mixture types 3.2.1 Define and describe the types of concrete mixture. 3.2.2 Fixed mixture/ mixture worability 3.2.3 Design mixture 3.2.4 Nominated or nominal mixture Evaluation: Quiz 2	W5		1. White Board 2. Marker Pen 3. C1004 Module 4. Quiz 2 question 5. Reference book i.Concrete Technology	
	MID TERM SEMESTER BREAK	W6 –W7			
3.0	**CONCRETE MIXTURE** Objectives: At the end of the lesson, students should be able to: Define wet concrete			1. White Board 2. Marker Pen 3. C1004 Module	

Topic No.	Topic, Sub.Topic and Objektive/ Lecture/ Practical/ Ko-curriculum/ Soft Skills and Evaluation	Week	Date of Implementation	Material/Tool	Remark/Note
	3.3 Describe the workability of wet concrete 3.4 Describe the factors influencing workability ; 3.4.1 Water/ cement ratio 3.4.2 Aggregate/ cement ratio 3.4.3 Shape and fleshiness of aggregate 3.4.4 Additives substance 3.5 Describe the factors which cause the happening of ; 3.5.1 Material separation 3.5.2 Surfacing of cement 3.6 Describe the steps and the purpose of carrying out workability test. 3.6.1 Slump test 3.6.2 Compaction factor test 3.7.3 Vebe consistency meter test Evaluation : Test 1 Assignment 2	W8		4. Test 1 question 5. Assignment 2 question 6. Reference book i.Concrete Technology	
4.0	**STEPS OF PREPARATION, TRANSPORTATION, CASTING, COMPACTION AND TREATMENT OF CONCRETE AT THE CONSTRUCTION SITE** Objectives: At the end of the lesson, students should be able to: 4.1 Describe two step of batching 4.1.1 Volume method 4.1.2 Weighing method 4.2 Elaborate the method of mixing concrete at construction site and the types of mixer which are used 4.2.1 Mixing with hands 4.2.2 Mixing with machine 4.3 Explain the type of transportation and the method of trasporting concrete which has been mixed; 4.3.1 Wheel barrow	W10-W11		1. White Board 2. Marker Pen 3. C1004 Module 4. Reference book i.Concrete Technology	13/09-Awal Ramadan

Topic No.	Topic, Sub.Topic and Objektive/ Lecture/ Practical/ Ko-curriculum/ Soft Skills and Evaluation	Week	Date of Implementation	Material/Tool	Remark/Note
	4.3.2 Dumper 4.3.3 Lorry 4.3.4 Crane 4.3.5 Sledge 4.3.6 Pump				
5.0	**INTRODUCTION AND THE CHARACTERISTICS OF THE REINFORCED CONCRETE**	W12-W13			
	MID TERM SEMESTER BREAK	W14-W15			
6.0	**CONSTRUCTION METHOD OF THE REINFORCED CONCRETE**	W16-W17			
7.0	**PRE STRESSED CONCRETE**	W18-W19			
8.0	**PRE CAST CONCRETE AND PRE FABRICATION TECHNOLOGY**	W20			
9.0	**LIGHTWEIGHT CONCRETE**	W21			
	Revision	W22			
	FINAL SEMESTER EXAMINATION	W23-W24			

APPENDIX 4-A

Student ID no : ____________________

Dear Student,

Thank you for giving a cooperation to participate in this research project for my PhD Research Program : **HOW DOES A HYBRID APPROACH USING COLLABORATIVE AND METACOGNITIVE STRATEGIES INFLUENCE GENERIC COMPETENCIES AMONG CIVIL ENGINEERING STUDENTS IN MALAYSIAN POLYTECHNICS?**

This survey will take approximately 20 minutes to complete. The goal of this project is to determine the potential effectiveness of the Hybrid Approach compared to the 'Traditional Approach' and to identify whether the Hybrid learning environment will improve students' attitudes and generic skills.

I would be very grateful if you could complete the questionnaire in this survey. The survey will be only used for the purposes of the study and your responses will remain confidential. So, please respond to the questions as honestly as possible.

Your participation in this study is voluntary and you may refuse to answer any question. Please tick this box ☐ to confirm that you understand the nature of this research and give your consent to take part.

Thank you very much for participating in this questionnaire.

Yusmarwati Yusof
PhD Student
School of Education
University of East London
Email : yusmar_yu@yahoo.com

SECTION A: <u>Demographic Details</u>

Instruction: Please tick (√) in the appropriate box.

1. Sex:

a. Male ( ) b. Female ( )

2. Ethnic Group:

Malay	( )
Chinese	( )
Indian	( )
Other ethnic group (please specify below) ______________________________	( )

3. Religion:

Muslim	( )
Christian	( )
Buddhist	( )
Hindu	( )
Other religion (please specify below) _________________________________	( )

4. Name of previous school: ____

5. Result of Malaysian Certificate of Education (SPM) :

SUBJECT	**GRADE**
Malay Language	
English Language	
Mathematics	
Science	
Technical Subject	
Technical Drawing	

SECTION B: STUDENTS EVALUATION

Please tick (√) in the appropriate box.

1. What is the most difficult subject you study in this polytechnic? Pick only one answer from the list.

a. Engineering Subjects (all engineering subjects module in your programme, i.e; Architecture, Building Constuction) ( )

b. Sciences ( )

c. Mathematics ( )

d. Computers ( )

e. Humanity and Social Studies ( )

f. other subject (please specify) ( )

____

2. Please tick (√) only one answer in the appropriate box using the following scales.

5 = Always **4 = Often** **3 = Sometimes** **2 = Seldom** **1 = Never**

a. What is the most usual **Teaching Material/Aid** that is used for the subject you have ticked in (1) above?

Teaching Material/Aid	**5**	**4**	**3**	**2**	**1**
a. chalk and talk	☐	☐	☐	☐	☐
b. power point presentation	☐	☐	☐	☐	☐
c. OHP and transparency	☐	☐	☐	☐	☐
d. model	☐	☐	☐	☐	☐
e. specimen/real object	☐	☐	☐	☐	☐
f. video and television	☐	☐	☐	☐	☐
g. chart/ graph/ map	☐	☐	☐	☐	☐
h. picture/ photograph	☐	☐	☐	☐	☐

b. What is the most usual **Teaching Method** that is used for the subject you have ticked in (1) above?

Teaching Method	**5**	**4**	**3**	**2**	**1**
a. a lecture	☐	☐	☐	☐	☐
b. a group discussion	☐	☐	☐	☐	☐
c. a debate	☐	☐	☐	☐	☐
d. a demonstration	☐	☐	☐	☐	☐
e. a project	☐	☐	☐	☐	☐
f. a problem solving	☐	☐	☐	☐	☐
g. an inquiry	☐	☐	☐	☐	☐
h. a contention	☐	☐	☐	☐	☐
i. a simulation	☐	☐	☐	☐	☐
j. a tutorial	☐	☐	☐	☐	☐

3. If given a choice, how would you prefer to learn the subject you have ticked in (1) above. Put the number in the right table below to show your preferable methods starting with 10 for the most and 1 for the least preferred.

METHODS	PREFERABLE
a. a lecture	
b. a group discussion	
c. a debate	
d. a demonstration	
e. a project	
f. a problem solving	
g. an inquiry	
h. a provocation	
i. a simulation	
j. a tutorial	

SECTION C: EVALUATION ON TEACHING STRATEGIES

Please tick (√) in the appropriate box to show how often a lecturer delivers a lesson using the following strategies. Please use the following scales.

5 = Always **4 = Often** **3 = Sometimes** **2 = Seldom** **1 = Never**

No	Teaching strategy	5	4	3	2
1	The lecturer uses appropriate/suitable teaching aids to teach the topics	☐	☐	☐	☐
2	The lecturer presents and writes all the important points on the white/black board.	☐	☐	☐	☐
3	The lecturer uses a variety of teaching methods while delivering a lesson.	☐	☐	☐	☐
4	The teacher questions students regularly while teaching in the classroom.	☐	☐	☐	☐
5	The lecturer likes to give/have some exercises in classroom after finishing the lesson	☐	☐	☐	☐
6	The lecturer requires students to complete assignments about the lesson that has been taught.	☐	☐	☐	☐
7	The lecturer regularly sets a paper assessment after certain topics are completed.	☐	☐	☐	☐
8	The lecturer organizes students into groups to complete teaching activities in classroom.	☐	☐	☐	☐
9	The ecturer has good relationship/communication with students.	☐	☐	☐	☐
10	The lecturer encourages students to know the role of every member and how to fully co-operate with the group.	☐	☐	☐	☐
11	The lecturer uses teaching methods that encourage students to talk with more confidence in front of friends.	☐	☐	☐	☐
12	The lecturer uses teaching methods that encourage students to think creatively.	☐	☐	☐	☐

SECTION D: EVALUATION ON STUDENTS LEARNING

Please tick (√) in the appropriate box to show how often you are learning a lesson using the following strategies. Please use the following scales.

5 = Always **4 = Often** **3 = Sometimes** **2 = Seldom** **1 = Never**

No	**Learning strategy**	**5**	**4**	**3**	**2**
1	You feel more comfortable to do any learning task individually rather than in a group.	☐	☐	☐	☐
2	You will accept and respect opinions and contributions from your friends even if you think they are not true.	☐	☐	☐	☐
3	You are able to be a group leader and manage the given task efficiently.				
4	You can communicate and discuss with group members in harmony while doing a given task.				
5	You are trying to relate everything that you have learnt to your existing knowledge to help you gain a better understanding about the topics.	☐	☐	☐	☐
6	You can solve a given problem accurately and faster without help from the lecturer.	☐	☐	☐	☐
7	You are able to accomplish a task in a given time.	☐	☐	☐	☐
8	You have the initiative to help yourself understand a taught lesson rather than rely on a lecturer notes (eg; draw mind mapping, write short notes).				
9	You like to explore and simplify the taught lesson in your own way rather than memorize it.	☐	☐	☐	☐
10	You prefer to do a revision by referring to many sources (internet, magazine, journal, etc) to help you gain a better understanding about the topics.				
11	You feel that the learning environment in this institution helps you to develop self confidence.	☐	☐	☐	☐
12	You feel that the learning environment in this institution prepares you to be involved in a real work place.	☐	☐	☐	☐
13	You feel that the learning environment in this institution encourages you to build up positive attitudes.	☐	☐	☐	☐

SECTION E : COMMENTS AND SUGESSTION ON HOW TO IMPROVE TEACHING AND LEARNING STRATEGIES.

____

____

____

APPENDIX 4-B

Dear Student, Student ID no : ____________________

Thank you for your cooperation in participating in this research project for my PhD Research Programme, **HOW DOES A HYBRID APPROACH USING COLLABORATIVE AND METACOGNITIVE STRATEGIES INFLUENCE GENERIC COMPETENCIES AMONG CIVIL ENGINEERING STUDENTS IN MALAYSIAN POLYTECHNICS?**

This survey will take approximately 20 minutes to complete. The goal of this survey is to determine the potential effectiveness of teaching strategies ('Hybrid Approach') that have been employed in learning 'Concrete Technology: C 1004' compared with strategies that have been used previously ('Traditional Approach'). The survey is also intended to gauge whether the Hybrid learning environment has the potential to improve students' attitudes and generic skills.

I would be very grateful if you could complete the questions in this survey. The survey only will be used for the purposes of the study and your responses will remain confidential. So, please respond to the questions as frankly as possible.

Your participation in this study is voluntary and you may refuse to answer any question. Please tick this box ☐ to confirm that you understand the nature of this research and give your consent to take part.

Thank you very much for completing this survey.

Yusmarwati Yusof
PhD Student
School of Education
University of East London
Email : yusmar_yu@yahoo.com

SECTION A: Demographic Details

Instruction: Please tick (√) in the appropriate box.

1. Sex:

   a. Male ( ) b. Female ( )

2. Ethnic Group:

Malay	( )
Chinese	( )
Indian	( )
Other ethnic group (please specify below) ______________________________	( )

3. Religion:

Muslim	( )
Christian	( )
Buddhist	( )
Hindu	( )
Other religion (please specify below) ______________________________	( )

SECTION B: EVALUATION ON STUDENTS' LEARNING STRATEGIES.

Please tick (√) in the appropriate box to show how strongly you agree or disagree with the statements in the table below. The statements concern those lessons in which you have participated using the strategies that have been gone through while learning Concrete Technology (C1004). Please use the following scales.

4 = Strongly agree **3 = Agree** **2 = Disagree** **1 = Strongly disagree**

No	Learning strategy	4	3	2	1
1	You feel more comfortable doing any learning task individually rather than in a group.	☐	☐	☐	☐
2	You accept and respect the opinions and contributions from your friends even if you think they are not true.	☐	☐	☐	☐
3	You are able to be a group leader and manage the given task efficiently.	☐	☐	☐	☐
4	You are able to perform any role that appointed to you and take the responsibility very well.	☐	☐	☐	☐
5	You can communicate and discuss with group members in harmony while doing a given task.	☐	☐	☐	☐
6	You can voice out your opinion and idea confidently without feel fear and embarrass.	☐	☐	☐	☐
7	You are trying to relate everything that you have learnt to your existing knowledge to help you gain a better understanding of the topics.	☐	☐	☐	☐
8	You can solve a given problem accurately and faster without help from the lecturer.	☐	☐	☐	☐
9	You can accomplish any task in a given time frame very well.	☐	☐	☐	☐
10	You can organize and plan any given task properly and more systematically.	☐	☐	☐	☐
11	You have the initiative to help yourself understand a taught lesson rather than relying on a lecturer's notes (e.g., drawing mind maps, writing short notes).	☐	☐	☐	☐
12	You like to explore and simplify the taught lesson in your own way rather than memorize it.	☐	☐	☐	☐
13	You prefer to revise by referring to many sources (internet, magazine, journal, etc) to help you gain a better understanding of the topics.	☐	☐	☐	☐

SECTION C: EVALUATION ON THE HYBRID APPROACH

Please tick (√) in the appropriate box to show how strongly you agree or disagree with the statements in the table below. The statements concern the suitability of teaching strategies that have been employed by lecturer in delivering '**Concrete Technology: C1004**'. Please use the following scales.

4 = Strongly agree **3 = Agree** **2 = Disagree** **1 = Strongly disagree**

No	Learning strategy	4	3	2	1
1	The teaching strategies help you to relate everything that you have learnt to your existing knowledge much better.	☐	☐	☐	☐
2	The teaching strategies encourage you to think critically.	☐	☐	☐	☐
3	The teaching strategies help you to be more creative in completing the given task.	☐	☐	☐	☐
4	The teaching strategies help your brain to respond and generate ideas quickly in solving the given task	☐	☐	☐	☐
5	The teaching strategies encourage you to involve yourself actively in every learning activity	☐	☐	☐	☐
6	The teaching strategies promote your full participation in every learning activity	☐	☐	☐	☐
7	The teaching strategies help you to be more precise and think positively about learning.	☐	☐	☐	☐
8	The teaching strategies help you to be more prepared and excited to learn about something.	☐	☐	☐	☐
9	The teaching strategies encourage you to communicate orally with confidence to the whole class.	☐	☐	☐	☐
10	The teaching strategies help to improve your non verbal communication skills (writing, drawing) much better.	☐	☐	☐	☐
11	The teaching strategies help you to widen knowledge through sharing idea with friends more effective.	☐	☐	☐	☐
12	The teaching strategies help to apply your knowledge and share ideas about learnt topic through group discussion efficiently.	☐	☐	☐	☐
13	The teaching strategies encourage you to be more responsible to any assigned task.	☐	☐	☐	☐
14	The teaching strategies help you to be more independent and not rely too much to a lecturer while learning.	☐	☐	☐	☐
15	The teaching strategies help you to be more aware of your friends which helps you to fully co-operate to your group.	☐	☐	☐	☐
16	The teaching strategies give you an opportunity to increase your skills in using new techniques and equipment that relate to a lesson.	☐	☐	☐	☐
17	The teaching strategies help you to develop self confidence.	☐	☐	☐	☐
18	The teaching strategies prepare you to be involved in a real work place.	☐	☐	☐	☐
19	The teaching strategies encourage you to build up positive attitudes.	☐	☐	☐	☐

SECTION E : COMMENTS AND SUGGESTIONS AS TO HOW TO IMPROVE THE TEACHING STRATEGY.

1. **What is one thing do you LIKE in learning with this teaching strategy?**

____

____

____

2. **What is one thing that you DISLIKE in learning with this teaching strategy?**

____

____

____

THANK YOU

APPENDIX 4-C

TEKNOLOGI KONKRIT (C1004)
UJIAN AWALAN

(*PRE TEST AND POST TEST*)

NAMA (*Name*): ______________________ **NO MATRIX:** ______________________

1. **Terangkan** apakah yang dimaksudkan dengan Bancuhan Konkrit? **(2M)**
   Explain what is the concrete mix?

   ____

2. **Nyatakan 3 (TIGA)** jenis Bancuhan Konkrit mengikut CP114. **(3M)**
   Specify 3 (three) types of concrete mix according to CP 114.

i. ______________________________
ii. ______________________________
iii. ______________________________

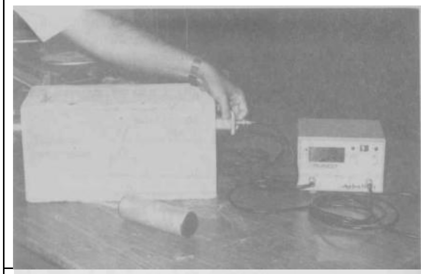
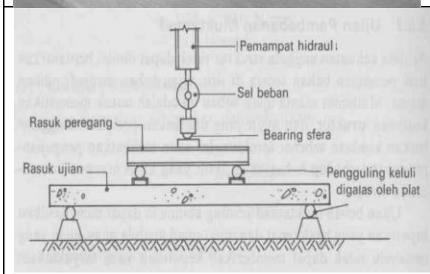
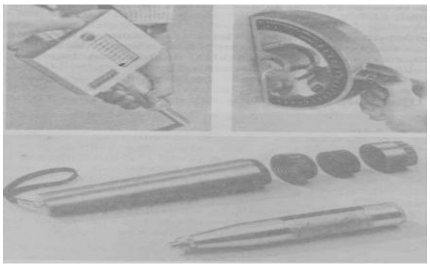
3. **Terangkan** apakah yang dimaksudkan dengan Kebolehkerjaan (Workability) dalam kerja konkrit? **(3M)**
   Explain what is the definition of workability that applied in concrete work?
   ____
   ____
   __

4. **Padankan** kegunaan setiap gred konkrit dalam jadual di bawah mengikut kesesuaian kegunaannya dalam pembinaan. **(2.5M)**
   Match the concrete grade with the correct statement of its use in the box.

Gred Konkrit				Kegunaan
7 10	•		•	Konkrit tetulang dengan batu baur padu.
15	•		•	Konkrit tetulang tegas dulu.
20 25	•		•	Konkrit tetulang tegas kemudian.
30	•		•	Konkrit tanpa tetulang.
40 50	•		•	Konkrit tetulang dengan batu baur ringan.

5. **Senaraikan** apakah jenis-jenis ujian kebolehkerjaan bagi jenis konkrit basah: **(3M)**
List down workability tests for wet concrete work.
   i. ____
   ii. ____
   iii. ____

6. **Padankan** gambar dibawah dengan ujian yang sesuai. **(1.5M)**
Match the following picture with a correct statement.

Jenis Ujian		Gambar
Ujian Tukul Anjal		
Ujian Ultrasonik		
Ujian Rasuk		

APPENDIX 4-D

STAGES IN PREPARING FOR AND CARRYING OUT INTERVIEWS.

Semi structured interviews will be conducted in this study. Interview data will be gathered to provide additional insights regarding teaching approaches, subjects/course value, and the extent of students' learning. This method will provide additional evidence concerning the dependent variables, and provide an opportunity for in-depth probing, and elaboration and clarification of terms. In this study, at least two lecturers from each polytechnic who teach Concrete Technology will be chosen as a sample. The stages in preparing the interviews are;

1. BEFORE INTERVIEW

- Negotiate access with each lecturer and their polytechnic before carrying out the interview.
- Inform the participant earlier (via mail/phone call) before the session and make an appointment.
- Negotiate and gain permission for method of recording to be used in the interview. In this study digital sound recorder is intended to be used as a method, but, if the interviewee is not comfortable with recording, notes will be made.
- Choose an appropriate venue which offers a degree of privacy and assured uninterruption.

2. DURING INTERVIEW

- Give a briefing and an explanation of the interview including the purposes and how the data it generates will be used.
- Also inform the interviewees how long the interview will take, bearing in mind that lengthy interviews will engender transcription problems as well as problems of sustaining interest.
- Conclude the interview with thanks, give contact details and explain how the interviewee will get the feedback.

3. AFTER INTERVIEW

- All the data gathered will be kept in a safe and secure place to ensure confidentiality, and will only be used for the purpose of this study.
- All the data that have been recorded will be transcribed and all documents will be stored in the computer that is password-protected.

THE INTERVIEW SCHEDULE.

1. Can you tell me a little about your educational background?
    - probe 1- from which university and course
    - probe 2 – the highest level of education

2. How long have you taught in the polytechnic scheme?

3. What do you enjoy about being a lecturer in a polytechnic?
    - probe 1- the structure, facilities, environment
    - probe 2- a students, and collegue , and staff

4. What is your opinion about polytechnic students in general with respect to their academic performance and aspirations?
    - probe 1- students performance and learning achievement
    - probe 2 - students attitude and behaviour

5. What subject do you normally teach, and how long have you taught Concrete Technology?
    - probe 1- any other subjects that being taught regularly
    - probe 2- how many in total in every academic session.

6. Are there any problems that you encounter when teaching this subject?
   - probe 1- problem in preparing and delivering the lesson.
   - probe 2 – problem with students
   - probe 3 – problem that related to other factors.

7. With respect to the students whom you teach, to what extent do they like the subject that you teach?
   - probe 1 – how do they welcome the subject, are they showing any interest
   - probe 2- what has been the nature of achievement of students taking this subject in the past 3 years?

8. Would you please comment on the average scores that students taking this subject have been receiving in the same period?

9. Please kindly comment on how do learners participate in your classroom when learning this subject?
   - probe 1 - how is their reaction – active or passive
   - probe 2 – face impression, body language to show any sign of participation.

10. When teaching this subject, what teaching methods do you normally use?
    - probe 1- a favourite teaching practice
    - probe 2 – how you conduct learning

11. Would you please comment on the reasons that make you prefer these teaching methods?
    - probe 1 – for subject pedagogy
    - probe 2 – for relevance

12. Please kindly indicate the teaching methods that you employ in your teaching besides the one you mentioned earlier. Please answer yes or no to the list that I will read to you.

Teaching Method	**YES**	**NO**
b. Group discussion	☐	☐
c. Debate	☐	☐
d. Demonstration	☐	☐
e. Project work	☐	☐
f. Problem solving	☐	☐
g. An inquiry	☐	☐
h. A contention	☐	☐
i. Simulation	☐	☐
j. Tutorial(s)	☐	☐

13. With respect to teaching aid/material, kindly indicate the ones that you use in your teaching:

Teaching Aid/Material	**YES**	**NO**
a. Chalk and talk	☐	☐
b. Power point presentation	☐	☐
c. OHP and transparency	☐	☐
d. Model	☐	☐
e. Specimen/real object	☐	☐
f. Video and television	☐	☐
g. Chart/ graph/ map	☐	☐
h. Picture/ photograph	☐	☐

14. Now I can see that you also employed ___________ and _______________ in your teaching. Is there any problem that stops you using it regularly?

15. Apart from the above, are there any other teaching aids/materials that you employ in your teaching? How regularly do you use these?

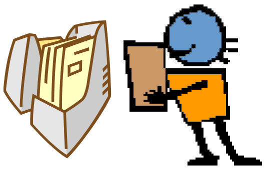
    - probe 1 – are there any other strategies that been used while teaching this subject?
    - probe 2 - what do you recommend as the best teaching aids or material in teaching this subject?

16. From your teaching experience to date, in what ways could the teaching of your subject be improved?
    - probe 1- what do you perceive to be the main challenges in the teaching of you subject?

17. Thank you very much for your cooperation. I will transcribe the tape recorder and present the data in my report. If you wish to listen to this record, you can have a copy of this tape.

APPENDIX 4-E

STUDENT'S LOG SHEET



STUDENT ID :

TOPIC LEARNT :

DATE :

1. What is one important thing that you **understand** from today's activity?

2. What is one thing that you do **not understand** from today's activity?

3. What is one thing that you **enjoyed** about today's activity?

4. What is one thing that you **disliked** about today's activity?

5. What skills have you improved on today and to what level? Tick in the appropriate table. (You can tick as many as you think are relevant to you).

SKILL	**LEVEL OF IMPROVEMENT**			
	1 (low)	**2**	**3**	**4(high)**
Knowledge				
Cognitive/ thinking				
Oral communication				
Written communication				
Action planning				
Presentation				
Reasoning				
Reflecting				
Problem solving				
Team building				
Lifelong learning				
Self organizing				
Leadership				

6. Do you think that you can apply what you have learnt in the real world (if yes, how and if no, why)?

Yes, how	
No, why	

7. What should you do for improvement of quality of what you have done?

____

____

____

APPENDIX 4-F

GRADUATE SCHOOL

UEL
University of East London
www.uel.ac.uk

Professor Peter Martin
School of Education
Stratford

ETH/08/15/0

12 March 2008

Dear Professor Martin,

Application to the Research Ethics Committee: How does a hybrid approach using collaborative and metacognitive strategies influence generic competencies among civil engineering students in Malaysian Polytechnics? (Ms Yusmarwati Yusof)

I advise that Members of the Research Ethics Committee have now approved the above application on the terms previously advised to you. The Research Ethics Committee should be informed of any significant changes in the programme that take place after approval has been given. Examples of such changes include any change to the location, number of participants, scope, methodology or composition of investigative team. These examples are not exclusive and the person responsible for the programme must exercise proper judgement in determining what should be brought to the attention of the Committee.

In accepting the terms previously advised to you I would be grateful if you could return the declaration form below, duly signed and dated, confirming that you will inform the committee of any changes to your approved programme.

Yours sincerely

Debbie Dada
Administrative Officer for Research
d.dada@uel.ac.uk
02082232976

APPENDIX 4-G

UNIT PERANCANG EKONOMI
Economic Planning Unit
JABATAN PERDANA MENTERI
Prime Minister's Department
BLOK B5 & B6
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN
62502 PUTRAJAYA
MALAYSIA

EPU

Telefon : 603-8888 3333
Telefax : 603-888

Ruj. Tuan:
Your Ref.:

Ruj. Kami: UPE: 40/200/19/2237
Our Ref.:

Tarikh: 17 April 2008
Date:

Yusmarwati Yusof
Lot 52 Jalan 45
Kg Cheras Bharu
56100 Kuala Lumpur

APPLICATION TO CONDUCT RESEARCH IN MALAYSIA

With reference to your application dated 7 January 2008, I am pleased to inform you that your application to conduct research in Malaysia has been approved by the **Research Promotion and Co-Ordination Committee, Economic Planning Unit, Prime Minister's Department.** The details of the approval are as follows:

Researcher's name	:	**YUSMARWATI YUSOF**
Passport No. / I. C No:		**740507-05-5240**
Nationality	:	**MALAYSIAN**
Title of Research	:	**"HOW DOES A HYBRID APPROACH USING COLLABORATIVE AND METACOGNITIVE STRATEGIES INFLUENCE GENERIC COMPETENCIES AMONG CIVIL ENGINEERING STUDENTS IN MALAYSIAN POLYTECHNICS"**

Period of Research Approved: **THREE YEARS**

2. Please collect your Research Pass in person from the Economic Planning Unit, Prime Minister's Department, Parcel B, Level 4 Block B5, Federal Government Administrative Centre, 62502 Putrajaya and bring along two (2) passport size photographs. You are also required to comply with the rules and regulations stipulated from time to time by the agencies with which you have dealings in the conduct of your research.

3. I would like to draw your attention to the undertaking signed by you that you will submit without cost to the Economic Planning Unit the following documents:

a) A brief summary of your research findings on completion of your research and before you leave Malaysia; and

b) Three (3) copies of your final dissertation/publication.

4. Lastly, please submit a copy of your preliminary and final report directly to the State Government where you carried out your research. Thank you.

Yours sincerely,

(MUNIRAH ABD. MANAN)
For Director General,
Macro Economic Section,
Economic Planning Unit.
E-mail: munirah@epu.gov.my
Tel: 88882809/2818/2958
Fax: 88883798

ATTENTION

This letter is only to inform you the status of your application and **cannot be used as a research pass**.

C.c:

Ketua Setiausaha,
Kementerian Pengajian Tinggi,
Aras 7, Blok E3, Parcel E,
Pusat Pentadbiran Kerajaan Persekutuan,
62505 Putrajaya
(u.p: En. Mohd Azmin bin Yusoff) (Ruj. Tuan: KPT.R.620-1/1/1Jld.5 (42)

Pengarah,
Instiut Pengurusan Penyelidikan dan Perundingan,
Universiti Malaya
C313, Bangunan IPS,
50603 Kuala Lumpur.

APPENDIX 5-A

Correlations

		D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13
D1	Pearson Correlt	1	.196(**)	.233(**)	.075	-.006	.068	.244(**)	.159(*)	.070	.053	.125	.150(*)	.102
	Sig. (2-tailed)		.006	.001	.298	.933	.350	.001	.028	.333	.468	.082	.037	.160
	N	193	192	193	193	193	193	193	193	193	193	193	193	192
D2	Pearson Correlt	.196(**)	1	.303(**)	.538(**)	.321(**)	-.083	.376(**)	.244(**)	.292(**)	.248(**)	.335(**)	.330(**)	.459(**)
	Sig. (2-tailed)	.006		.000	.000	.000	.254	.000	.001	.000	.001	.000	.000	.000
	N	192	192	192	192	192	192	192	192	192	192	192	192	191
D3	Pearson Correlt	.233(**)	.303(**)	1	.228(**)	.199(**)	.158(*)	.294(**)	.242(**)	.198(**)	.264(**)	.233(**)	.181(*)	.267(**)
	Sig. (2-tailed)	.001	.000		.001	.006	.029	.000	.001	.006	.000	.001	.012	.000
	N	193	192	193	193	193	193	193	193	193	193	193	193	192
D4	Pearson Correlt	.075	.538(**)	.228(**)	1	.470(**)	.020	.382(**)	.214(**)	.288(**)	.188(**)	.386(**)	.396(**)	.461(**)
	Sig. (2-tailed)	.298	.000	.001		.000	.777	.000	.003	.000	.009	.000	.000	.000
	N	193	192	193	193	193	193	193	193	193	193	193	193	192
D5	Pearson Correlt	-.006	.321(**)	.199(**)	.470(**)	1	.109	.209(**)	.243(**)	.258(**)	.198(**)	.320(**)	.419(**)	.430(**)
	Sig. (2-tailed)	.933	.000	.006	.000		.130	.003	.001	.000	.006	.000	.000	.000
	N	193	192	193	193	193	193	193	193	193	193	193	193	192
D6	Pearson Correlt	.068	-.083	.158(*)	.020	.109	1	.153(*)	.272(**)	-.089	.171(*)	.180(*)	.148(*)	.123
	Sig. (2-tailed)	.350	.254	.029	.777	.130		.033	.000	.221	.017	.012	.040	.090
	N	193	192	193	193	193	193	193	193	193	193	193	193	192
D7	Pearson Correlat	.244(**)	.376(**)	.294(**)	.382(**)	.209(**)	.153(*)	1	.340(**)	.291(**)	.267(**)	.405(**)	.376(**)	.399(**)
	Sig. (2-tailed)	.001	.000	.000	.000	.003	.033		.000	.000	.000	.000	.000	.000
	N	193	192	193	193	193	193	193	193	193	193	193	193	192
D8	Pearson Correlat	.159(*)	.244(**)	.242(**)	.214(**)	.243(**)	.272(**)	.340(**)	1	.225(**)	.269(**)	.285(**)	.251(**)	.321(**)
	Sig. (2-tailed)	.028	.001	.001	.003	.001	.000	.000		.002	.000	.000	.000	.000

	N	193	192	193	193	193	193	193	193	193	193	193	193	192
D9	Pearson Correlat	.070	.292(**)	.198(**)	.288(**)	.258(**)	-.089	.291(**)	.225(**)	1	.170(*)	.260(**)	.265(**)	.215(**)
	Sig. (2-tailed)	.333	.000	.006	.000	.000	.221	.000	.002		.018	.000	.000	.003
	N	193	192	193	193	193	193	193	193	193	193	193	193	192
D10	Pearson Correlat	.053	.248(**)	.264(**)	.188(**)	.198(**)	.171(*)	.267(**)	.269(**)	.170(*)	1	.331(**)	.177(*)	.220(**)
	Sig. (2-tailed)	.468	.001	.000	.009	.006	.017	.000	.000	.018		.000	.014	.002
	N	193	192	193	193	193	193	193	193	193	193	193	193	192
D11	Pearson Correlati	.125	.335(**)	.233(**)	.386(**)	.320(**)	.180(*)	.405(**)	.285(**)	.260(**)	.331(**)	1	.717(**)	.596(**)
	Sig. (2-tailed)	.082	.000	.001	.000	.000	.012	.000	.000	.000	.000		.000	.000
	N	193	192	193	193	193	193	193	193	193	193	193	193	192
D12	Pearson Correlat	.150(*)	.330(**)	.181(*)	.396(**)	.419(**)	.148(*)	.376(**)	.251(**)	.265(**)	.177(*)	.717(**)	1	.652(**)
	Sig. (2-tailed)	.037	.000	.012	.000	.000	.040	.000	.000	.000	.014	.000		.000
	N	193	192	193	193	193	193	193	193	193	193	193	193	192
D13	Pearson Correlat	.102	.459(**)	.267(**)	.461(**)	.430(**)	.123	.399(**)	.321(**)	.215(**)	.220(**)	.596(**)	.652(**)	1
	Sig. (2-tailed)	.160	.000	.000	.000	.000	.090	.000	.000	.003	.002	.000	.000	
	N	192	191	192	192	192	192	192	192	192	192	192	192	192

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

APPENDIX 5-B

Factor Analysis

Communalities

	Initial	Extraction
comfortable to do any learning task individually rather than in a group.	1.000	.439
will accept and respect opinions and contributions from friends	1.000	.615
be able to be a good leader	1.000	.471
have no problem to communicate with group member	1.000	.573
try to relate everything that have learnt to existing knowledge	1.000	.457
can solve a given problem without help from the lecturer.	1.000	.707
be able to accomplish a task in a given time	1.000	.488
have the initiative to understand a taught lesson w/out rely on a lecturer notes	1.000	.431
like to explore and simplify the taught lesson in your own way.	1.000	.388
do revision by refering to many sources	1.000	.299

Component Matrix(a)

	Component		
	1	2	3
comfortable to do any learning task individually rather than in a group.	.262	.350	.497
will accept and respect opinions and contributions from friends	.649	-.259	.357
be able to be a good leader	.477	.320	.375
have no problem to communicate with group member	.673	-.339	.070
try to relate everything that have learnt to existing knowledge	.588	-.256	-.215
can solve a given problem without help from the lecturer.	.213	.701	-.414
be able to accomplish a task in a given time	.645	.170	.208
have the initiative to understand a taught lesson w/out rely on a lecturer notes	.518	.402	.032
like to explore and simplify the taught lesson in your own way.	.461	-.252	.334
do revision by refering to many sources	.448	.309	.055

the institution environment helps to develop self confidence.	1.000	.658
the institution environment prepares to real work place.	1.000	.698
the institution environment encourages to build up positive attitudes.	1.000	.675

Extraction Method: Principal Component Analysis.

the institution environment helps to develop self confidence.	.746	.004	-.319
the institution environment prepares to real work place.	.740	-.121	-.368
the institution environment encourages to build up positive attitudes.	.772	-.130	-.250

Extraction Method: Principal Component Analysis.
a 3 components extracted.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.358	33.524	33.524	4.358	33.524	33.524
2	1.344	10.337	43.861	1.344	10.337	43.861
3	1.197	9.208	53.069	1.197	9.208	53.069
4	.992	7.629	60.698			
5	.841	6.471	67.169			
6	.797	6.131	73.300			
7	.716	5.504	78.805			
8	.643	4.946	83.751			
9	.616	4.740	88.491			
10	.505	3.886	92.377			
11	.410	3.156	95.533			
12	.337	2.589	98.122			
13	.244	1.878	100.000			

Extraction Method: Principal Component Analysis.

APPENDIX 6-A

POLITEKNIK B - EXPERIMENTAL GROUP

REKOD KEHADIRAN MODUL

JABATAN : **JABATAN KEJURUTERAAN AWAM**
SESI : **JULAI 2008**
KURSUS : **DIPLOMA KEJURUTERAAN AWAM**
KOD & MODUL :
KELAS : **DKA 1C / DKA 2C**
PENSYARAH MODUL :

MINGGU KULIAH						
TARIKH						remark
	JENIS AKTIVITI P&P					
BIL	NO. PEND.	JENIS KEHADIRAN				
		Pre-test (100%)		Post-test (100%)		
1	08DKA08F1084	25		55		
2	08DKA08F1085	0		80		excluded
3	08DKA08F1086	35		60		
4	08DKA08F1087	20		75		
5	08DKA08F1088	25		75		
6	08DKA08F1089	35		60		
7	08DKA08F1090	25		60		
8	08DKA08F1091	25		70		
9	08DKA08F1092	15		75		
10	08DKA08F1093	25		70		
11	08DKA08F1094	20		85		
12	08DKA08F1095	20		45		
13	08DKA08F1096	30		70		
14	08DKA08F1097	0		40		excluded
15	08DKA08F1098	20		40		
16	08DKA08F1099	20		65		
17	08DKA08F1101	25		55		
18	08DKA08F1102	25		65		
19	08DKA08F1103	20		60		
20	08DKA08F1104	25		60		
21	08DKA08F1105	30		65		
22	08DKA08F1106	35		90		
23	08DKA08F1107	25		75		
24	08DKA08F1108	20		50		

25	08DKA08F1110	25		85		
26	08DKA08F1111	15		65		
27	08DKA08F1112	20		100		
28	08DKA08F1113	25		60		
29	08DKA08F1114	25		45		
30	08DKA08F1115	15		75		
31	08DKA08F1116	20		50		
32	08DKA08F1118	45		65		
33	08DKA08F1119	25		60		
34	08DKA08F1120	20		80		
35	08DKA08F1121	55		100		
36	08DKA08F1122	20		80		
37	08DKA08F1123	30		50		
38	08DKA08F1124	25		60		
39	08DKA08F1125	25		50		
40	08DKA08F1126	35		50		
JUMLAH HADIR / BILANGAN PELAJAR						
PENGESAHAN PENSYARAH MODUL						

APPENDIX 6-B

THE APPLICATION OF HybCoMet STRATEGY: