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Learning and Teaching in Hong Kong:

What is and what might be

J. B. Biggs & D. A. Watkins (Eds.)

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Preface

In 1989-90, an Advanced Diploma in Education course, leading to the Master of Education (1990-91), was run on the theme *The Psychology of Student Learning*. Both courses aimed to acquaint students, most of whom were teachers in Anglo-Chinese schools, with the most recent developments in the area of educational research known as "student learning", and to use that knowledge for their own professional development.

Research in student learning has developed over the last fifteen or twenty years to become almost a research *genre*. It is distinguished by three major features:

1. Understanding how students learn is achieved by research methods that conceptualise the student in the context of classroom, school, or tertiary institution, rather than by "top-down" applications from the psychology of learning. Psychology might provide useful metaphors for conceptualising student learning (such as "information processing"), but they are no more than metaphors. Student learning theory is constructed "bottom-up", from the context in which students learn.
2. A consequence of that position is that the student's perspective is crucial. To understand why and how students learn it is necessary to study learning from the student's point of view, not the researcher's, not even the teacher's. Related to this position is the general class of theories of learning known as *constructivist*, that it is the student who constructs knowledge from experience, not the teacher who imparts it.
3. The aim of many researchers in undertaking research into student learning is to improve the learning/teaching environment, whereas the aim of those who apply psychology to the field of learning is more often to develop theory than it is to sharpen practice. The knowledge gained about how students learn, and the conditions under which learning is enhanced or inhibited, may readily be utilised to enhance future learning. Implications for teaching, and for the professional development of

individual teachers, are therefore profound.

The Advanced Diploma/M. Ed. course was constructed with several coursework units bringing students up to date in these developments, always with an eye to how they themselves might develop as professional educators. Carrying out an empirically based dissertation was an essential part of the course, particularly valuable in this case as to date little research had been carried out within the student learning tradition with Hong Kong students.

This monograph is based on the dissertations that were submitted for the M.Ed. degree, adapted and rewritten by their original authors. All the dissertations that were submitted were passed, and all are included here. The students themselves chose their own research topics, according to their own professional interests. Their studies comprise a cohesive and revealing view of learning and teaching processes in Hong Kong, falling conveniently into three groups: "What Is", "Language Matters", and "What Might Be".

"What Is" describes the current situation with respect to important issues: student's perceptions of teaching demands and classroom characteristics, teachers' thinking and expertise, and how students cope with various pressures, in particular examination preparation and time demands. This group provides a factual and empirical basis for some of the problems, and of the positive features, of schooling in Hong Kong.

Reading and writing in a second language places particularly heavy demands on Hong Kong students, so it is not surprising that there is a section we call "Language Matters". Studies here address the follow questions: the medium of instruction in primary and secondary school -- more English in primary or more Chinese in secondary? How do Hong Kong students learn from text? How can they argue more effectively using text? This group of studies occupies a halfway position between what is and what might be: based on what is, all point the way to learning through language more effectively in future.

The third group of studies signals "What Might Be": innovations that could easily be used to handle some of the problems, given their success as reported here. Topics include: what sort of classrooms students would prefer to what they actually have, the place of mastery

learning for teaching turned-off students, cooperative learning, and correcting students' misconceptions of some basic concepts in science.

These dissertations use common concepts, and sometimes instruments, and so we provide in Chapter 1 an overview of the field of student learning, which serves the dual functions of orienting the reader and of minimising redundancy. In Chapter 14, we review and highlight the pattern that is revealed. We were struck by the way that these research studies, driven by individual student choice, provide such a frank yet hopeful picture of teaching and learning in Hong Kong schools. We are sure that this monograph will create much interest amongst teachers, administrators, and policymakers; and hopefully, amongst researchers, to augment and to challenge what our students have found.

We asked the authors to write with a view to addressing the general reader, not a dissertation examiner. Thus, much of the detail that is necessary in a dissertation has been removed: for example, comprehensive literature reviews, and exact methodological and statistical procedures. Readers who want that extra detail may obtain it from the Education Library at the University of Hong Kong, where all the dissertations are lodged. The present focus is on communicating the substance of the work, which as the reader will soon discover is well worth communicating; it is original, important, and highly relevant to learning and teaching as it is in Hong Kong, and how it might demonstrably be improved.

JBB, DAW.

April, 1993

OVERVIEW

CHAPTER 1

THE NATURE OF STUDENT LEARNING: A CONCEPTUAL FRAMEWORK

John Biggs & David Watkins

INTRODUCTION

Research into student learning should start with the context in which learning takes place. Our basic assumption is that learning is not a unitary process that happens inside an individual, but is a construction that takes place as a result of the individual interacting with a context, which usually contains other individuals. We sometimes seem to assume that learning and studying take place in a vacuum, but as Entwistle and Waterston (1988) say: "In fact, the learning environment has profound effects on studying" (p. 264).

In particular, we are interested in learning that takes place in institutional contexts: schools, colleges, or universities. That locus profoundly affects not only what is learned, but why and how it is learned. The institutionalisation of learning, and the fact that school means different things to different students, is the starting point for the research area known as "student learning". That area provides the conceptual framework that underwrites the empirical studies contained in this book, and to avoid repetition in the following chapters, we give a brief overview of that framework in this initial Chapter. The following issues are addressed:

1. Methodology.
2. School learning and everyday learning.
3. How knowledge is constructed.
4. Conceptions of learning and teaching.
5. A model of classroom learning.
6. Students' approaches to learning.

7. Assessing learning outcomes.
8. The improvement of teaching.
9. Cross-cultural aspects.

A NOTE ON METHODOLOGY

In our course, we emphasise that no one approach to research is intrinsically better than another. Quantitative and qualitative methods each has advantages and limitations. **Quantitative** methods typically employ (i) standardised measuring instruments administered under controlled conditions to a large number of subjects as representative as possible of the population of interest, and (ii) sophisticated statistical analyses. This approach is particularly useful for studying consistency in behaviour. However, despite the attempt at scientific objectivity of the quantitative approach, this perspective can be difficult to interpret. A major problem is that the context of learning, particularly as perceived from the students' point of view, is difficult to probe through standardised questionnaires and statistical analysis.

Qualitative methods, which may range from open-ended comments supplementing questionnaires to in-depth interviews, are usually more useful for exploring factors which influence students' approaches to learning. A form of qualitative analysis that has a particularly strong influence on research into student learning is **phenomenography** (Marton, 1981; Marton, Hounsell, & Entwistle, 1984). Marton and Saljo's (1976) study of surface and deep approaches to learning, and their relationship to the quality of the outcome, is a much-quoted source. In the phenomenographic tradition, learning is studied from the perspective of the learner, not that of teacher or researcher, the object being to see how students construe the content, expressed as the form of the relationship the knower sets up with the known. Usually such constructions, or conceptions, can be expressed in a limited number of hierarchically ordered ways, some learners having partial or superficial conceptions of the intended topic, others sophisticated ones. Learners may "comprehend", more or less, the teacher's perspective, but they genuinely *learn* only what they construct from their own perspective. Their approach to learning is how they go about that construction, while their constructions themselves can be taken as outcomes of

their learning.

To sum up, we believe that a fuller understanding of student learning is often provided by a combination of quantitative and qualitative methods. We think this belief is supported by the Chapters that follow.

SCHOOL LEARNING AND EVERYDAY LEARNING

School learning inevitably differs from learning in everyday life, but in what sense does it differ? Schools exist precisely because there are socially and culturally important things to learn that children would not learn if it was left to everyday experience, inside or outside the family. Schools are there to make sure children learn the hard stuff; necessary, mostly uninteresting, and not likely to be learned in everyday experience. And that is what makes school learning a problem, for both the student and the teacher.

To young children, learning is fun. To school students learning is ... well, what you do in schools. Learning means being taught, passing the test, and the higher the mark, the better the learning. What is taught may have little relevance to what is experienced in real life.

School learning, then, differs from everyday learning in several ways (Resnick, 1987). Following are some of the more important ones, including those having particular relevance to Hong Kong students:

1. *Direct versus indirect relevance.* Everyday learning is concerned with personally valued content, experienced first hand, and situated in context. We are directly involved in everyday learning. The content learned in school, on the other hand, is mostly about what others have discovered, and it is expressed in an abstract, remote way. But that is the nature of the case. Schools are there to pass on the cultural heritage and skills necessary for operating in an increasingly complex society; they help us to avoid reinventing the wheel.

2. *Learning abstract symbol systems.* If we are to learn about things, rather than experience them directly, we need a symbol system that enables us to do so. Students have therefore two tasks: to master that

symbol system, and then to master what is taught via the medium of the symbol system. And as we all know, that creates special problems for Hong Kong students, who have to learn two symbol systems, one in Chinese, the other in English, and then to learn most content through the system that is least familiar to them.

In Hong Kong, we have the bizarre situation where, in Anglo-Chinese schools, virtually all students and almost all teachers share the same mother tongue, which they use in their everyday interactions outside school, but in school they are supposed to use an exotic language, English. We say "supposed", because prior to the recent Education Commission Report No. 4 (Education Commission, 1990), English was the official medium of instruction, but was so used in pure form in few schools. Most used "Chinglish", a mixed code usually comprising English technical vocabulary in a Cantonese discourse structure; a sensible resolution to an unbalanced and unrealistic requirement. The language issue is critical in understanding student learning in Hong Kong, and is directly addressed in Chapters 6 - 10 ("Language Matters"), and indirectly in several others.

3. *Motivation.* Because of its indirect relevance to the individual, school knowledge does not often provide its own motivation for learning, except in that special case we call intrinsic motivation. Much everyday learning, on the other hand, springs precisely from a felt need to learn. A teenage boy doesn't need to be "motivated" to learn how to drive a car, because the felt need to learn to drive is built into a whole fabric of expectations and values; the need to learn mathematics is not often part of that fabric. We admit, however, that any need-to-learn in an institutional sense is more part of the fabric of Chinese expectations and values than it is in the Western fabric (Watkins & Biggs, in press).

4. *Individual versus social learning conditions.* School learning emphasises the solitary role of the individual in learning and problem-solving. Shared problem-solving is rarely encouraged; mostly it is labelled as "cheating". The context of everyday practice, on the other hand, is most frequently social. Chinese culture particularly values working collaboratively; and in fact Hong Kong students are

very likely to form spontaneous collaborative learning groups (Tang, 1991), as if to off-set the highly individualistic way we teach them. And as we will see below, cooperative learning methods are successful, at least in one geography classroom (Chapter 12).

5. Accreditation and assessment. Because the school is expected to vouch for and accredit the standard of learning of its students, assessment assumes a dominant role in school learning, often to the point where the examinations determine what is taught and how it is learned, rather than purely educational considerations. Evaluation is of course present in everyday life, but not as the ever-present shadow that dominates school-life (Bloom, 1971). In Hong Kong, assessment is seen as so important that an independent body organizes public examinations, the Hong Kong Examinations Authority, which is deliberately independent of the Education Department itself. We will see directly in Chapter 4 and indirectly elsewhere that the attempt to satisfy examination conditions distorts the way students write both inside and outside the classroom.

6. Metacognition. A crucial difference between school and everyday learning is the use of **metacognition**, involving self-direction in our learning. Metacognition simply means that we reflect critically on what we are doing, to help us cope with new and complex situations of all kinds. As the recent proposals for the aims of schooling in Hong Kong state, this is what schooling is ultimately about (Education Commission, 1992). In everyday life, we tend to set our own goals for what is to be learned, how well, and for what end; we decide when learning has been completed for the purpose in question. Yet schools discourage the very things they should be fostering. It is not entirely the schools' fault. The goals are already decided: that is the curriculum. The strategies for reaching those goals are taken over by someone else: they are the teaching method. Monitoring progress along the way is done too by some one else: that is the weekly test. Deciding when they have been reached adequately is the accreditation process itself. Evidently students are supposed to learn responsible self-direction by being responsibly directed by other people.

What happens is that students' metacognitive skills are used in other ways in school. They define for themselves their intentions in

having to confront the reality of daily classroom attendance and decide how they are going to handle it; to play the assessment game to the hilt, to play along just enough to keep out of trouble, or to engage their academic tasks with interest and as meaningfully as possible. These metacognitive decisions are what is meant by their "approaches" to learning.

In sum, then, the *institutional* character of school learning gives rise to the conceptions we may have of learning and of teaching, to different tracks in the growth of competence in and out of school, to the way students are motivated, to the strategies for learning that they adopt, and to the kinds of learning outcome that result.

HOW KNOWLEDGE IS CONSTRUCTED

A **constructivist** view of knowledge holds that it is students who construct their knowledge, not teachers who "transmit" knowledge to them. Such a view is inherent in Shuell's (1986) conclusion about cognitive psychology's contribution to education:

If students are to learn desired outcomes in a reasonably effective manner, then the teacher's fundamental task is to get students to engage in learning activities that are likely to result in their achieving those outcomes ...It is helpful to remember that what the student does is actually more important in determining what is learned than what the teacher does. (p. 429).

Constructivism is not a theory so much as a perspective on learning, emphasising that:

- people actively construct knowledge for themselves
- knowledge is based on categories derived from social interaction not observation,
- people determine their own knowledge.

Particularly in the early stages of learning, the content learned may appear to be external to the learner. Facts and procedures seem to exist "out there", and need to be taken on board. The teacher's

view of what is "correct" can be used to assess whether or not learning has occurred.

Meanings and points of view, however, cannot exist independently of the learner. Making sense of something is what the individual does (or does not) do. What one individual understands about something is not what another might understand. Knowledge in the constructivist view is relativistic, not absolute; it is not "out there" waiting to be discovered. People are like scientists, who progressively construct their kind of knowledge as the best guess yet for making sense of the evidence and existing knowledge. This process is never complete. A conceptual system is constructed and if it works, it is publicly accepted until disproved, or until the whole paradigm of which it is part is replaced (Kuhn, 1970). This is also the way children learn.

There are some important educational implications of this view (Driver & Oldham, 1986):

- what is learned may not be what the teacher *intends* to be learned.
- what is learned depends on what is already known: the most important determinant of learning is existing knowledge.
- learning is ongoing, continuous, and active. One lesson is not going to contain the learning associated with a concept; the child will have experiences relevant to the concept that formal instruction should encourage and make explicit.
- one must allow learners to develop self-direction, and not force "correct" constructions onto them.
- teachers who see their role as passing on established truths, will be threatened if students question their utterances.

These points, the last two particularly, make life difficult for teachers. If a student's construction or understanding of a concept is incorrect, then isn't it unprofessional *not* to correct it? Yes, but the student is the one who must accept that it is incorrect, and then reconstruct it correctly (Roth & Anderson, 1988). As Wittrock (1977: 180) says:

... methods of teaching should be designed to stimulate students actively to construct meaning from their own experience rather than stimulating them to reproduce the knowledge of others.

Facing students with their misconceptions is an important first step, which needs to be followed up in order to effect a reconstruction (see Chapter 13).

CONCEPTIONS OF LEARNING AND TEACHING

How we learn and how we teach depend very much on what we think learning and teaching are (Chapters 2 and 3). Several **conceptions** of learning and teaching have been distinguished (e.g. Marton & Saljo, 1984; Beaty, Dall'Alba, & Marton, in press). The following is a reconstruction, which forms a hierarchy of levels of learning and teaching. We start with the lowest level.

1. *Quantitative*

(a) *Learning*: Learning is a matter of how much is learned. Many people hold this view. When one of us (JBB) was teaching secondary school, a Form 2 boy brought a note from his father concerning some homework that had been set, to "please continue to stuff the gen into him". Learning, for this parent, was having a head stuffed full of facts. More sophisticated quantitative conceptions would include competency assessment, which sees the curriculum as a collection of essential facts and skills, to be taught, assimilated, and tested on cue.

(b) *Teaching*: Teaching is the transmission of knowledge. Many teachers, especially beginning teachers, see their task as one of transmitting knowledge that emanates from an external source (Russell & Johnson, 1988). Tobin and Fraser (1988) refer to this kind of teaching as based on an "absorption" model of learning. Good teachers here need only to know their subjects, and to communicate that knowledge fluently. If learning is then inadequate, it is the student's fault: a lack of ability, preparation, or motivation. Not only do some teachers see their role as one of delivery through a pipeline, so do many students: Chapter 2 neatly picks up this issue of the

relation between students' conceptions of learning and of what they see as "good" teaching.

2. Institutional

(a) *Learning*: Learning needs validating, by being taught and evaluated in an institution of learning. The evidence that learning has occurred is that a course has been passed, and the higher the grade, the better the learning.

(b) *Teaching*: Teaching is the efficient orchestration of teaching skills. Here teachers are prepared to adapt their techniques to different students, and are sensitive to different needs. They see good teaching as effective management, both of teaching resources and of the students themselves. Shavelson and Stern (1981) found a majority of US high school teachers in their sample operated at this level; they planned their teaching in terms of the activities they were themselves to carry out. They focused on their own teaching, not on learners' learning.

3. Qualitative

(a) *Learning*: Learning involves meaning, understanding, and a way of interpreting the world. Such a conception is implicit or explicit in most official statements of the aims of schooling. The differences between quantitative and qualitative conceptions of learning have been elaborated in recent phenomenographic research (Beatty, Dall'Alba, & Marton, in press), and are captured in the following dictum:

Education is what is left when you have forgotten what you have been taught.

(b) *Teaching*: Teaching is the facilitation of learning. Here the teacher interacts with the learner in line with the qualitative, constructivist conception that learning involves the active construction of meaning by the student, and is not something that is imparted by the teacher (Driver & Oldham, 1986). The teacher's role is to engage

the student in effective learning activities (Shuell, 1986). Level 3 is a student-centred approach to teaching, whereas both Levels 1 and 2 are teacher-centred. We see in Chapter 3 that, as opposed to novice teachers, a group of expert Chemistry teachers held a Level 3 conception, that influenced both how and what the students learned.

A MODEL OF CLASSROOM LEARNING

Students undertake learning for a variety of reasons; those reasons determine how they go about their learning; and how they go about their learning will determine the quality of the outcome. This chain of events, which has implications for teaching, is captured in Figure 1.1.

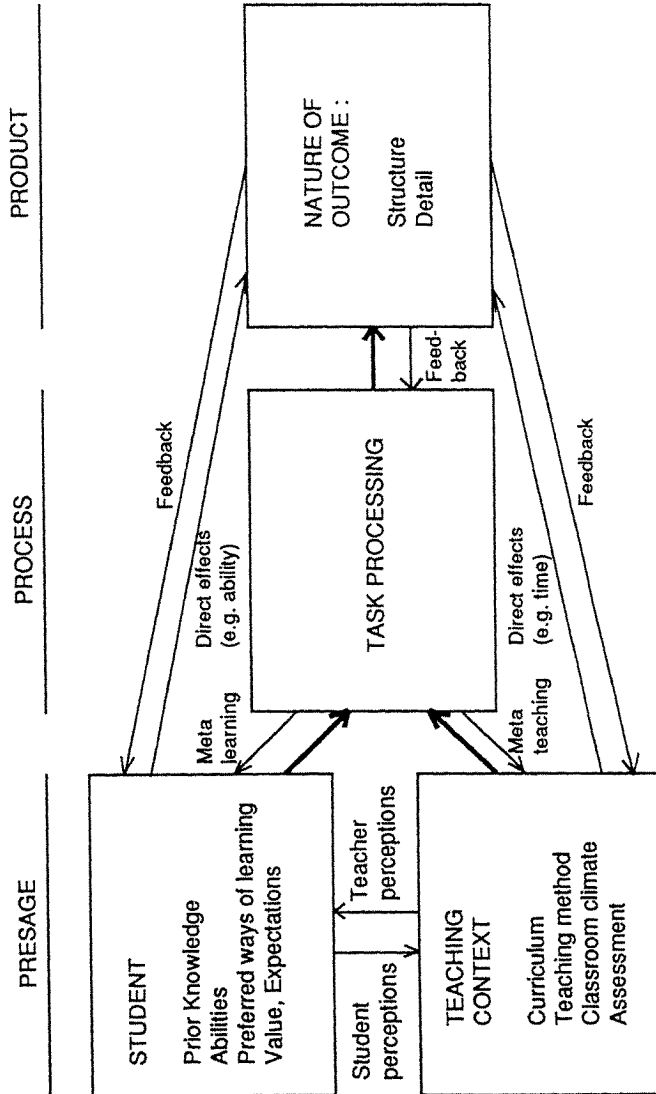
The model, first outlined by Dunkin and Biddle (1974) in the context of classroom interaction, represents in the present version an integrated system, comprising three main components: **presage**, **process**, and **product** (hence the 3P model).

Presage factors exist prior to learning, and are of two kinds: those pertaining to the student, and those to the teaching context. Students bring to the classroom relatively stable, learning-related, characteristics: abilities, expectations and motivations for learning, conceptions of what learning is, prior knowledge, and so on.

The teaching context contains the superstructure set by the teacher and the institution. On the teacher's side, there are such things as the teacher's personality, their own beliefs and conceptions of teaching, and the like; and on the institutional side, the course structure, curriculum content, and methods of teaching and assessment. This context, apart from its cognitive aspects, also generates a "climate" for learning, which, whether "cold" or "warm", teacher-centred or student-centred, has important motivational consequences.

The students are immersed in this teaching context, and interpret it in the light of their own preconceptions, motivations, and expectations. This interpretation, and the decisions for action based on it, comprise a metacognitive activity called "metalearning" (Biggs, 1985), by means of which students derive their approaches to learning, which in turn determine the outcome of learning.

Figure 1.1: The 3P model of classroom learning



The *product* may be described and evaluated in line with the corresponding conceptions of learning. Quantitative evaluation assesses how much was learned, qualitative evaluation how well, and often in what way, it was learned. Qualitative evaluation tends to be neglected, or at best quite subjective. Phenomenography or the SOLO taxonomy (see below) each suggest ways in which teachers may make more use of qualitative evaluation. Institutional evaluation is expressed in grades and other forms of public recognition. While institutional evaluation may emphasise qualitative or quantitative aspects of performance, the latter have dominated for various reasons. Another important kind of outcome is affective: whether the student feels that the learning was a positive experience or not.

The 3P model thus describes a cycle of events, in which student characteristics, the teaching context, students' learning processes, and learning outcomes are mutually inter-related. The model has been used to guide much research in Western educational contexts. Both student and teaching presage variables have been found to relate to ways in which the learning task is processed (Biggs, 1987a; Crooks, 1988; Ramsden, 1985), and levels of processing to either poorly structured and low level outcomes, or to well structured, high level outcomes (Biggs, 1979, 1987a; Marton & Saljo, 1976; Watkins, 1983a). Thus, rich teaching/learning contexts yield high level processes, which in turn lead to complex and appropriately integrated outcomes; rigid or impoverished teaching leads to low level learning processes, and fragmented, unsatisfactory outcomes.

Although all components generally work in a forward direction from presage through process to product (the heavy arrows), they also interact with each other (the light arrows) to create a **system**. A system is a working whole made up of component parts, which interact with each other to form an equilibrium; this state of equilibrium is the system. Introduce a new part, or change one of the existing parts, and one of two things happens. If the existing system is stable and resistant to change, the new part will change to merge imperceptibly with the existing system, and things will remain the same. If the system is fragile, the new component will change the old equilibrium, forming a new system. Things will work differently in future.

An excellent example of a system at work is the question of medium of instruction already alluded to. The requirement of using English when most teachers and students share Cantonese as their mother tongue is unbalanced and unrealistic; Chinglish is a sensible resolution. To surface learners, mastery learning teaching strategy is a sensible way of resolving a difficult situation; to deep learners mastery learning is inauthentic (Chapter 11). Thus, the systems characteristic is important in understanding how "what is" in Hong Kong classrooms came to be that way, and how easily "what might be" will one day come to be what is.

STUDENTS' APPROACHES TO LEARNING

Approaches to learning can refer (i) to what happens at the process level, which is the sense used originally by Marton and Saljo (1976) in their identification of surface and deep approaches, or (ii) to predispositions to adopt particular processes, which is what is meant when students are asked by questionnaire how they usually go about learning.

Let us first look at the qualitative studies of approaches to learning. In the Marton and Saljo (1976) study, students were asked to read academic articles and then to describe what they had learned, and how they had gone about learning it. The "what" was classified in terms of their conception of the topic, and it soon became clear that the level achieved depended on what the learner intended to gain from the article. Students generally expressed one of two major intentions: either to understand the author's intended meaning, or to recall key terms and memorise details as accurately as possible in anticipation of subsequent questions. Those having the first intention processed the text for meaning, focusing on themes and main ideas: those having the second, focused on words and sentences. These intentions and methods of reading became called the "deep" and "surface" approaches, respectively. The deep approach was associated with abstract, high level, accounts of the passage, with the details being used for illustration and support, while the surface approach was associated with simple, factual statements that overlooked interconnections between aspects of the passages, and which usually missed the author's point.

The measurement of approaches to learning in the phenomenographic school is almost always by in-depth interview. There is no "instrument" as such for measuring deep and surface approaches in Marton's sense, although the inventories produced by both Biggs (1987b; 1987c; 1992) and Entwistle and Ramsden (1983) have been heavily influenced by phenomenography. Factor analysis of questionnaire responses has typically produced factors closely resembling the Marton and Saljo deep and surface approaches, plus a third factor called the achieving approach (Biggs, 1979, 1987a; Entwistle & Ramsden, 1983; Entwistle & Waterston, 1988; Watkins, 1983b).

Thus, in approaching a school task, the student may have extrinsic, intrinsic, or achieving motives: to pass with minimum trouble, to satisfy curiosity, or to get the highest marks possible. And as motives help to determine the strategies used, the strategies finally adopted for a particular task will depend in part on which motives are strongest. Together, motives and strategies form approaches to learning. The motive provides the general direction learning is to take, and the strategy, or set of strategies, describes the way in which the student will typically pursue that general direction. Three common approaches are called **surface**, **deep**, and **achieving**.

Surface approach

The motive here is extrinsic; it is to carry out the task because of either positively or negatively reinforcing consequences. That is, the student is willing to engage the task and pass minimally either because she wishes to gain a paper qualification with minimal trouble or effort, or because life will be even more unpleasant if he does not.

A common surface strategy is to rote learn. Surface motivated students focus on what appear to be the most important topics or elements, and try to reproduce them accurately. Because of this focus, they do not see interconnections between elements, or the meanings and implications of what is learned. Sometimes accurate reproduction is important in itself -- for example when formulae need to be accurately reproduced whether or not they are understood -- but that is not then a surface approach. The essence of a surface approach is to avoid coming to grips with the task properly, to "get

by" with minimum trouble. Students holding a quantitative conception of learning believe that the reproduction of detail is always appropriate, so they are likely to adopt a surface approach that is not integrated with task requirements. In line with their conceptions, they believe that the more they reproduce, the better is their learning.

A student may even know that reproduction of detail is missing the point, but knows also that teachers will give credit for doing just that, as the following quotations from our current research with Hong Kong school students show (see also Chapter 4):

The problem is the format of the examinations, which only requires you to reproduce the answers....I think to rote learn is a disgrace to myself because I am being spoon-fed and have been deprived of my right to understand.

and

They (the teachers) only give you a graph, ask you to memorise it, and then test you on the same thing. They do not tell you how that graph has been derived. I personally do not like that.

and again

For Chinese, we are given many SCE questions with answers. I will study the questions and rote learn the answers as we know that the teacher will set the same questions. I know I should not do that but I have to in order to get high marks.

Thus, the surface approach is used when the main aim is simply to get the task out of the way, which can often be done quite plausibly by rote learning key details, whatever is actually required. Such a strategy avoids detailed resource and strategy planning, monitoring, and in depth involvement with the task, but it may meet minimal requirements, as the student appears to expend some effort in the general direction of the task.

Deep approach

The deep motive is based on intrinsic motivation, curiosity, or felt functional importance. If something is important, the appropriate strategy is to understand it and to handle it appropriately. Both curiosity and importance create a personal commitment to learn, with consequent feelings of "ownership". Such a commitment involves processes of a higher cognitive level than rote learning: searching for analogies, relating to previous knowledge, theorising about what is learned, and deriving extensions and exceptions. Study behaviour is marked by in depth involvement: wide reading, discussion with teachers and other students, playing with the task, and thinking about it when out of school (see Chapter 5).

The deep approach is thus plugged into the content of a particular task. While we cannot say what "the" deep approach is, in general terms the student using a deep approach will:

- possess a great deal of relevant content knowledge
- operate at a high, or abstract, level of conceptualisation
- use optimal strategies for handling the task.

These optimal strategies will be determined by what the task is; deep approaches to reading and writing are described in Chapters 8 and 9, respectively. The conception that drives the deep approach is the view that learning is the construction of meaning.

Achieving approach

The achieving motive is, like the surface motive, focused on the product not on the process. The product in this case is the pride and satisfaction that comes from doing particularly well: obtaining high grades or winning prizes. The general strategy is thus to maximise the chances of obtaining high marks; hopefully this involves optimal engagement in the task (like the deep strategy), but such engagement is the means, not the end (unlike the deep strategy). The extent of such engagement really depends on what earns the most marks. If the teacher rewards accurate recall of detail, then that is what the achieving student will give, as the third student quoted on p.17 freely

admits.

The achieving strategy concentrates on cost-effective use of time and effort. This is rather a cold-blooded calculation, involving organisational behaviours: being self-disciplined, neat and systematic, planning ahead, allocating time to tasks in proportion to their "importance", keeping clear notes, and all those other planning and organisational activities referred to as "study skills". The element of competition may also prompt such behaviours as racing to the library immediately the assignment is announced, taking out as many of the important books as can be handled cost-effectively, and hiding the rest randomly around the shelves so that the other students won't find them.

While at any given time surface and deep approaches are mutually exclusive, an achieving approach may be linked to either surface or deep. Surface-achievers, for instance, systematically rote learn selected detail to obtain high grades; deep-achievers, who often are the better students, are organised and planful in their search both for meaning and for high grades.

Measuring approaches to learning

Instrumentation. A student's "approach" in the presage sense describes the way that an individual characteristically goes about most academic tasks, having created an equilibrium out of perceived course demands, personal intentions in meeting those demands, and a way of meeting them and handling the course; some students go deep, others surface (Biggs, 1993). (When many go the latter way, we might begin to look at what that course is doing to students' approaches to learning.) This meaning of approach is usually assessed by questionnaire. The *Learning Process Questionnaire* (LPQ) (at secondary level) (Biggs, 1987b), and the *Study Process Questionnaire* (at tertiary level) (Biggs, 1987c) were originally developed and normed for Australian samples, but have now been extensively developed, translated, and normed for Hong Kong use, as described below and fully in Biggs (1992).

The LPQ is a 36 item, self-report questionnaire in two forms. *Form A*, is available either bilingually (Chinese and English) or in English only, is intended for the upper secondary school (S4 to S7);

Form B is available monolingually in either Chinese or English, is intended for upper primary and lower secondary (P5 to S3). Norms are provided separately for males and females, and separately for the Government sector (primary and Anglo-Chinese secondary), and English Schools Foundation primary and secondary. It is thus possible to compare a given student's score with a "typical" student of that age, sex and sector. Deviations from the "typical" are expressed in terms of deciles.

The SPQ is a 42 item, self-report questionnaire available either bilingually (Chinese and English) or in English only. Norms are provided for different groupings of academic departments, separately for first year, and for second and higher year students.

In some uses of the instruments (e.g. Chapters 8 and 11), "bias" scores may be calculated after the raw scores have been converted by the appropriate table of norms to deciles. If the difference between the deep and surface decile scores are two deciles or more, say, a student would be classified as "deep-bias" or "surface-bias" according to which decile score is the greater (achieving deciles are ignored for this purpose).

Validity of learning process questionnaires. Because they evolve in a system, questionnaire scores of learning approaches should relate both to personal characteristics of the student, and to differences in teaching context.

On the personal side, the surface approach is generally associated with negative factors: poor performance, drop-out, poor academic self-concept, and an external locus of control (the belief that one is controlled by other people or events rather than that one controls one's own destiny). The deep approach is associated with positive factors: an "academic" approach as long as the focus is on personally valued subjects, and a good academic self-concept. The achieving approach is also positive academically, and is driven by the need to excel. Both deep and achieving are associated with an internal locus of control and confidence in handling English as a medium of instruction (Watkins, Biggs, & Regmi, 1991). The "best" approach, academically speaking, is a combination of deep and achieving.

On the side of the teaching context, a predisposition to this or

that learning approach is the individual student's way of achieving balance in the system as perceived by the student, and thus is an index of the teaching environment. There is now a wealth of research that has established clear relationships between different classrooms and the patterns of scores that one would expect. Perceived relevance, clear teaching goals and expectations, teacher supportiveness, problem-based learning, and the like, are associated with deep and achieving approaches to learning (e.g. Biggs, 1987a; Entwistle & Tait, 1990; Newble & Clarke, 1986; Ramsden, Martin & Bowden, 1990; Watkins & Hattie, 1990). Studies relating to the Hong Kong teaching/learning context are reported in Biggs (1992) and here in Chapters 3, 5, 10, and 12.

ASSESSING LEARNING OUTCOMES

Despite educators' espoused aims, and their best intentions, tests and examinations have usually emphasised the measurement of quantitative rather than qualitative aspects of learning, by focusing on items correctly recalled, points made, etc. Indeed, common test technology assumes a theory of learning and teaching that sees learning as proceeding in discrete, measurable "quanta" that are describable as "correct" or "incorrect", which may be summed to give an aggregate or total score. In most objective tests, what is important in practice is the total sum of items correct, each item being "worth" the same as any other item. This is a highly quantitative view of the nature of knowledge.

We have seen that/in the constructivist view of knowledge, on the contrary, we build on what we know, changing the *nature* of our understanding as we build. Young children's conceptions of their world are not wrong so much as *partial*; they construct models of the world that work for them)(which incidentally closely resemble those used early in the history of science by the ancient Greeks). Our task is to transform those models by instruction so that they approximate more closely the frameworks that are currently accepted in the curriculum, and by scientists and scholars. That is a peculiarly difficult task, but not impossible, as is demonstrated in Chapter 13.

This development, from a state of relative ignorance to the conceptions accepted in the curriculum, follows an ordered sequence

that can be described on a topic by topic basis, or across the curriculum. Alternative framework researchers (Driver & Oldham, 1986; White & Tisher, 1986) and phenomenographers (Marton, 1981; Ramsden, 1988) focus on how individuals construe each concept, usually by means of in-depth interviews. It is also possible to trace commonalities in the way understanding grows across different topics, even across subject areas. Biggs and Collis (1982) showed that students learn quite diverse material in stages of ascending structural complexity that in general outline showed the same sequence across tasks; they therefore postulated a general taxonomy of learning, called the "SOLO Taxonomy" -- SOLO being an acronym for the structure of the *observed learning outcome* -- by means of which it is possible, in the course of learning a subject, to identify in broad terms the stage at which a student is currently operating.

SOLO concentrates on the increase in the structural complexity of learning as it progresses. There are quantitative and qualitative aspects to this: the amount of detail in the student's response, and how well put together that detail is. Both aspects are important, and the SOLO taxonomy provides a systematic way of describing how a learner's performance grows in complexity when mastering many school tasks.

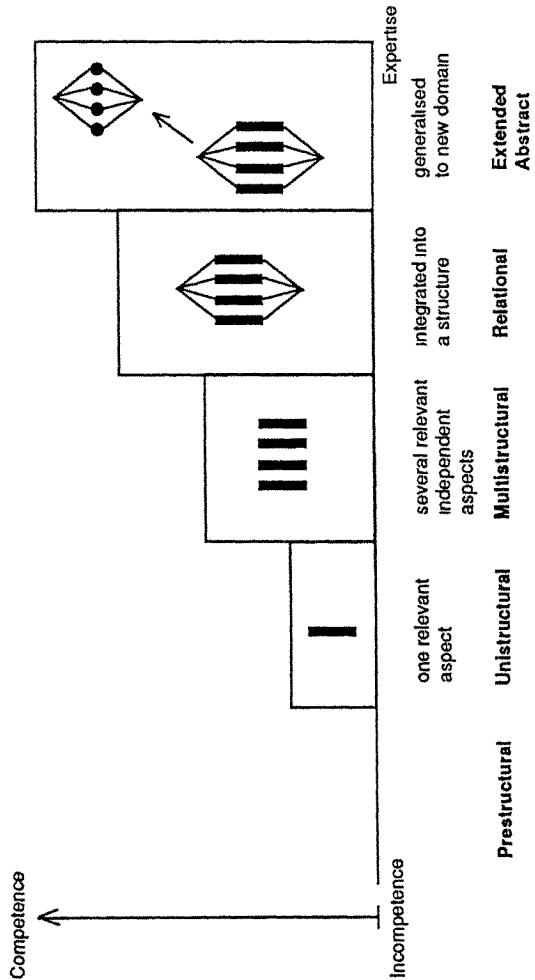
The format of SOLO assessment can either be open-ended, or closed. In open ended assessment, a topic is taught, and then a broad question is asked, which requires students to explain a phenomenon in their own words. Closed assessment uses "ordered-outcome" items, which are structured like a multiple-choice text, except that the subitems require a particular SOLO level of response, and the respondent attempts all subitems (Biggs, Lam, Balla & Ki, 1988). The following stages are found:

- First, there is preliminary preparation, but the task itself is not attacked in an appropriate way (**prestructural**)
- Next, one (**unistructural**), then several (**multistructural**), aspects of the task are focused on, but serially; these aspects are not otherwise related to each other.
- These aspects then become integrated into a coherent whole (**relational**)
- Finally, and only sometimes, the previous integrated whole

is generalised to a higher level of abstraction (**extended abstract**)

The general structure that underlies the SOLO taxonomy is outlined in Figure 1.2.

Figure 1.2: Five levels from incompetence to expertise: The Solo Taxonomy



Examples of SOLO responses to open-end questions used to index the quality of learning may be found in Chapters 3, 7, and 12, ordered-outcome items also in Chapter 12, while a topic specific method was used in Chapter 13.

THE IMPROVEMENT OF TEACHING

Most of the Chapters in this book refer to relationships between two or more components in the 3P model, in particular between the teaching context and students' approaches to learning, and to the quality of learning outcomes. It is therefore desirable to say a little more here about the link between this model and implications for teaching.

As can be seen from Figure 1.1, the outcome can be affected in two main ways:

- (a) by taking *single* presage factors, from either student or teacher domains, and relating them directly to learning outcomes (e.g. achievement as directly dependent on ability).
- (b) by taking the *interaction* (or mutual effect) of student and teaching presage factors on students' approaches to learning (e.g. high ability students perceive more complex task demands, consequently use higher level processes, and achieve better outcomes).

(a) implies a deficit model because it assumes that something is lacking in either student or teacher. In the blame-the-student version, the student is said to be deficient in motivation, ability, home background, previous teaching, or in something else. The solution is focused on the student: to select out or to remediate. The teaching goes on as before. In the blame-the-teacher version, where the focus is on what the teacher is doing, the teacher is held responsible for poor learning. Examples of each "blame" model may be found in Chapters 2 and 3, respectively.

(b), on the other hand, assumes that as it is the students who construct knowledge, it is how they approach the task that will

determine the quality of the outcome. The teacher's role is to optimise the way students go about their work. As surface approaches lead generally to undesirable, and deep and achieving to desirable, outcomes, good teaching should minimise those factors that lead to surface learning, and to maximise those leading to deep and achieving, which as we see in Chapter 3 is what expert teachers evidently do.

Factors leading to a surface approach:

- overwork; that is, too much work for the time available
- assessment practices emphasising recall of detail (of which there is a vast range, and which probably more than anything accounts for surface learning)
- stress, both in the sense of time pressure and interpersonal friction between teacher and student
- practices that tell the student to be cynical or contemptuous, such as: setting trivial or makework tasks that have no clear value, long delays in marking or even not marking and providing feedback at all, rewarding form rather than content in evaluating assignments (e.g. ignoring the content of an assignment and marking it for its spelling and grammar), devaluing the topic, hoop-jumping, teachers expressing their dislike/contempt for the topic, and so forth.

Students read their messages from what teachers actually do in their teaching and assessing, not from what they say. What messages are there in the contexts of teaching and assessment? Tobin and Fraser (1988) summarise the position with respect to science and mathematics teaching in Australia and the US:

Academic work is mainly directed towards earning points for a grade and preparing for tests and examinations which require recall of factual information and application of procedures. Thus examinations and tests have a strong effect on how students engage in classrooms. (p. 76)

The situation in Hong Kong is likely to be no better, and very possibly worse (see Chapters 2, 4, 11).

Factors leading to a deep approach:

- positive associations of pleasure
- social reinforcement (praise) and the example of admired figures (modelling)
- ownership over the task
- receiving messages signifying competence
- the right mix of familiar and unfamiliar
- expectations of a high level of response

And in general, attributions and conditions that suggest competence and control over the situation.

Such conditions may be difficult to achieve in a class of 40 students, overworking for an examination held in a less than well understood language. However, there is room for some flexibility, as several of the studies included here indicate. Group work is particularly valuable, as we see in Chapter 12, which reports the use of cooperative learning groups to teach S6 geography. It is surprising that groupwork is so little used in Hong Kong, particularly as groups are very much part of the collectivist Chinese culture. Indeed, if teachers don't provide groupwork, at least some Hong Kong tertiary students will spontaneously create their own collaborative learning groups (Tang, 1991). Once more, we see an unbalanced situation moving towards equilibrium.

But if the system is stable, thereby requiring only those teaching strategies that are viable within that system, where is the room for innovation, even exemplary teaching? Don't we all then have to teach in the same way? Tobin and Fraser (1988) selected a group of "exemplary" science and mathematics teachers and studied their personal characteristics, classroom practice and student work. There were several consistent differences between the exemplary and comparison teachers. Exemplary teachers knew their subject matter exceptionally well; they had high expectations of their students' level of performance and were sensitive to misunderstandings they might have; they consistently used a wide repertoire of teaching strategies.

They were themselves open to trying different ways of involving their students, recognising misconceptions, and rephrasing questions that would lead the students to a better understanding. They held a Level 3 conception of teaching; they were constructivists. Chapter 3 reports a similar study of exemplary teaching in Hong Kong. The point is that there *is* room for being very good within one's own classroom system; blaming the larger System out there is a cop-out.

CROSS-CULTURAL ASPECTS

Most of the research on student learning has until quite recently been conducted in Western contexts: in Sweden, the United Kingdom, Australia, and the USA. While that situation is now changing, not least because of the work reported in this book, it does raise questions about the extent to which the concepts, methodologies, and instruments of a to date essentially Western research tradition can be transported to cultures that may differ more radically than Sweden does from Australia, say. Much work suggests that in genuine Third World countries the use of directly translated Western instruments is questionable (Lonner & Berry, 1986), but where does that leave an affluent country such as Hong Kong, where the main, Governmental, system of schooling, and the tertiary structure, are explicit (if somewhat outdated) replications of Western models?

All the studies reported here were carried out in Hong Kong, so that these findings in the absence of comparative data cannot in the strict sense be cross-cultural. However, the validity of the "imported" theories and instruments is very much a question that needs to be resolved. The basic issue concerning conceptual equivalence involves the "emic" and "etic" approaches to research (Triandis, 1972). Emic research utilises only concepts that emerge from a particular culture and are presumed to be unique to that culture; possibly the concept of "face" is of this nature. The etic approach seeks to compare cultures on what are presumed to be universal categories, such as height or weight. Triandis warns against "pseudo-etic" research, that is imposing concepts on one culture that are derived from another, on the assumption that those concepts are universals when they may not be. In particular, the danger is that Western, if not middle-class Caucasian male, concepts become the yardstick for judging

nonWestern cultures.

Are approaches to learning a case in point? How well does the concept of approach to learning, derived in Sweden, UK, and Australia, transport to Hong Kong, a system based on different assumptions about learning and teaching (some it is said going back to Confucius)? Perhaps that is a question best answered by the readers of this book rather than by its editors.

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WHAT IS

CHAPTER 2

INSIDE THE CLASSROOM: THE STUDENTS' VIEW¹

Tommy Tang

INTRODUCTION

Since the introduction of universal education from Primary One (P1) through to Secondary Three (S3), many teachers, and especially those teaching low-ability students, have complained about the declining academic standards, motivation, and discipline of their students.

Many feel that the problem lies basically in the education system and in the students themselves. Their argument is that the quality of the student intake is poor and the system does not allow the school much freedom to expel bad students. No matter how low the standards of the students are, they still get promoted from P1 to S3 because of the compulsory education system. Examinations no longer possess the motivational function they once enjoyed. Thus, teachers feel a sense of helplessness in getting their students to make an effort in their studies. Moreover, since the system they are in does not allow much teacher participation, the sense of hopelessness creeps in.

Many researchers, focussing on the learning process, have shown that students' conceptions of learning and approaches to learning are influenced by how students perceive the learning context (Fransson, 1977; Laurillard, 1979; Ramsden, 1984, 1988; Van Rössum et al., 1985). The way a student approaches a particular learning task is not an inherent quality of that student. It is the result of a complex

¹In this and some other Chapters, students' comments have been quoted directly. Fictitious names have been used in order to protect their anonymity.

interaction between personological factors, such as ability, past experiences, family background, and contextual factors, such as teaching methods, teachers' attitudes, type of assessment, and work load (see 3P Model of Learning; Figure 1.1). For example, parental pressure and excessive workload encourage a surface approach of memorising facts and details to meet deadlines and adults' demands. On the other hand, a sense of relevance and curiosity encourages a deep approach: seeking meanings and the underlying principle and structure of the learning materials.

The present study, using intensive interviews, attempts to understand how students in a below-average school (in terms of student intake) think about and make sense of some important elements of learning context, and how such perceptions influence their motivation and learning strategies.

RESEARCH METHOD

Twenty subjects (9 females and 11 males), half from S2 (Secondary Two) and the other half from S4 (Secondary Four), were interviewed using a semi-structured interview schedule. They were chosen with the help of their class-teachers to maximise variation in terms of ability and conduct.

The interviews aimed to tap subjects' perceptions of good teachers, classroom interaction, the purpose of tests and exams, their conceptions of learning, and approaches to learning, as revealed in their own statements, with as little suggestion from the interviewer as possible.

The interviews were conducted in Cantonese and transcribed verbatim into English. The data were intensively read and analysed in order to discover both the variations and similarities of subjects' statements on a concept. The product of the analysis was a set of distinct categories, which captured the different ways the subjects perceived each concept. Based on the categories thus obtained, the protocol of each subject was categorised by two independent judges with an agreement of about 80%.

Four experienced teachers of the school were also interviewed to get their perspective on these issues.

RESULTS

Conceptions of Learning

Beaty, Dall'Alba and Marton (in press) distinguished six different conceptions of learning:

- (a) Learning as a quantitative increase in knowledge.
- (b) Learning as memorising.
- (c) Learning as the acquisition and application of facts and procedures.
- (d) Learning as abstraction of meaning.
- (e) Learning as seeing something in a different light.
- (f) Learning as changing as a person.

The first three conceptions are characterised by an external, quantitative (Saljo, 1979) and dualistic (Perry, 1988) conception of knowledge. Knowledge is seen as something ready made, out there, to be picked up and stored. In contrast, what characterises the other three conceptions is the existence of a personally abstracted meaning, a way of seeing things (Beaty et al, in press).

Of the 20 subjects, 15 were categorised as holding conception B, 4 conception C and 1 conception D.

Approaches to Learning

The concept of deep and surface approaches to learning has been firmly established in both qualitative and quantitative studies (see Chapter 1). In this study, only 1 subject was classified as utilising a deep approach. The other 19 all adopted a surface approach.

Further analysis revealed a finer distinction within the surface approach, which can be characterised by Svensson's concept of "variations of completeness within an approach" (1984). When using a surface approach, some subjects would only study and memorise the parts for tests and exams with understanding only at the *word* or *sentence* level, while the others would try to grasp some *organisation* and inter-relationship of the parts, hoping to retain and recall them with greater efficiency later in tests and exams.

Borrowing Biggs' (1988) terminology, the two surface approaches were termed 'restrictive surface', and 'elaborative surface' approaches, respectively, as illustrated below:

Restrictive Surface Approach

- T: Can you choose one subject and tell me how you prepared for it?
- S: Geography. I jotted down notes ... shorter notes from notes given by the teacher. There're many sheets of notes, so I cut them short.
- T: You cut them short, and then what?
- S: Revise.
- T: How did you revise?
- S: Memorise you know the meaning.
(Jacqueline, S4)
- T: How did you study (for the first term exam)?
- S: you picked up the book and spelled the words, read (memorised) the sentences well. Sometimes, for Chinese Language, (I) looked at the vocab meaning and the text. In English, spelled the new words well, looked at the meaning. If (I) didn't know the meaning, (I) would look up the dictionary.
(Wai Ling, S2)

Elaborative Surface Approach

- T: How did you revise Chemistry for exam?
- S: I read it myself. After reading, I would underline the main point for revision.
- T: You said 'revision'. How did you revise?
- S: Say, after reading, I would do some exercises to see if I could do them. If I could, then I knew. If not, I would learn from the exercise, and revise it once more.
(Eva, S4)

Of the 19 subjects taking surface approach, in S4, 4 held

restrictive and 3 elaborative surface approach, and in S2, 8 held restrictive and 2 elaborative surface approach. Two S4 student's approach could not be classified into these subdivisions.

Conception of Learning x Approach to Learning

In a study of university learners, van Rossum and Schenk (1984) found a strong correlation between conception of learning and approach to learning - surface, quantitative conceptions of learning (Conceptions A and B) being associated with a surface approach, and deep, qualitative conceptions of learning (Conceptions D and E) being associated with a deep approach, with conception C as the grey area.

In the present study of secondary students, a slightly different relation was suggested - conceptions A and B being associated with restrictive surface approach, and conceptions C and D associated with elaborative surface or deep approaches (Table 2.1).

Table 2.1: Conception of Learning x Approach to Learning

Conception of Learning	Level	Deep/ Elaborative Surface Approach	Restrictive Surface Approach	Unclear
B	S2	0	7	0
	S4	2	4	2
C/D	S2	2	1	0
	S4	2	0	0

A subject seeing learning as memorisation, with direct reproduction of the learning materials (Conception B), is likely to adopt a restrictive surface approach. In fact, in S2, all 7 out of the 7 subjects who held conception B took a restrictive surface approach.

In contrast, 4 out of the 5 subjects holding conception C or above utilised an elaborative surface approach.

Conception of a Good Teacher

A good teacher, as perceived by these students, was one who was:

- (a) Strict enough to control the order of the classroom.
- (b) Able to explain well.
- (c) More friendly with students after class.

With the exception of (c), these emphasise external control. Many students saw keeping order in the classroom as problematic for teachers:

S: Maybe, in the first few days, they listened, the first few days in S.2. But later when they know which teachers are permissive and which are not, then, they won't listen to those permissive ones, and only listen to those who are not permissive.
(Yuen Man, S2)

T: You said you want teachers to be stricter. Why ?

S: Because some teachers are not strict and cannot control us. Sometimes some students are very noisy and we cannot hear the teachers. They listened only when Miss was very angry.
(Wai Ling, S2)

Over two-thirds of the subjects attributed students' failure to keep quiet and listen in class to teachers being too permissive. This perception of the role of teachers matches the traditional Chinese view of teaching -- 'Control first and then teach' -- which I believe many teachers possess.

This emphasis on external control is also congruent with these students' perception of the purpose of tests, exams and homework:

- T: Why do we have tests and exams?
S: Maybe it is afraid that we don't pay attention in class so it has tests and exams, to force them to revise
(Wai Yee, S2)
- S: The purpose (of tests and exams) to force our students to revise and to let us score marks to get a pass.
(Ching Hin, S4)
- S: I prefer to have homework. If there is no homework, it causes a person to become lazy. You always don't want to do (home)work, and if you get used to not doing (home)work, you won't want to do it.
(Yuen Man, S2)

These subjects perceived tests, exams and homework as necessary to force and help students to pay more attention in class and to revise more at home.

The third theme that runs through the interviews is the relation between conception of learning, approach to learning and perception of tests, exams and homework on the one hand, and perception of good teaching on the other. Two teaching strategies were perceived as exemplifying good teaching:

Restrictive Teaching Strategy. Of the 12 classifiable subjects, ten said that a teacher taught well if she could explain as clearly as possible at word and sentence levels and, if necessary, explain several times so that the students could 'understand'. The following quotes illustrate this restrictive teaching strategy:

- T: In your opinion, what should they do to teach better?
S: Explain more clearly even though they explain several times. If (taught) in more detail, students will then understand. It'd be better if the teachers often quiz us and constantly remind us.

(Jacqualine, S4)

S: The (Chinese History) teacher is very good. After copying the notes (on blackboard), he would explain from beginning to end until you know all of them If no questions, then he'd copy the next (pages). This made you understand better, understand more deeply.

(Ying Wai, S4)

Elaborative Teaching Strategy. The other 2 classifiable subjects described good teaching as the usage of various methods to facilitate student discussion and participation to develop more holistic understanding of the learning materials. The elaborative teaching strategy is illustrated below:

S: Discussion is good. From discussion, you can discover some question; at first you have never thought of this question, but from others' questioning, you know more.

(Ling Wah, S4)

S: Those who teach well often would work and discuss with students. They give more opportunities for students to express and discuss.

(Eva, S4)

Conception of Good Teaching X Approach to Learning

A complete picture of the relationship between subjects' approaches to learning and conception of good teaching follows.

Only 11 subjects were classifiable on both conception of good teaching and approach to learning. Despite the small number observations, the picture is quite clear. All nine subjects utilising a restrictive surface approach saw a restrictive teaching strategy as good teaching, whereas the 2 subjects who took deep or elaborative surface approach favoured an elaborative teaching strategy.

DISCUSSION

So far, we can see students' conceptions of learning, perceptions of good teaching, and their approach to learning, are functionally related. That is, a quantitative, absorptionist conception of learning (which most subjects held) *logically* implies a perception of restrictive teaching as good teaching, and a restrictive surface approach to learning.

Restrictive Surface Approach: Causes and Consequences

Those subjects adopting the restrictive surface approach experienced a lot of learning difficulties, such as boredom, lack of persistence, and dependence on rote learning. Below are some typical examples:

S: (I) don't like (myself, because) I want to work hard, but when I hold the book, I just don't want to read it. Say, you have a test tomorrow. At most you'll open the book, and read it, at most once or twice. You just don't want to memorize it, spell the words. But in fact, if just skimming it once, how can you get high mark? Whenever you hold the book in your hand, and don't want to study, you can't cram it into your head however hard you force yourself.
(Kai Kwon, S2)

S: I just remembered a little. During the whole revision, I only remembered a small part after each revision. If I had to remember in detail, I couldn't. My brain couldn't adapt to this.
(Kwok Fai, S4)

T: Did you meet any problems when revising geography?

S: Yes Sometimes I had to rote-memorise something and I didn't quite understand it. When exam came, I would forget easily. I couldn't get it clearly understood. I could only rote- memorise and hoped they wouldn't come up (in exam).
(Jacqueline, S4)

These difficulties relate to their approach to learning. If they only focussed on the facts and details of the learning materials and tried to memorise them for tests or exams, they would find revision boring and difficult to sustain (Svensson, 1977). Moreover, if the subjects focussed on the parts of the learning materials, they tended to overlook and fail to appreciate their underlying structures and principles (Marton, 1988). Thus, examples, details, and illustrations which aimed to explain the principle or theory were taken as extra information for memory. That is why Jacqueline and Kwok Fai saw their learning difficulty as a *quantitative* one: of being unable to retain the vast quantity of materials dealt with in S4. That also explains why these subjects saw tests and quizzes as means teachers use to help/force them to study harder, because on their own they could not force themselves to cram the learning materials.

It is also important to note that while in S2 some students could overcome the difficulty by working hard to memorise the learning materials (surface restrictive approach), and would probably be rewarded due to the factual content of assessment, the solution (a restrictive surface approach plus hard work) became an obstacle to understanding in senior forms.

The crucial question that we must ask is: Why did these students choose to use surface (especially surface restrictive) approaches to learning, and become so passive and dependent on teachers' control of their studies? This study shows that we need to look at student learning *in context*.

We found that the students believed that many teachers saw student problems as teacher-owned problems (Brophy & Rohrkemper, 1981), i.e. they saw problem student behaviour as a threat to their self-esteem, causing them to feel frustrated and irritated. And they tended to use extrinsic, often punitive, means to deal with problem students.

External control and Self-esteem

Students themselves believe they have to be ordered or scolded and punished if they are to be more obedient. Many subjects, indeed, felt that if a teacher scolded and punished a student for misbehaviour or not handing in homework, he was regarded as caring for the students.

For example:

S: It seems that all our teachers don't care for the students.

T: Why do you have this feeling?

S: Like the English Language Miss, she let us go in and out as we like. When we were noisy, she did not do anything about us and couldn't control the discipline herself Many teachers just didn't care about (us).
(Yuen Man, S2)

T: Do you like (teacher acting strictly)?

S: Yes, I do. This can improve the conduct in the classrooms. (If) you do not hand in homework, (you) will be punished to stay behind after school. Our Maths teacher will give (us) black marks if we still do not hand in. Forget to bring textbook for the first time and (you) will be punished to copy. The second time, is retention after school. The third time, black marks. More black marks, if it goes on.

T: Do you think it's good?

S: Yes, it is. It can warn students to remember to bring textbooks back to school.
(Wai Ling, S2)

Both students and teachers think that the students do not have self-control and have to be controlled. They do not have intrinsic interest in their studies and have to be made to study by extrinsic means. To some extent such a perception is not ungrounded. That is to say, these children do not have a lot of self-control and discipline and they have had little intrinsic interest in their school subjects since primary school (see Ramsden, 1988).

So, these teachers are not totally wrong when they say that given the freedom to choose, the students will choose not to do what teachers want them to do. Many of my colleagues are strongly in favour of using extrinsic constraints to motivate students. They argued that given students' low L2 proficiency, lack of relevance of most learning materials, and their entrenched passiveness, it is extremely difficult to use intrinsic interest to arouse these students; thus

extrinsic means is the necessary first step to get these students to put more effort into their studies. The present writer does not object to using extrinsic rewards; they do not lower intrinsic interest if they serve to signify students' levels of competence (Lepper, 1983). However, Lepper stressed that many extrinsically motivating programmes were not used optimally, tending to control behaviour rather than to provide information.

Many of the methods of controlling students' behaviour are used mechanistically (Deci, 1980). The teachers base their control methods on what they think the students should *do*, with little concern about the cognitive and affective processes mediating between the stimulus and responses inside the students. Thus teachers try to control the overt behaviour of their students with extrinsic means, often punitive, so that teaching can be carried out and students do the required home assignments. This way the students may obey, but what do they learn? How will the students make sense of the situation? What effect does it have on students' self-concept, their perceptions of schooling, their motives and learning strategies? These are important questions that we must answer.

Extrinsic control fails to recognise and develop a person's inner needs and sense of self-determination to act on the environment. A person's self-concept is a schema through which incoming information is interpreted and reacted to, and which determines how the experienced stimuli are related to the self (McCarthy & Schmeck, 1988). People with high self-esteem have more trust in their own selves and their own experiences, they are more assertive and independent in examining the learning materials against this own experiences, and hence are more likely to use a deep approach to learning. They prefer challenging tasks which provide them with the opportunity to assert their self-competence.

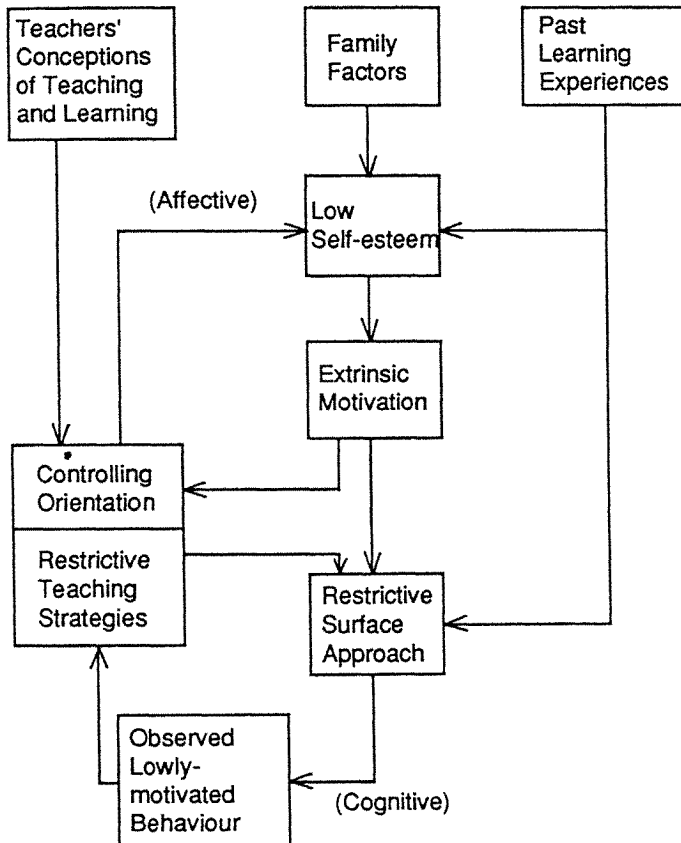
On the other hand, people with low self-esteem tend to have less self-trust and have doubts in the authenticity of their own experiences. They tend to be passive and dependent on teachers for the right answers and react only to external cues (for example, marks, and extrinsic rewards), and hence are more likely to adopt a surface approach. They prefer easier tasks in which they are more likely to succeed to satisfy external demands or to get extrinsic rewards (Pittman, Boggiano, & Ruble, 1983).

An integrated model

Figure 2.1 depicts the relationship between teachers' conceptions of learning and teaching, and teaching strategies on the one hand, and students' approaches to learning on the other at two levels of interaction. The focus here is the case when students adopt a restrictive surface approach.

Figure 2.1: Interaction of students' learning approach and contextual factors at cognitive and affective levels

(Note: The diagram only considers restrictive surface approach)



The lower loop of the diagram describes the interaction between teachers' and students' thoughts and actions at the cognitive level. Teachers' controlling orientation and restrictive teaching strategy is a logical outcome of their quantitative, absorption model of learning and knowledge. Students' personological factors (e.g. ability and past experiences) together with their perception of contextual factors will shape their approach to learning. Considering the case of restrictive surface approach, the observed passivity of the students will call for and at the same time justify control-oriented, restrictive teaching strategies. The restrictive teaching methods which focusses on transmission of facts and detail, and the frequent use of tests to induce more student effort, however, would further encourage students to take a restrictive surface approach to learning. This completes the lower loop.

The upper loop describes the interaction at the affective level. The impact of the control-orientation of teachers on students' approach to learning has its effect first on their self-esteem, perception of locus of casuality and self-competence. When extrinsic rewards and constraints are used to induce more task engagement, which results in perception of external locus of casuality, the students will lose their sense of self-determination. The students have learnt to react only to external cues. Thus, learning only for satisfying adults' demands or for obtaining extrinsic rewards, these students tend to adopt a surface approach, and thus will find studies hard, boring and difficult to sustain. When the students are seen as passive and dependent, teachers' control-oriented, restrictive teaching methodology is justified.

Moreover, when students lose their self-determination (e.g. the students are forced to obey orders and do boring tasks) they will try to recover control in other illegitimate ways (Deci, 1980). This 'rebellious non-compliance' (not explicitly shown in the diagram) is a reaction against the controlling environment and is a product of external forces and internal non-conscious forces (which developed when their attempt to assert autonomy was punished or ignored). Thus, student disruption and aggression in class once again calls for and justifies stricter teacher control.

So, the two loops represent two spirals of interaction. To stress again the message conveyed in the diagram, the problem of students'

lack of motivation and misbehaviour can only be fully understood by examining the phenomena in context. The students' personological history is important in influencing their actions. But they don't act only on their own past history. They interpret and act on their perception of the environment. Therefore, whatever the teachers do, it has a great impact on the students, for better or for worse.

IMPLICATIONS: WHAT SHOULD TEACHERS DO?

Pask (1988) in his study of learning styles found that the transition from serialist to holist styles of thinking is risky and will temporarily interrupt success that the person previously enjoyed by using a serialist approach. Serialist and holist learning styles are not identical to surface and deep approaches, but the implications are similar. Children with poor self-esteem will find it difficult to shake off a surface approach out of insecurity due to temporary failure during transition. Thus, successful transition from surface to deep approach requires a healthy self-concept (high self-esteem) and teacher and family support in order to overcome this insecurity.

Unfortunately, the interview data showed teachers generally mistrusted students' ability for self-control and self-enhancement, conveying to students two messages:

- (1) "Your experiences and resources are irrelevant, and inadequate, so take in what is taught, by rote if necessary."
- (2) "You are bad and have to be kept an eye on. We know you won't study on your own, so we will make you study."

So we commit the mistake of labelling and reifying students' motives by our control-oriented teaching and management methods. This, as just argued, is self-fulfilling and self-justifying.

Biggs (1992) argues that teaching should utilise the full range of quality experiences in cognitive development. Didactic teaching at the symbolic level results in "a form of learning that was shallow and narrow in its range of application". He called for multi-modal learning, including "inductive, experiential, workshop, discovery, and problem-based classroom methods", so that students' inner resources, built on this earlier experiences, can be utilised.

To facilitate the transition from restrictive, to elaborative surface, and to deep approach, students have on the affective side to be given acceptance and respect for their idiosyncracies, and predispositions (a legacy of their past), and *guided* freedom so that they can explore the worlds and express their thoughts without fear. Only then can they learn to come to respect, trust and use their own resources, to confront the learning materials with their own experiences (Saljo 1984; Svennson 1984) and derive meanings from them, and form their own world views. Only then can we provide a learning environment that promotes genuine cognitive development.

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CHAPTER 3

DO TEACHERS' BELIEFS INFLUENCE STUDENTS' LEARNING?

Thomas K.W. Tang

INTRODUCTION

Several questions have commonly been raised about the quality of teachers. One of them is whether teaching experience affects the efficiency of teachers. Another is whether the beliefs of teachers about teaching and learning affect how well their pupils learn. In this Chapter, these two questions are discussed in the light of some recent research findings.

Clark and Peterson (1986) suggested that teacher's cognitive and other behaviours were guided by and made sense in relation to a personally held system of beliefs. Thus the beliefs about teaching, learning, and the nature of the curriculum are all important aspects that would affect the efficiency of teachers. Conversely, expert teachers, with considerable experience of teaching, would be likely to hold different beliefs from inexperienced or novice teachers. Unfortunately, despite the importance of this area, not very much research has been done on these aspects.

The present research investigates the relationship among the level of experience of teachers, the beliefs they hold and the outcome of their teaching. The investigation is based on a study of the approach to teaching Chemistry by four expert and four novice local school teachers. All the teachers were university graduates majoring in Chemistry. The experts were recommended by members of the Chemistry Inspectorate. All four experts had at least nine years of teaching experience. Some of the experts had higher degrees while others were active participants in committees in the Curriculum Development Council or the Hong Kong Education Authority. The

novices all had less than two years of experience and three of them had no formal teacher training.

The research procedure involved interviews with the teachers, classroom observations, and questionnaires to pupils. The teacher interviews included questions about how they planned their lessons as well as their conceptions of learning, teaching and science. Classroom observations were used to check whether their performance in lessons was consistent with their planning and their conceptions. The questionnaires to pupils were meant to measure their achievement in learning, their approach to learning and their perception of the learning environment.

TEACHER PLANNING

Analysis of the interview protocols revealed marked differences in the focus and method of planning activities between experts and novices.

When asked about planning in general, the focus of the novices' planning activities was apparently subject content knowledge. Thus content knowledge was the object to search out from textbooks and to put down in notes. This focus on content was also true for the novice teacher who did not mention the textbook. He was familiar with the content, so there was no need to plan.

On the other hand, the focus of experts' planning was pedagogy. Confronted with the question about planning, two of the experts immediately talked about how they would introduce and sequence a topic. Another expert actually described the transition of the focus of planning:

In previous years, I concentrated on acquiring knowledge and in these few years, I paid more attention to my presentation. I think that the way of presentation is more important as this affects whether pupils can remember. (Expert 3)

Possibly, after years of teaching, the experts knew by heart the subject content knowledge, and had extensive schemata of their subject content knowledge. Consequently, they could free their mind from content to focus on the best way to teach. On the other hand, the novices, besides being overwhelmingly occupied with finding out

about subject knowledge, might not have the cognitive structure for contemplating pedagogy.

The difference in focus was also apparent when discussing planning for individual lessons. The concern of the experts when planning immediately before the lesson was again pedagogy.

I also thought about the objectives of the experiment and planned some guiding questions to lead the pupils towards my objectives. (Expert 2)

Since expert teachers used an interactive approach to teaching (discussed later), they were more flexible in their planning of individual lessons. On the other hand, none of the novices reported planning about pedagogy. Immediately before the lesson, they still seemed preoccupied with the planning of the content.

A possible explanation of this difference in the focus of planning is that the two groups of teachers had different conceptions of teaching. Consequently, the two groups of teachers may have different foci in their planning activities. The following sections are intended to establish a relationship between teachers' planning behaviour and their underlying conceptions, including the conception of science as well as conception of learning and teaching.

CONCEPTIONS OF SCIENCE LEARNING

The teachers were asked directly about their concept of science learning and the effect of their concept on their planning. The following is based on the analysis of their interview protocols.

The novice teachers apparently viewed science as a collection of knowledge (or facts) that could be used to explain phenomena or solve problems. Compared to the five different conceptions of science identified in a study of preservice teachers in the West, the conception of the novices in the current study was similar to the "naive conception" stated as

naive conception of science: science as a body of knowledge consisting of a collection of observation and explanations of how and why certain phenomena function in the universe (Aguirre,

Haggerty & Linder, 1990)

This conception of science, compared to others listed in Aguirre et al's paper, lacks reference to the experimental base and the tentative nature of scientific knowledge. Novices believed that science learning was a process to acquire knowledge useful for explaining phenomena and solving problems. The following quotations illustrate such a conception:

(What do you mean by "a scientific view-point"?)

Every phenomenon has a reason behind it. So one should try to explain it. (Novice 1)

It means that after learning a theory, the theory may be employed to explain or predict some facts. (Novice 3)

Novices had similar referential aspects when they were talking about problem solving or application. They considered that problem solving in relation to examination grades was most important.

Two of the novices suggested that their concept of science learning did not affect how they planned their lessons, yet the author believes that its influence on planning is quite obvious. It is only that these two novices have not recognized the influence.

None of the expert teachers in the current study held such a "naive concept" of science. Rather, two central components were identified among the conceptions of the experts, which were absent in the conception of the novices. The first was that science was related to society. Science learning could help pupils to understand the modern technological society and to adapt to the life within such society. Three of the experts directly talked about this.

Science education should also let pupils learn about application of science. Students should be aware of the application and appreciate the implication..... science education should bring out the relationship of society with science and technology. (Expert 2)

I stress the importance of adapting to the requirement of the society. (Expert 3)

In recent years, there has been much discussion among science educators locally (Holbrook, 1990) and globally (UNESCO, 1986) about the science and technology in society (STS) approach to teaching science. It seemed that the expert teachers were generally more aware about this trend than the novices.

The second common component in the conception of the experts was that science as a way of thinking was described as logical, analytical and empirical.

The right attitude is to ask why for everything. They should possess power of observation and ability of logical deduction. Analytical power is essential. To achieve these, they have to possess certain degree of observation power and analytical power in learning science. (Expert 4)

It is not easy to make explicit the implicit concepts involved in teaching and learning processes, the proposed conception of science as logical, analytical and empirical way of thinking seems to be a reasonably accurate summary of the conception expressed by the experts.

Thus, the experts and novices treated the nature of scientific knowledge differently. The novices considered it as a collection of memorizable facts and algorithms while the experts treated it as a way of acquiring knowledge through empirical observation and critical thinking. Secondly, the two groups of teachers held different views of the function of learning science. The novice teachers presumed the purpose of the learning science was to solve examination-like problems; whereas the expert teachers conceived the function as a socialization process to the technological society.

CONCEPTIONS OF LEARNING AND TEACHING

Conceptions of learning and teaching are actually two sides of the same coin. A concept of learning should evoke a corresponding concept of teaching. The findings of the current study are quite

consistent with the framework in Chapter 1. The teachers were asked in the interviews about their concepts of pupils' learning and good teaching. From the analysis of the interview protocol, the quantitative view and the qualitative view on pupils learning and good teaching were clearly evident. The novices had a quantitative view of teaching and learning. Learning is the intake of knowledge:

For this level of secondary school, the pupils rely on the teacher to provide them with knowledge..... (What do you mean by that a student has learnt something?) it depends on the results of examination. (Novice 2).

... (If I) understood the teacher and could solve the problems in the exercise without resorting to copying from others or asking for help, that meant I had learnt that knowledge. (Novice 3)

That is, the pupils understand and can solve the problems in examination. [Note: this teacher later suggested that understanding means an ability to solve the more difficult examination questions] (Novice 4)

Although three of the four novices use the words understand or understanding, all of them treated understanding as an ability to solve problem (mostly in examinations) rather than grasping the meaning of something.

In response to the question about their conception of good teaching, the novices suggested the following:

It means the fulfillment of the duties. The contents that are required should be covered in the lessons. The lazy pupils should be overseen. (Novice 2)

.... Unlike that pupils just listen to a teacher or even forget about what the teacher says. If pupils forget what the teacher says, it (the teaching) is a failure. (Novice 3)

Most of the novices treated teaching as the transmission of knowledge.

The experts appeared to have deeper conception of learning than the novices, although there was some variation. Their views of learning were exemplified by the following quotations:

Firstly, if pupils have learnt something, it is reflected in their results for both internal and external examinations. Secondly, pupils' learning may not be immediately noticeable. The second aspect is very difficult to measure. It relates to how well the pupils adapt to life in society. It depends on how much knowledge they get and what attitude they have. For example, when learning about alcohol, they should learn not to be drunk. Possibly, in a class of 40, 35 learn not to be drunk. This means I am successful. It is impossible to check it now. (Expert 1)

I do not believe examinations can measure student learning..... The important issue, at least for learning science, is that students can apply. An example of application is that after learning about polymers, the students understand the source of polymer and usage and they exert greater care in using less plastic bags. Such type of application in daily life reflects that the students have learned well. (Expert 2)

From the analysis of the protocols, the experts were found to have a qualitative view of learning. They stressed the importance of learning as interpreting and applying the knowledge gained. On the other hand, some experts accepted that learning had to be validated by examination, but immediately commented on the inadequacy of limiting learning to such an institutional view.

Some expert conceptions of teaching were expressed as follows:

There must be some interaction in the process. The teacher should not be too dominant. The teacher should not direct the pupils but guide the pupils. The teacher should develop pupils' attitude and interest towards learning. These are elements of good teaching. Furthermore, organization is also an important attribute of good teaching. The flow of the lesson is very important. (Expert 2)

- From a wider scope ... basically, the teacher should be able to
- - cover the syllabus. At a higher level, the teacher can help pupils to acquire scientific minds. At an even higher level, teaching should involve the moral aspect. (Expert 3)

All the experts in the current study delineated more than one level or aspect of concepts about good teaching. Their conceptions compared with the vague concept of keeping pupils interested were richer and deeper. Expert 2 was clearest about it. He expressed the concept of teacher as a guide without being too dominant and the importance of teacher-student and student-student interaction as an aspect of teaching. Other expert teachers referred to teaching as helping pupils to acquire scientific minds or accentuated discovering, experiments and questioning in teaching. Most experts also embodied the view of teaching as a means to bring about attitude change. All these were consistent with the qualitative (or constructivist) view.

While the experts might also have a quantitative or institutional view (two mentioned ideas like covering the syllabus and the flow of the lessons) they had predominantly the qualitative/constructivist view of teaching.

The growth of expertise: A hypothesis

The following hypothesis is put forward to explain how the experts have become more qualitatively oriented than the novices. Gradually, through years of experience, the expert teachers become more and more aware of the strength and difficulties in pupils' learning (Borko & Livingston, 1989), finding the quantitative view of teaching and learning to be inadequate to account for why pupils understand or not. One expert discovered that providing information from textbooks was not adequate to ensure learning. At the same time, teachers feel progressively more confident to have interaction with pupils, and find that the interactive approach to teaching is more effective.

Relationship between conception and planning for teaching

The quantitative-orientated teachers held the view of teaching as transmission of knowledge and thus the selection and the

presentation of the content were of great importance. Consequently, they equated planning and selection of contents. Furthermore, they would find the textbook, which contained the actual content for delivery, an important source of their contents. They would also find the curriculum guide and the list of objectives, which delineated the contents in terms of teaching activities or target pupils' behaviors, were of little use to formulate what to transmit to the pupils in lessons. Since their main purpose was to transfer the knowledge just as someone deposited money into a bank (Freire, 1972), direct teaching and didactic approach would be most appropriate. Within such an approach, experiments were of little use, if of any use at all. Finally, once the transmission of knowledge was carried out, the quantitatively-orientated teachers considered they had done their job; they have no need to reflect on how to improve their transmission for the next lesson.

On the other hand, the qualitatively-orientated teachers perceived their role as supporting pupil learning through interaction and their pupils were the ones who really constructed their own knowledge (Wheatley, 1991). Only the interactive approach was consistent with such a qualitatively-orientated viewpoint. In order for the pupils to have something to base the construction of knowledge on experiments were needed and formed an integral part of the learning activities. In order to be functional in such an interactive teaching environment, the teachers should be able to improvise and be flexible (Yinger, 1989). To cope with this, the teachers required a clear image about the direction of the lessons and the type of activities that would scaffold learning. The former image required references to the list of objectives, while the latter, references to the curriculum guide. Finally, unlike relatively static nature of the content for a didactic lesson, an interactive lesson was dynamic in nature and varied according to the status of pupils. In order to provide the best assistance for pupils in their learning, the qualitative-orientated teachers could reflect on the previous lesson to determine how the current lesson should go.

There was thus a definite distinction between the conception of learning and teaching of the expert and novice teachers. When the teachers were classified as quantitatively orientated or qualitatively orientated, all four experts were considered as qualitatively orientated

while all four novices were quantitatively orientated.

OBSERVATIONS OF EXPERTS AND NOVICES TEACHING

One lesson from each of the eight teachers were observed. These lessons of the expert and novice teachers were not directly comparable as they were on different topics and of different types of lessons. However, some features of the lessons and differences between the two groups of teachers as observed are worth further consideration.

The lesson plans of the experts were generally more detailed than the novices; therefore deviation from the lesson plans was more difficult to detect in the case of the novices as there were much less to make reference to.

The novices seemed more consistent in the lesson to their declared approach than the experts. Although some experts resorted to lecturing at one point or another during their lesson, they all suggested they preferred the interactive approach. The novices, on the other hand, applied the lecturing approach as they had indicated in the interview. It was possible that the experts had idealized their practices.

Thus the experts were much more interactive in the observed lessons than the novices. All the experts asked questions that required deep a level of cognition and all of them posed greater number of questions to pupils than the novices, whereas a quantitative view of learning and teaching seemed to represent the novices' observed lessons accurately. It may therefore be concluded that the qualitative-quantitative dichotomy exists not only in teachers' cognition but also in the way the experts and novices conducted their lessons. This difference in approaches to teaching was also a main feature of experts and novices differences reported by Tobin and Fraser (1988).

Furthermore, there was evidence of use of the discovery approach which integrated experiments with teaching by three of the experts but no evidence of this nature was available from the observed lessons of the novices. This was possibly due to the contrasting conceptions of science the two groups of teachers had. The observed lessons here supported the notion that beliefs about the nature of science affected the approach of the teachers in the lessons

(Greunder & Tobin, 1991).

EFFECTS ON PUPILS' PERCEPTIONS, LEARNING PROCESSES, AND OUTCOMES

In order to compare the effect of teachers on pupils, a questionnaire was designed to measure some aspects of pupils' learning. The first part of the questionnaire was aimed to measure the level of processing the pupils used in learning Chemistry. This part of the questionnaire was adapted from the Learning Process Questionnaire (LPQ). The second was a measure of the perceived learning environment in Chemistry classes modified from Hattie and Watkins (1988). The final part was a short test about the "Mole Concept" in Chemistry. Two questions were set in this final part. One of the questions concerned the importance of the mole concept in Chemistry while the other one was a problem on calculation with more data given than required. Pupils' answers for this final part were graded according to the SOLO taxonomy (see Chapter 1).

Perception of environment. The difference between pupils of the two groups of teachers in the perceived learning environment was clear. The scores for the second part of the questionnaire indicated that learning environment was perceived as better in the eyes of the pupils of the experts than those of the novices (ANOVA, $P < 0.01$). The pupils of the experts generally felt happier about their learning environment, about their likelihood of success in that environment, about their impression of fair treatment by the teacher as well as about the usefulness of the learning arrangement.

Approach to learning. The pupils of the experts scored higher (ANOVA, $P < 0.01$) on the questionnaire items concerning deep processing in learning than the pupils of the novices. In other words, there was some evidence that the pupils of the experts utilized a deeper approach in learning Chemistry. This indicated a tendency for the pupils of the experts towards a combination of more intrinsic motivation and more concern about understanding when studying.

Learning outcome. The data also indicated that the pupils of the experts had learnt more effectively about the mole concept than the pupils of the novices. The scores for both questions as well as the total score of the pupils taught by experts were significantly (ANOVA $P < 0.05$) higher than the other group. These pupils of the experts were better in suggesting the importance of the 'mole concept' as well as in understanding the steps to solve involving calculations' problems.

DISCUSSION AND CONCLUSIONS

The current research found that the experts employed an interactive and discovery approach to the teaching of Chemistry. Some of the questions asked in lessons were quite demanding cognitively. This should communicate two important messages to the pupils. The first was that they were responsible for their own learning. The second was that learning was about making sense out of observations. From this point of view, the expert teachers with a qualitative orientation to teaching imparted a more qualitative view of learning to their pupils. This qualitative perspective then influenced the pupils to use a deep approach in learning. Firstly, a meaning-finding orientation was likely to elicit a deep approach of learning (see Marton, 1988). Secondly, the pupil acceptance of their own responsibility for learning would also encourage a deep approach to learning (see Biggs, 1990).

Moreover, the qualitative orientation of teaching and learning also influenced the pupils' perception of their learning environment (see Entwistle, Kozeki, & Tait, 1989). The stress on discovery and interaction would likely increase the positive attitudes towards the learning environment including their feeling while learning and their sentiment towards the teachers. The tendency toward accepting responsibility for their own learning, i.e. emphasizing one's own effort, would likely increase optimism about success (see Ames & Ames, 1984).

Last but not least, a qualitative orientation to teaching and learning would likely bring about better quality of learning outcomes (see Marton & Saljo, 1984; Watkins, 1983). Thus noting the more qualitative orientation of learning and deeper approach with pupils of the expert teachers, it should not be astonishing to find that the

achievement of these pupils, according to the SOLO taxonomy, was higher.

In conclusion, the current study suggests that the differences between the expert and novice teachers, as manifested in their lesson planning, conceptions, cognitive structure, and conduct of lessons, have an effect on the learning of the pupils. Such influence is appropriately interpreted through a framework of differences in the quantitative/qualitative orientation of learning and teaching between the two groups of teachers. If such a situation is true for teachers in general, the importance of teachers carefully evaluating their own beliefs cannot be overemphasized.

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CHAPTER 4

HOW EXAMINATIONS AFFECT STUDENTS' APPROACHES TO WRITING

Flora H.K. Fan

INTRODUCTION

In Hong Kong, students' English language ability in general, and writing ability in particular, are declining. This is not due to lack of awareness of the problem on the part of teachers and administrators but rather to the effects of institutional constraints on the process and product of writing.

Research in writing has been carried out extensively. An emerging paradigm links the process of writing to the product of writing. The present Chapter considers this relationship from the perspective of the 3P model of learning, focusing on examinations as the principal institutional presage factor, motivation to get a high grade as the principal personal presage factor, and on their interaction.

THE PRESENT STUDY

Researchers in composition (e.g. Marshall, 1984; McCarthy, 1987) have pointed out that writing in Western schools is performed in a highly evaluative climate. The students' focus on the desired grade may limit the way they approach writing tasks. Little research has been done on the effects of the examination context on students' approaches to writing, and the present study was conducted to help fill in this gap.

The Hong Kong examination system places considerable restrictions on English composition writing. At HKALE, candidates are required to write a minimum of five hundred words on a single

topic in one hour and 15 minutes. Compositions are assessed on a nine point scale based on double impression marking. To reflect this situation, in this research an examination condition was set constraining the time limit, word limit and using impressionistic marking. For comparison a non-examination condition was also set in which all the constraints were lifted. Eighteen Form 6 students were asked to write on a given expository topic about society in Hong Kong in an examination and write on a similar topic at home. To control for differences the difficulty or interest level half the students wrote on Topic A in the examination condition and Topic B in the non-examination condition while the other half of the students reversed the order of the topic. Interviews were then conducted in Cantonese and translated into English probing student approaches to writing.

RESULTS AND DISCUSSION

The interview data were divided into four parts: (a) student conceptions of and approach to writing in the two conditions, (b) the time constraint and strategies for coping, (c) the word constraint and strategies for coping, and (d) strategies for the constraint of impressionistic marking.

Student Conceptions of and Approach to Writing

When students were asked about the purpose of writing, five different conceptions were found. The two general conceptions were 'writing is for examination' (61%) and 'writing is for expression and sharing' (56%). (Some students gave more than one response). Three other conceptions were also mentioned. Two students (11%) said writing is for practical use; one student (6%) said writing is an art, a mere show of talents and passions, and one student (6%) said writing is to learn how to think.

When asked what they wanted to get from examination writing, many students said they wanted to get a high grade and they added that this was the only thing they could get from it. Their concern for grades is overwhelming. Some even start evaluating while writing:

Ching Han: I'll check whether I can pass while writing. If I feel not so good after writing half, I'll write fewer words and write slower to improve the quality but I can't 'cause I've to write fast.

Some expressed disappointment if they cannot put down their ideas in time in examinations:

Chek Kin: I feel disappointed when told to stop, for I still have some to write. I'd have written more to get a high grade, though it's not for the feelings of sharing, not in exam. At home, I have a sense of completeness, for I can put down all I want.

The negative feelings arising from being told to stop, when you still have more to write, arises not from the failure to express and share with others but from the consequences of not expressing enough to be awarded a higher grade. Exams motivate, but at the expense of quality:

Yuen Kuen: Exams motivate you to finish the product quick. It's impossible to have any concern about writing. I'm more motivated to write better at home.

The feelings at home are generally good because they can express all they want, there is then a sense of completeness and satisfaction. Thus, while students only think about the grade during an examination, they may engage in some reflective activities when they write at home. This is particularly true of those students holding the conceptions that writing is an art and writing is to learn how to think:

Ping Kee: After exam, I'll definitely not think about it. I just feel relieved, for I can leave an austere atmosphere. At home, if I like the topic, I'll make it more forceful. I'll even put it in a book, take it out and read it when I'm free.

Chek Kin: People're changing. So I write down my feelings and read them sometimes to see my ways of thoughts, just like a diary. I really enjoy writing at home but in exam, I write for grade; there is not a sense of sharing.

Overwhelmingly, students adopt the achieving approach. They are more motivated to get a high grade, the only thing they can get from it. The affective outcome is generally negative. In contrast, there is positive affective outcome associated with home writing. Some students do engage in some reflective activities in home writing, typical of the deep approach.

Time constraints and strategies for coping

There was a substantial difference in the mean total time spent by the subjects writing in the examination condition and the non-examination condition, 66.6 minutes and 97.5 minutes respectively. Quantitatively, the students spent more time on the following activities for home writing:

1. *Pre-writing activities.* In home writing, two students (11%) reported spending time reading newspapers for more ideas, and two students (11%) spent more time planning and organising. However, in examinations, because of limited time, the thinking process was greatly affected and ideas put down are either unwanted or 'half-baked', as illustrated by the following:

Hack: You can't set time for chickens to lay eggs especially for literature. You can't set task finished within a short time. It only tests the writing speed and the condition you're in, whether you've inspirations at that time, nothing else.

2. *While-writing activities.* In home writing, four students (22%) said they looked up words in dictionaries. Two students (11%) put it aside and waited for inspiration when they could not come up with any good ideas. Three students (17%) reported changing shape with new

ideas and new positions emerging, asking others, and writing more ideas respectively. As for examination writing, many students said that they had to think while they wrote with little organisation and planning. Writing thus is a process of putting down thoughts as they come along (Graves, 1983).

Ping Kee: I just put down a few points and then write. There isn't much organisation and paragraphing due to the word and time constraints. I just write as much as I think is related to the topic within this time and space. In exam., I can't give more examples and elaborations to support myself. At home, I usually do so because I think this is good writing.

The writing process is also disrupted, because they have to refer to the watch all the time:

Alan: Time affects me very greatly. I feel nervous if I can just put down 200 words within half an hour. I count words and look at the time though I know it's bad because if you're absorbed in writing, you won't look at it. For foolscap paper, I count words after writing 3/4 paper.

Furthermore, examination writing is not an expressive act, either you cannot say all you want or your views become distorted:

Wai Ming: I'll put down four ideas though I have 6/7 ideas in examination. At home, I can put down all I can think of because it's always good to broaden my mind.

Since there is not enough time, many views are left unsaid and those expressed may not be what were intended. Writing is neither self-expression nor sharing of ideas:

Yuet Sze: Time affects me greatly, how I think, what points to use. Thinking is entirely different; I'm not my

normal self....

3. *Post-writing activities.* In home writing, seven students (39%) said they wrote more drafts, revised and reviewed to make their writing more satisfactory, checking both content and accuracy. Two students (11%) checked grammar, expression and organisation while one student (6%) proofread several times, checking different levels each time. Yet, when asked if they revised and reviewed in examinations, seven students (39%) said that proofreading was at best optional for lack of time and seven students (39%) said they could only afford to have one draft. Even if there was checking, it had a limited focus:

King Chee: I check grammar only. Even though I come up with a new idea, it's hard to add it technically.

Students only revise the mechanics because it is beyond their control to add or deduct anything easily due to the stringent examination rules. There is hardly enough space to put down a few second thoughts because the Examinations Authority stipulates that all candidates must write on each line. If not, they will suffer a mark penalty. More important, even though students reported surface level processing for examination writing, most students actually do not intend it and 11 students (61%) expressed the wish that time should be extended to bring about better quality writing:

Yuet Sze: Time must be ample. Maybe the whole morning. I need time to cultivate ideas. Ideas thought about for a short period of time aren't what you want.

To sum up, under the time constraint, examination writing is neither a thinking and discovery process nor an expressive activity. Instead, it is disrupted and mechanical, with the students concentrating on word level processing and knowledge telling (Scardamalia & Bereiter, 1983) characteristic of the surface approach. Home writing, on the other hand, displays some deep level activities.

The word constraints and strategies for coping

Many students were worried about not meeting the word limit and thereby having marks deducted. Generally the view they hold is that more is better but writing too much is not good, for they are liable to make more grammatical mistakes which may antagonise the markers:

Ching Han: I'll not write much 'cause markers aren't enthusiastic about marking. Writing six hundred words is OK but 700 is too much. If I write more, I'll make more mistakes and it also means that you don't meet the requirement. Psychologically, I think markers'll feel short compositions poor in quality.

An overwhelming majority are willing to meet the word requirement, even at the expense of sacrificing the quality. The strategies adopted are as follows:

1. *Choosing argumentative topics.* Choice is strategic:

Yuen Kuen: At CE Level, I like descriptive topics 'cause it's easy to write 300. At AL, I like argumentative ones 'cause I can write more.

Examinations, therefore, determine the kind of writing students utilise. Students write more on argumentative topics where they can simply set out points for and against a particular position, though they may not be interested in them. Thus, creative ability is affected. Clearly, this is due to the emphasis on expository writing in the Syllabuses.

2. *Padding.* Students go to great lengths to pad so as to write more to meet the word requirement:

Alan: Word limit is very restrictive. If I just write 300, I feel very nervous. I'll then stuff it by giving more

examples, ask myself what I can include and add more irrelevant ideas.

The distinction between "how much" is written and "what is written" resembles the qualitative and quantitative outcomes of Marton and Saljo (1984). Clearly padding in this way to increase the quantity may well detract from the quality of the composition.

Strategies for the constraint of impressionistic marking

Strategies for getting high marks in examination can be summed up in two words: play safe.

1. *Withhold personal views.* Sixteen students (89%) think that marking is subjective because of different topics and viewpoints. As such, marking is personal. Grammar but not ideas can be objectively assessed. Therefore, one strategy is to withhold one's views for fear of taking risks:

Yuen Kuen: I've to please markers, not to be too critical. Though I've a position, to be safe, I'll write both sides.

Considering the strategy as such, writing about an artificial topic in examination may result in a composition that is not truly argumentative.

2. *Focusing on grammatical accuracy rather than ideas.* With the concern on grammatical accuracy, writing is inhibited; i.e. if students are unsure of expressing an idea accurately, they will simply drop it. Further, students are unwilling to explore and try new things:

Ping Kee: Exam inhibits performance and expressiveness. It actually destroys the purpose of finding out how well students write. Quality deteriorates because of many adjustments. First, there's the fear of wrong use of words, clauses, and sentence structures. So, they break up complex sentences to write simple

ones especially at Cert. Level. Second, they adopt ambivalent positions though they've their positions 'cause they they don't want to offend the markers. Third, they deliberately separate 2 similar notions, for fear that markers think they don't know paragraphing. So paragraphs are short, choppy and incoherent. Exam is unreal, not lifelike. So it's irrelevant to talk of quality. I know some bright students also choose to play safe in exam and they impress the markers in their own ways, e.g. using difficult words....

3. *Memorising model compositions.* The previous two strategies are likely to be adopted by average to bright students to get higher marks whereas the 'model answer' strategy adopted by weaker students is mainly for survival. The following comment is illustrative:

Ching Han: Tip topics. There's great probability of successful tipping. If you read models of a wider scope, the success rate of tipping is 40%....

CONCLUSIONS

These students believe that to achieve in examination writing is to play safe. For example, they may try to express opinions popular with the markers, focus on accuracy rather than ideas, tip topics and memorise models. For the average to bright students, this may result in higher marks. For the weaker students, it is a matter of survival, to get a pass.

The students' descriptions of their experience of the learning context have crucial implications for improving the quality of teaching and learning. Perhaps the most significant single influence is their perception of assessment on writing and their reactions to the institutional constraints. In view of this, one answer to the problem lies therefore in refining assessment. The examination constraints like the time limit, the word limit and the system of grading clearly need closer scrutiny. The conditions for writing have to be modified to encourage deep approaches. In as far as assessment is under teacher

and administrator control, they must strive to ensure that a clear message about what sort of changes in the process and the product of learning are demanded from the students.

Changing the conditions of learning is only half the battle if we really want to improve learning (Ramsden, 1988). For example, one point raised by the students in the interviews is particularly worth noting -- the perception that markers are not enthusiastic about marking. As a result, there is the strategy of not writing too much for fear of wasting markers' precious time and therefore, giving them a bad impression. Thus, when we try to change the conditions for writing, to change students' conceptions of writing, we should also change teachers' conceptions of teaching writing. The answer lies in using reflective teaching strategies (Marton & Ramsden, 1988):

a teacher should take steps to gather specific feedback from his or her students on their perceptions of his or her requirements. (p.280)

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CHAPTER 5

COPING WITH WORKLOAD AND TIME CONSTRAINTS

Amelia Lee

INTRODUCTION

Adult education has grown in importance in Hong Kong over the last few decades, due to a high drop-out rate in secondary education, and people are encouraged to upgrade themselves after they have worked for a few years. Continuing education thus plays a significant role in training and providing a second chance for people. However, it also seems to provide significantly greater time stress on students as they are heavily committed with family, full-time jobs, friends and other social activities as well as part-time study.

Time constraints force students to use a surface approach for learning particular tasks (Ramsden, 1984; see also Chapter 1). However, that conclusion is based largely on research conducted in conventional learning modes. How do adults, studying part-time, and to whom successful time-management is part of their day-to-day coping skills, handle time constraints on their learning? That question is particularly interesting as adult learners enjoy richer experience, clearer objectives in study, and instant practice of what they learn (Kidd, 1973); these are characteristics of deep and achieving approaches to learning and there is evidence that mature age students do score higher on deep and achieving approaches (Biggs, 1987).

Adult students' concept of time is different from that of full-time students as it is regarded as valuable and scarce (Kidd, 1973). An adult's allocation of time depends on such things as: education of the person's parents, amount of activity in childhood home, number of years spent in school, the satisfactions derived from previous attempts to learn, and place amongst siblings as first children devote more

time to learning (Tough, 1978).

The writer attempts to examine how the time factor affects adults' motives for learning, and their devised learning strategies. This Chapter reports a study investigating:

1. the learning motives, strategies and approaches of adult students for both full-timers and part-timers; and
2. the extent to which time constraints affect the approach to learning and learning strategies of both group of students. Will the approaches of these two groups differ when part-time students experience more time stress?

METHOD

Subjects

In the present study, part-time learners are students ($N = 152$) aged 18-39 years, enrolled in part-time courses while engaged in full-time jobs, and have some previous working experience. Full-time learners, on the other hand, are students ($N = 50$) aged 18-39, enrolled in full-time courses; most are recent school leavers.

Design

The empirical study has two parts, involving both quantitative and qualitative analyses. The data are collected from students enrolling in the Certificate in Computer Science, the Higher Certificate in Business Management and the Higher Certificate in Secretarial Studies of Hong Kong Baptist College, School of Continuing Education. These courses are selected as they can either be studied in full-time or part-time mode. The quantitative analysis is based on the responses to the Study Process Questionnaire from part-timers and full-timers. In the second part, we take a deeper look at the impact of time constraint on learning in an ethnographic study, in which six full-timers and twelve part-timers are asked to write diaries. The diary was based on a set of structured questions consisting of the SPQ and the writer's self-designed questions designed to find out how they utilised the limited time available for them to study.

Instruments

The Study Process Questionnaire (SPQ) was used to determine what difference in approaches to learning might exist between full-time students and part-time students.

A 21 day diary was prepared with seven structured questions per day plus two items per day from the Biggs SPQ, modified from a similar technique used by Parer and Benson (1988). Both Chinese and English versions were presented. Students were assured that all information was confidential. The words used in the pre-structured questions tried to be as concise as possible in order to collect accurate data. The first and sixth structured questions were to measure the students' conception of time, and tried to find out whether the time conflict influenced their learning approaches and strategies. The second and fifth structured questions were constructed to understand students' learning methods and preferred resource materials. When all the diaries were in hand, the writer scored the responses to the SPQ items by converting raw scores to deciles according to the appropriate norms for Polytechnic and Sub-Bachelors courses (Biggs, 1992). For the diary analysis and interview, students were classified as "surface", "surface-achieving", "deep", and "deep-achieving", according to the highest decile(s).

Data Collection

The questionnaires were distributed during lecture sessions over two weeks in April, 1991. There were 23 classes involved in part-time mode and 3 classes involved in full-time mode. The researcher explained briefly her background, the objective of data collection and the technique of filling in the response sheet in order to eliminate unnecessary bias and distortion of data.

The 21 day diary with structured questions was mailed out together with a covering letter to explain the purpose of diary writing. Eight full-time students were randomly selected among the fifty respondents whereas twenty-two part-time students were randomly selected among the 152 respondents. They were requested to participate in the second part of the research, which began late in April, 1991. The students were contacted from time to time to ensure

that they were completing the diary correctly and to try to obtain a high rate of return.

One month later, six sets of records were returned from the full-time students and fifteen sets of records from the part-time students, but three completed only one-third of the questions. Thus there were only twelve qualified diaries from part-timers. The response rate was more than 50 percent which was regarded as satisfactory.

RESULTS

Quantitative Data

Analysis of the responses supported the internal consistency, reliability, and factorial validity of the SPQ for these students.

The comparison of part-timers and full-timers on SPQ subscale score showed no significant differences at the .05 level between full-timers and part-timers on approaches to learning, or on the motive and strategy subscales. There were however statistically significant differences in age, marital status, and employment status of the two groups ($P < 0.05$). As expected, the part-timers were more likely to be older than the full-timers, married, and employed.

Qualitative Data

The main purpose of this part of the study was to understand the ways in which students tackle the problem of time, in particular to understand:

1. the extent of time problems in their lives by linking the aspects of work, family life and social relations if applicable;
2. their study schedule; and
3. the ways in which they cope with time constraints, and to see if there were any differences in coping method according to their approach to learning.

Perception of Time Availability. Almost every student found insufficient time to study, no matter whether they were full-time or part-time students. The part-timers were very busy working, attending

evening class, participating in social activities and sharing time with family members. They felt they were rushing in and out all the time. This feeling eased a little for full-time students, but some of them who worked part-time found themselves stressed doing assignments and working.

I feel that my will to study goes against my family and other social commitment.... I have to attend class tonight. I have no time to study.

(a deep-achieving part-time student)

I cannot spare time to memorize all my course materials since I have to give private tutorial everyday.... I'm not the same as other classmates who have time to study. I cannot spare any time for my study....

(a surface full-time student)

The effect of time constraints on student learning. Time constraints have greater effect on students' learning strategies than on motive. They usually cannot review notes frequently, tidy up all notes in good order, browse around books and magazines, and so on. It was found that students who adopted a deep approach reacted positively towards time problems by revising their work schedule, but students with a surface approach used "time" as an excuse. The motive of surface-achieving students is affected by the limit of time so that they regarded reading anything more than the specified text as a waste of time. Not much difference is found between full-timers and part-timers.

If there is time, I will study as much as possible especially when the exams come. I usually feel anxious and nervous. Though I do not have regular study schedule, I take time off from my busy work to study.

(a deep part-time student)

I seldom work consistently over the term. It is almost nil. I need to give private tutorial everyday. I can only review my notes one week before the exam... I have no time to study.

(a surface full-time student)

As part-time students, we don't have time to study. The teacher shouldn't expect students to spend significant amount of time studying materials which everyone knows won't be examined.
(a surface achieving part-time student)

The study schedule. It was possible to record the average time spent per day in study from further analysis of the diaries. There were insufficient numbers to permit statistical analysis, and there were very wide ranges, but some conclusions seem clear (Table 5.1).

Table 5.1: Average time spent studying (hours per day) over 21 target days

SPQ Profile	Full-time	Part-time
Surface	1.9, 1.5, 2.8, 1.3 (N = 4)	0.0, 0.0 0.0 (N = 3)
Surface-achieving	2.8 0.5, (N = 1)	0.3, 2.0 (N = 3)
Deep	2.0 (N = 1)	0.4, 1.1, 2.0 (N = 3)
Deep-achieving	-- (N = 0)	1.00, 2.2, 1.5 (N = 3)

Full-time students tend to spend more time on study and revision than the part-timers, not surprisingly. Amongst the part-timers, however, deep and deep-achieving students possibly spend more time on studying than surface-achieving students, but all three

surface students recorded no time spent in study. As one said:

I'm not the same as other classmates who have time to study. I cannot spare any time for my study.

The way to tackle the problem of time

Some students devised good ways to solve the problems of time constraint. Some made better time management, some made use of spare office time and some made use of odd time. The students who use deep and deep-achieving approaches develop ways to overcome the problem of time. They make full use of their spare time, such as the time on their way home.

..... How do I study? I pay attention in class and think it over on my way home to digest all materials in class. When exams approach, I take extra time to review. I can manage thinking over what had been taught in class can deepen my memory and can save time.

(a deep-achieving part-time student)

I usually read through the course material once before next class. I underline important points and include them as part of my notes on a topic ... I try to have an overall revision for all courses a week. When there is any problem, I can raise them in the next lecture.

(a deep part-time student)

Their learning methods, such as frequent questioning to clarify points, are so effective that they usually 'deepen' in their minds. They seldom sacrifice private life to study. This allows them to enjoy their study. On the other hand, the strategy of surface-achieving students is only for particular examination or tests. It cannot be long-lasting. Surface students tend to spend little or even no time on study;

I usually do my revision before the exam unless I have spare time to study. Normally, I take some time off during my office hour or lunch time for revision.... I have scheduled my study

time-table since there is a test two weeks later.... As the test is approaching.... I give up all personal appointments.... Though I am tired, I keep working hard for the coming test.
(a surface-achieving full-time student)

CONCLUSION

The hypothesis that adult part-time students tend to be more surface-achieving than full-time students on account of time constraints was rejected. There were no differences between part- and full-timers on any of the SPQ scales, and both part-time and full-time students sampled experience time constraints. Perhaps the most interesting finding of this research was that students with deep approaches overcome the problem of time successfully. The time factor does not affect their motives to learning in this sample, as both the part-time and full-time students experience time problems, but it does affect how they studied in order to cope with the time problem. The strategies for handling time employed by students with deep approaches and students with surface approach were very different.

Students employing surface approaches take the lack of time as an excuse for not studying. They try to convince themselves that not spending too much time on study is reasonable. Their study time is very little and most of them only do revision as the examinations approach. They rely heavily on what the teachers have provided, such as notes, course outlines, and study guides. They think that the instructor should not expect too much from them as they do not have the time to find or even look at any extra course materials. Their motivation for learning is at such a low level that they just want to get the qualification.

On the other hand, the will to study for students with deep motivation is very strong. They have clear goals in mind and they try to achieve them as far as possible. In facing many barriers to study, such as time constraints, traffic problems, family commitment, full-time job and so on, they still maintain a good balance between the will to study and these barriers by studying late at night, making good use of their spare time, and thinking over the lecture content while they are on their way home. They employ skilful techniques to solve problems.

Thus, time constraints do not necessarily encourage a surface approach in handling particular tasks. This is likely only in those already already predisposed towards a surface approach, not in students predisposed towards a deep approach.

It is significant that age is positively correlated with the deep approach to learning (Biggs, 1987). It is also true that mature age students can and do cope well with handling time demands from their employment, families, and part-time study (Parer & Benson, 1988; Tough, 1978). The part-time students in this study were significantly older than the full-timers. Did they cope better with time demands because they were older and more experienced in time management, or because of a deeper approach to learning?

The answer at one level is important because it is not clear if inducing a deeper approach does in itself help students to cope better with time. Further research is necessary to separate out these factors. But at another level maybe it does not matter; it is still accepted that making students to be deep motivated is the best solution to overcome most barriers to study.

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LANGUAGE MATTERS

CHAPTER 6

THE EFFECTS OF ENGLISH MEDIUM IN THE PRIMARY SCHOOL YEARS ON LATER ACHIEVEMENT

How-kei Chan

INTRODUCTION

The use of English as a medium of instruction in primary and secondary schools in Hong Kong has led to much research in assessing the effects that it has on students' learning. It seems quite conclusive from this work that there are adverse effects on the overall performance of at least the majority of the school population in Hong Kong, and that the mother tongue (Cantonese) should be used for the purpose of teaching and learning to enable maximum cognitive development among these students (Llewellyn, 1982; Education Commission, 1984, 1986, 1988; Brimer, 1985a, 1985b; Crawford, 1986).

Primary students in Hong Kong are today predominantly taught in Cantonese with textbooks written in standard Chinese (i.e. Putonghua); only a very small minority (less than 1%) use English textbooks for subjects like science, arithmetic, health science, geography, history and social studies. In the great majority of schools, English is only learned as a foreign or second language.

In secondary school, on the other hand, more than 90% of students are taught with English textbooks, with internal and external examinations also conducted in English (Tam, 1984). Teachers conduct their lessons in a mixed mode of English and Cantonese, depending on the students' perceived competence in the use of English, the difficulty of the subject matter, the policy of the school and, of course, the teacher's own competence in the use of English. Johnson (1983) found that the average talking time engaged in a

lesson by a teacher was about 43% English, 48% Cantonese and 9% Cantonese inserted with English terms, with code-switching (i.e. switching from using English to Cantonese and vice versa) every eighteen seconds. The amount of English used differs among teachers and subjects and levels but it is extremely rare that a teacher will use only English as the medium of instruction. Actually, only one teacher in Johnson's sample of fifteen used only English in his lessons.

Because of the great varieties in how, and how, much English is used in the classrooms, these studies tend to be looking at very different scenarios, and it is difficult to draw general conclusions. Many investigations make conclusions about the use of English as the medium of instruction in Hong Kong schools, but the fact is "English" might be used in textbooks only, and a minimal amount used as discourse during lessons. These investigations seldom spell out the extent to which these students receive their instruction in the medium of English. Very little has been done to investigate students' learning when they are exposed to English as the medium of instruction over a considerable period of time (i.e. for at least a few years).

The present study is an attempt to investigate the effects on students' achievement when English is rigorously used as the medium of instruction in secondary school, and when the students come from English or Chinese medium primary school.

METHODOLOGY

The instructional language environment of "School E"

"School E" is a secondary school where English is used rigorously as the medium of instruction. All academic subjects, except Chinese and Chinese History in S1 to S3, are taught in English as the sole medium of instruction as school policy. Textbooks are all in English and teachers use English in lessons for more than 90% of the time; teachers or students occasionally use Cantonese for a few utterances, especially in Form 1 where some students do not have the ability in English to fully understand everything they need to. In S4 and S5, all subjects except Chinese, Chinese History and Chinese Literature are taught basically 100% in the medium of English.

School E attracts the best students from its own feeder primary

school and other schools in the school district, students being assigned only to the high ability band students (Band 1 and 2, and occasionally some Band 3) to its S1 classes. 65% of its S1 places are from the "feeder" primary school; some 10% are students from discretionary places (about 10%) who would not normally be assigned because they are of a lower band; remaining S1 places are filled by students in schools from the same school district. There are four classes in each of S1 to S5 and the proportion of feeder school students (FS) to non-feeder school students (NS) is approximately 2 to 1, and among FS students, the proportion of Band 1 to Band 2 students is roughly 3 to 2 and for NS students, the ratio is 2 to 1.

FS students received their primary schooling in the medium of English in most of their subjects as early as P1. These subjects include arithmetic, history, health, science, geography and social studies. More Cantonese was used in explanation of subject materials in lower primary classes but its use decreased as students progressed to senior levels. English and Chinese as language subjects were also learned. Cultural subjects such as Music, Art, Craftwork and the like were taught in Cantonese.

All NS students came from Chinese Medium primary schools, where all subjects except English are taught using Cantonese as the teaching medium. Students assigned to School E have to take a competency test in English, in which FS students are found to be superior to NS students. Students who are weaker in English are assigned to one class where "remedial" measures in the language are provided. Another class accepts students who are best in the competency test and some of them can choose to do French as a third language starting from S1. The rest of the students are spread into the remaining two classes.

All subjects except Chinese and Chinese History are taught using English as the medium of instruction during lessons in all four classes, but Cantonese might be used sparingly when students have difficulty in understanding the teaching materials.

Students with marked improvement in English are sometimes transferred to the other groups when promotions are done at S2, but there is limited mobility between groups in fact. Learning conditions remain more or less the same for the classes in S2. At the end of S2, students are re-grouped into four classes in S3. Except for the small

number of students taking French, who are left as an intact group, all other students are assigned on an essentially arbitrary basis to S3 classes and, except for those taking French, study the same subjects.

When students enter S4, they are required to study four compulsory subjects (Chinese Language, English Language, Mathematics and Biblical Knowledge) and five other subjects of their own choice, comprising various combinations within arts and science streams. Teachers in S4 and S5 use English basically 100% of the time during lessons.

Subjects

For various reasons, including emigration, only about 60% of the students who enter S1 successfully complete S5 and sit for the HKCEE. A total of 239 students entered School E in 1982, 1983 and 1984 in S1 and successfully completed their HKCEE examinations in 1987, 1988 and 1989 respectively; these students are the subjects of this study. Three cohorts are chosen because the attrition rate of 40% would severely reduce sample size if only one year was studied, and because problems of atypicality are reduced. The 1982, 1983, and 1984 cohorts were the last batch of students who took JSEA as the selection method for Form 4 places, and were closer to one another in their learning environment both socially and educationally both within and outside school.

Of the 239 students, 147 (83 Band 1, 64 Band 2) are FS, and 92 (60 Band 1, 32 Band 2) are NS. All are female.

Measures

Marks of the subjects each student took at different levels (S1, S3 and S5) are used for this study. The school from which they had their primary schooling and their banding are used as classifiers. The following describes the marks and how they were obtained.

1. S1 internal average marks of individual subjects of each student were obtained from the Principal of the school. The subjects of interest are: Chinese, English, Mathematics, Integrated Science, Social Studies (the average of History, Geography and E.P.A.), and

Chinese History. All marks are from 0 to 100, and the pass is set at 50. The school also provided information concerning the primary school affiliation and banding of each student.

2. The scaled scores of the six subjects (as in (1)) for each student were obtained from the JSEA Record Section, Education Department. These scores were converted from S3 internal assessment scores of the students with adjustment with reference to the "JSEA score" representing the school. They are a reflection of the individual's attainment in the subjects as compared to that of the entire Form Three population who participated in the JSEA allocation procedure in Hong Kong. All scores are from 0 to 900.

3. Raw scores of subjects taken in the HKCEE by each student were obtained from the Record Section, Hong Kong Examinations Authority. The range of marks and cut off points for grades in each subject were also provided.

RESULTS

First, correlations between English and other subjects were obtained at each level, separately for FS and NS students, in order to see the extent to which the medium of instruction correlated with achievement in other subjects, and particularly to see if these correlations varied between FS and NS students. There was a general trend for higher r s in the NS students early in secondary school, but these diminished in S5. In other words, performance in the content subjects appeared to become less language dependent by S5.

These results are shown more clearly by directly comparing the performance of FS and NS students in various academic subjects at S1, S3, and S5. Accordingly, t-tests were carried out on the academic achievement of FS and NS students. They indicate significant superiority of FS students in S1 in all subjects that were heavily English language dependent, and no significant difference in Mathematics and Chinese related subjects (Table 6.1).

Table 6.1: Results of t-tests on academic subjects in S1 between FS and NS students (FS=147, NS=92)

Subject	Mean (SD)		Level of significance
	FS	NS	
Chinese	75 (11)	75 (12)	n.s.
English	72 (7)	66 (9)	.000
Mathematics	82 (9)	81 (10)	n.s.
Science	77 (10)	64 (14)	.000
Soc. Studies	77 (10)	68 (13)	.000
Ch. History	71 (15)	76 (14)	.02

This pattern is repeated in S3 (Table 6.2).

Table 6.2: Results of t-tests on academic subjects in S3 between FS and NS students (FS=147, NS=92)

Subject	Mean (SD)		Level of significance
	FS	NS	
Chinese	584 (65)	595 (53)	n.s.
English	670 (17)	650 (30)	.000
Mathematics	592 (58)	573 (61)	n.s.
Science	639 (29)	624 (32)	.000
Soc. Studies	645 (24)	633 (30)	.01
Ch. History	617 (34)	621 (34)	n.s.

In S5, however, when the students took the HKCEE examinations, there are no significant differences in any subject, apart from the two languages themselves (Table 6.3).

Table 6.3: Results of t-tests on academic subjects in the HKCEE examinations between FS and NS students

Subject	Mean (SD; N)		Level of significance
	FS	NS	
Chinese	134 (22; 147)	142 (20; 92)	.01
English	297 (26; 147)	274 (36; 92)	.000
Mathematics	127 (30; 147)	122 (33; 92)	n.s.
Science	242 (57; 48)	246 (54; 18)	n.s.
Biology	131 (28; 98)	131 (26; 51)	n.s.
Ch. History	111 (23; 7)	121 (22; 16)	n.s.
BK	61 (14; 147)	58 (15; 92)	n.s.
Ch. Lit	153 (37; 18)	184 (36; 25)	.01
Eng. Lit	52 (15; 130)	51 (15; 55)	n.s.
Geography	155 (27; 76)	147 (24; 50)	n.s.
History	140 (33; 48)	124 (39; 26)	n.s.
Economics	152 (29; 120)	146 (31; 85)	n.s.
Accounts	68 (13; 49)	72 (13; 38)	n.s.
Computer	125 (19; 37)	124 (17; 32)	n.s.
Typing	62 (14; 18)	67 (10; 14)	n.s.
Home Econ	107 (16; 12)	100 (12; 11)	n.s.
Art	67 (29; 15)	78 (30; 11)	n.s.
Additional Mathematics	98 (35; 24)	109 (37; 8)	n.s.

It thus seems that primary school background maintains its effects on the language itself, so that English primary medium students are better in English and Chinese primary medium students better in Chinese, but that the subjects taught seem by now to be unaffected, except ironically Chinese Literature at which the FS students are significantly worse. A subanalysis of Band 1 and Band 2 students showed that this tendency in FS students was restricted to Band 2,

not Band 1 students who did equally well in Chinese as Chinese primary medium students.

In order to put the results of this school in perspective, Table 4 presents students' HKCEE mean marks and the entire candidature's cutting grades in major subjects.

Table 6.4: Rough Estimation in Percentile Ranking of Students' major HKCEE results

Subject	Mean Mark (FS; NS)	Estimated Percentile Ranking in entire HKCEE candidature
Chinese	(134; 142)	60-percentile
English	(297; 274)	95/90-percentile
Math	(127; 124)	75-percentile
Ch History	(111; 121)	50-percentile
Ch Lit.	(153; 184)	60/50-percentile
History	(140; 124)	80/70-percentile
Geography	(155; 147)	85-percentile
Economics	(152; 146)	90-percentile
Accounts	(68; 72)	90-percentile
Biology	(131; 131)	75-percentile
Science (Phy/Chem)	(242; 246)	60-percentile

School E students, whether from English or Chinese medium of instruction in primary school, FS or NS schools, are obviously doing very well compared to other Hong Kong students, especially in English and in subjects taught through English. They are less good, but still above average in science, and around the average in Chinese History and Chinese Literature. However, as these subjects are relatively unpopular and are not usually chosen by the best students, this relatively poorer showing may not necessarily reflect competence in Chinese Language.

DISCUSSION AND CONCLUSION

Effects of learning in English at different levels

These results clearly indicate the effects of the language medium in primary school in the early secondary years and that the effects diminish by S5 when the secondary language policy is rigorous and consistent.

Removing the use of English as a medium of instruction at secondary level would certainly create a more comfortable environment for learning, but this would probably cost these students the opportunity of one day becoming bilingual instead of monolingual.

By S5, few differences between FS and NS students remain except in competence in the languages themselves. Comparisons with the total candidature who took the HKCEE examinations indicate that both groups of students were successful in most subjects. The students in this study were Band 1 and 2 students, representing the top 20% to 40% of the student population at the time of Primary Six. Even when there is no fall in the standard among these students, they would probably be no higher than the 70-75 percentile in academic achievement among the entire school population in Hong Kong. Results from the comparison show that these students were performing extremely well in many areas, except in those Chinese related subjects. This shows that after five years of being taught in a second language, NS students do not perform any worse than the best of students who might have gone through their schooling in a different mode of instruction.

Both FS and NS students have achieved the standard of 90-percentile in English. There seem to be no explanation other than that the secondary learning environment produced such convincing results. However, a few more years of English Medium teaching in primary school might have given the FS students an advantage over the NS students in better development of the English Language itself.

It is worth investigating what caused the relatively low results in those Chinese related subjects. Both Chinese History and Chinese Literature scores are at the 50-percentile level, which is low compared to achievement in other subjects. The number of students

who took the two subjects in Forms 4 and 5 were 23 and 43 respectively. These numbers only represent about 10 to 20% of the sample of students, suggesting that these subjects were unpopular and less likely to be chosen by the better students, so that it does not necessarily follow that competence in Chinese medium subjects was impaired by the rigorous use of English.

Limitations and suggestions for further study

This study has at least three limitations. It has only concentrated on one of the possible factors that bring about high achievement in students. It is obvious that students that went through the five years at School E had achieved successfully, but how much the medium of instruction had contributed to the success remains to be evaluated.

This study does not claim that the use of English in teaching will always produce desirable results; much research has pointed to the contrary. This study simply looks at one school and one way of teaching/learning and claims that it is successful for its own students. It would be even more beneficial if different approaches and strategies are compared and perhaps an optimal solution can be found.

These data only looked at examination scores, and there are numerous other ways of representing students' learning, such as representing learning in SOLO terms. Many of these are just as important as examination scores and it would be interesting to note if a teaching medium that caters for one might have a different effect on another.

Conclusion

This study sets out to evaluate whether learning completely in a second language would have any adverse effect on learning. For high achievers, it seems clear that they are able to achieve reasonable success at school if they are given sufficient time. Previous analyses clearly demonstrated that although they were lagging behind other students in the first few years, they could at the end of S5 out-perform many who had not had the opportunity of learning in such an environment.

Students who participated in this study were all Band 1 and Band 2 students and it is recognised that many high achievers will succeed in the end even in unfavourable conditions. Therefore, it remains to be seen whether English can be used genuinely as a medium of instruction with those lower Band students, or under what conditions it can profitably be employed.

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CHAPTER 7

TEACHING HISTORY IN THE MOTHER TONGUE

Belinda C.Y.S. Cheng

INTRODUCTION

The debate on the balance between English and Chinese as media of instruction in Hong Kong has a long history. Ethnically, 98 per cent of the population is Chinese and they speak Chinese at home. However, English is regarded as the more prestigious, high competence in that language is seen as guaranteeing more educational, professional, and financial opportunities. Even though 1997 implies that the language of colonial power (English) will decline in importance, parents still prefer to send their children to those Anglo-Chinese schools that use English rigorously as the medium of instruction. In their eyes, "English is the passport, it is the prestige, it is the profession, and parents want their children to get on the boat early and to stay there" (Fu, 1987: 29). This parental preference and social prejudice stem from the feeling that greater exposure to the language should benefit proficiency.

However, since the introduction of compulsory education in 1978, a large proportion of students have experienced learning difficulties, particularly when taught through the medium of English, to the point where some teachers find it very difficult to use English exclusively even in the teaching of English (Ho & Naerssen, 1986). In such a teaching context, only a minority who have high proficiency in English can succeed in the system and make their way to post-secondary education.

With English as the predominant medium of instruction, many students are unlikely to have developed the linguistic skill that can enable them to benefit cognitively and academically from a foreign-

medium education. In fact, the English-medium education in Hong Kong adversely affects many students' educational attainment. Hong Kong classrooms are often said to encourage a predominantly rote approach to academic learning. A typical view is that expressed in a *South China Morning Post* editorial (12 Sept., 1987):

The majority of schools use English as the medium of instruction although most students are not sufficiently proficient in the language they are trying to learn; they are compelled by this weakness to spend much of their time memorizing the English words to fulfill their study objectives to the extent they fail to grasp neither the English nor the Chinese language well.

To cope with this language problem, educators and policy makers in Hong Kong have devoted a lot of effort to modifying the teaching context. Suggestions include revising the curriculum and method of instruction, teacher training, the encouragement of the use of Chinese as the language of instruction, the research and preparation of bilingual textbooks (Education Commission, 1984, 1986, 1988, 1990).

Language issues in the Hong Kong education system have already been extensively discussed by a number of writers (e.g. Fu 1987; Luke & Richards, 1982; Johnson, 1983; Yu & Atkinson, 1988; Tam, 1986; Siu & Mak, 1989; Ho & Naerssen, 1986), indicating that, all other things being equal, teaching and learning in the mother tongue is educationally more effective. Even when taught in English, students showed better performance when tested in Chinese than in English, particularly for the low achievers in schools (Tam & Yuen, 1985; Mok, 1985). Relatively little is known, however, about students' study processes when learning in different language media of instruction.

There is some evidence that both secondary and tertiary ESL students were significantly higher than monolinguals in deep approach to learning (Biggs, 1987a; Cantwell & Biggs, 1988). Bilinguals in these studies seem to concentrate on main ideas and themes to compensate for difficulties in coping with the lower order mechanics that are virtually automatic in monolinguals, which is a different view from that expressed in the *SCMP* editorial suggesting that English medium

promoted surface approaches. It would therefore be important to find out what happens in the Hong Kong situation, by looking at students' depth of processing and survival strategies in their learning activities.

The present study is an attempt to investigate the study processes students employed in different modes of presentation and the quality and quantity of their learning outcomes. Learning quality is assessed by applying the SOLO Taxonomy (see Chapter 1). Affective information on students' feeling about learning in the English medium is also included. It is hoped that such analyses will find a relationship among modes of instruction, study processes, and learning outcome so as to contribute to the research on how Hong Kong students go about their learning with English as the medium of instruction.

SUBJECTS AND METHOD

The subjects were 36 Form 4 female students from an Anglo-Chinese school. This class was selected since they take both English History and Chinese History, and therefore study two subjects of similar teaching contents and nature, but differing in the teaching medium employed. Some parts of the syllabi of both subjects coincide with each other. S4 was chosen because the students would not be too much preoccupied by public examinations and less pressure would be exerted on them. The school, a subsidized Anglo-Chinese girls' school with English as the medium of instruction, is typical of the majority of schools in Hong Kong.

The subjects were divided into two language groups with equal numbers (English and Chinese) randomly. Within each group, subjects were further subdivided into three groups (high, average and low achievers) according to their marks obtained in the subjects of English, Chinese, English History and Chinese History in the mid-term examination. All subjects participated in the specific tasks and twelve were chosen for interview (see Table 7.1).

Table 7.1: Students chosen for interview

	English	Chinese
High Competence	3	3
Low Competence	3	3

Tasks

Two tasks, one from English History and one from Chinese History, were chosen. The teaching content and nature of the two are more or less the same, but in the former English was used as the teaching medium with Cantonese explanation for some key words or expressions, and in the latter, the mother tongue was the teaching medium. The content of both tasks did not fall into the syllabus in S4 so that no student would have any prior knowledge of it. The two tasks were presented in both English and Chinese versions. They were used to measure the learning outcomes where there was a difference in modes of presentation. The interview schedule was to tap information on students' study processes especially on their learning strategies for English History and Chinese History. Detailed instructions were given at the beginning of the tasks and the interview.

Task I. Students were first asked to read a text, abridged from *A Certificate History for Hong Kong - The Modern Transformation 1760-1970* of an historical abstract entitled "International co-operation". Half the group were given the English version and the others the Chinese version. Students were instructed to concentrate on the facts and details in anticipation of factual recall items, namely true and false questions.

Task II. A historical text, abridged likewise from *A Certificate History for Hong Kong - The Modern Transformation 1760-1970 and East Meet West Volume 3 - 1919-1970* entitled "The War in Asia", was read by

the students. Students were asked to concentrate on meaning in anticipation of open-ended questions to be analysed by the SOLO taxonomy for structural complexity.

In sum, then, each student in both the English and Chinese groups was instructed to read one text meaningfully and the other for detail, while each text had been presented in both English and Chinese, followed by both highly factual questions and an open-ended question. Thus, after the completion of tasks, the following data were available: language medium (English, Chinese), condition for learning (meaningful/factual), number of factual details recalled, SOLO level. SOLO level was taken as index of quality of learning, recall of details that of quantity of learning.

Study processes. In the following weeks after the tasks, interviews were conducted to obtain information on students' study processes on the actual tasks completed and their general approaches to learning the two subjects: English History and Chinese History. Other information elicited from the subjects included learning strategies in studying English History and Chinese History, and their personal feelings towards the question of language of instruction.

Study design. Modes of presentation (English and Chinese), and level of competence (high, average and low) in the subjects of English, English History, Chinese, Chinese History, were defined as independent variables; and total scores of factual recall items for both tasks, and of SOLO items for both tasks, as dependent variables in a two-way ANOVA. Interview data were analysed into deep and surface processes, and the learning strategies in specific as well as general tasks were elicited from subjects with either high or low competence for information on relationship between language medium, study processes and learning outcomes.

RESULTS

Relationship between Language Medium and Learning Outcomes

Paired t-tests and independent t-tests between students' scores in

factual recall items, SOLO items in English and Chinese groups in both tasks under factual and meaning conditions of presentation, indicate that the means for scores for English medium of instruction were consistently lower than those for Chinese medium (Tables 7.2 and 7.3).

Table 7.2: Results of Specific Tasks for the Quantity of Learning

Task	Mode of Presentation	Means (Factual Recall Scores)	<i>t</i> (<i>P</i> <)
I (Fact)	English	2.67	n.s.
	Chinese	3.33	
II (Meaning)	English	2.89	<.01
	Chinese	3.67	

Table 7.3: Results of Specific Tasks for the Quality of Learning

Task	Mode of Presentation	Means (SOLO Scores)	<i>t</i> (<i>P</i> <)
I (Fact)	English	2.22	<.01
	Chinese	3.11	
II (Meaning)	English	1.94	<.001
	Chinese	3.22	

Relationship between Level of Language Competence and Learning Outcomes

ANOVAs with level of language competence and language mode of presentation (Table 7.4) yielded a non-significant effect with average factual recall score and level of competence in English. However there is a significant interaction between the Level of English competence and Language mode of presentation ($p < 0.05$), showing that students of low English competence benefit considerably from instruction in Chinese, but that the language mode of presentation makes no difference with respect to factual recall with students of high English competence. There was only one significant effect on SOLO scores: high English competence produced higher SOLO scores whatever the medium.

Table 7.4: Results of ANOVAS for level of language competence and language mode of presentation

Source of Variation	P Value
Average Factual Recall Score	
Eng. Comp.	n.s.
Lang. x Eng. Comp.	<0.05
Chin. Comp.	n.s.
Lang. x Chin. Comp.	n.s.
Average SOLO Score	
Eng. Comp.	<0.01
Lang. x Eng. Comp.	n.s.
Chin. Comp.	n.s.
Lang. x Chin. Comp.	n.s.

Eng. = English, Chin. = Chinese. Comp. = Competence

Relationship between Study Processes and Language Medium

Interview data from 12 students with high and low level of competence in both language and subject matter indicate that there is no strong evidence that using English as medium of instruction promotes more surface processes in learning. Both surface and deep processes were adopted by both language groups:

I remember key words, phrases and sentences for safety.
(surface)

I try to use my own words in answering if I can't remember.
(deep)

The interview data suggested that surface processing is not mainly associated with the English mode of instruction, and deep processing with learning in the mother tongue, as expected. Indeed, rather the contrary took place, as indicated in the following typical statements:

I rote-learn more as I can remember easily. (Chinese History)

I translate from English to Chinese for understanding and thinking and back to English in writing. (English History)

These examples illustrate that the interview data generally did not allow firm conclusions to be drawn concerning strong relationships between study processes and language medium. Different students seem to be handling the problem in different ways.

DISCUSSION

The present findings indicate that English medium of instruction leads to poorer learning outcomes, both quantitatively and qualitatively, but the interview data did not allow one to conclude that English medium necessarily leads to surface level processing.

Teaching medium operates at the presage level of the 3P Model, together with students' language competence in influencing their way

to go about learning and hence the learning outcomes. Students' study processes are identified as deep and surface, as suggested by Laurillard (1979) and Marton and Saljo (1976). There is a tendency for surface and deep processes to be found in both English History and Chinese History, with even possibly more deep processing associated with English History and surface with Chinese. A complex translation process occurs when students use the English medium, so whether English medium induces more surface processes or deep processes cannot be concluded since further investigation into the actual study processes behind the translation processes is needed. Furthermore, although deep processes appear to be associated with the use of a second language as the medium of instruction, the adoption of the deep approach is not necessarily associated with *better* learning outcomes (Chan, 1990). As the present results show, learning in English as L2 is progressively worse, compared to mother tongue instruction, as English competence declines; clearly, language competence in the end over-rides a deep approach.

To summarise, then, the present study suggests a definite relationship between language medium and learning outcomes: better learning quantity and quality are associated with Chinese medium of presentation. However, whether teaching in a second language medium, as opposed to the mother tongue, leads to surface approaches to learning and to poorer learning outcomes on that account is on this evidence still unclear.

PRACTICAL IMPLICATIONS

The present results support previous research findings that learning is more effective if taught in the mother tongue. The students do express their feelings that learning tends to be easier and facts are more easily remembered in the first language. They also indicate a great interest in reading and learning as they enjoy the study process without any translation process or vocabulary problem.

On the other hand, there is evidence that using English as the medium of instruction encourages a deeper approach to learning and is thus beneficial; however, for those with low competence in the language, that is little help. The latter students have problems in their linguistic repertoire, and their lack of ability to express their opinions

and present their argument. The process of translating from English to Chinese and back, seemingly representing some aspects of a deep approach to learning (Biggs, 1990), probably does not occur in those who lack the competence to do so and it would be these students who have to resort to rote-learning. As one of the interviewees expressed it, "following the words from the book is easier than to express in (my) own words." This phenomenon is not uncommon among students' in Hong Kong. Thus while education should be for all, universal employment of English as the medium of instruction does not seem to be appropriate. For those who have the ability to cope with learning in a second language, such provision would be beneficial, but for those who are not linguistically competent, instruction should be in the mother tongue.

Nevertheless, parents and students in general choose not to switch into Chinese as the medium of instruction. In fact, with the peculiar language situation in Hong Kong, both languages are needed in the education system. The recent suggestion of streaming into instruction in different languages at the secondary level in Education Commission Report No. 4 (1990) which aims at ensuring that each student can be 'educated through a medium likely to lead to maximum cognitive and academic development' appears to be a feasible solution to the problem of language of instruction. The policy should be implemented, however, only when there are adequate supporting measures such as bilingual textbooks, intensive English bridging programmes at various levels, strengthened teacher education and most important of all, the public acceptance of both English and Chinese in employment and educational opportunities.

Finally, there are implications for the improvement of the teaching context. As the interview data suggested, surface processes are very often associated with the study of Chinese History which is a subject conducted in the mother tongue. That gives us a hint that the problem of the deep and surface approach to learning has gone well beyond the question of teaching medium. Given the inevitable competitive and examination-oriented nature of the Hong Kong education system, teachers and students, particularly those who are not competent in English, are bound to use a collection of survival strategies that bypass the usual approaches to learning.

To be realistic, teachers or schools should adopt teaching

methods to help students get the most out of the existing system. The creation of favourable learning environment using highly structured teaching procedures with clearly defined objectives and an emphasis on mastery learning for those low achievers and providing a high structure emphasizing examination techniques and norm-referencing (Biggs, 1985) for high achievers may well develop students more in the deep direction of learning.

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CHAPTER 8

WHAT MAKES A GOOD READER?

Hebe Wong

INTRODUCTION

What makes a good reader? Many students, parents and even teachers would say that those who score highly on reading tests are successful readers. Processing each and every letter, word recognition, and grammatical knowledge are typically seen as necessary for good reading, rather than how readers actually go about the task of reading. The present study, instead of looking at reading outcomes, focuses on the *process* of reading, and its relationship to learning approach and language competence.

Bottom-up and top-down processes

Increasingly, experts agree that learning to read is knowing how to use strategies to maximize the understanding of a text, and that reading strategies are essential to better reading. Many researchers have attempted to define and classify reading strategies, which may be classified as involving "bottom-up" and "top-down" processing (van Dijk & Kintsch, 1983). The former is a lower level, data-driven strategy while the latter is a higher level, global knowledge-driven strategy.

Goodman (1975) saw reading as a bottom-up activity in suggesting that reading was a guessing game. While reading, a reader will predict, confirm, reject and correct the meaning of text, making a tentative guess which should be consistent both with the information in memory and with the graphic cues. The more competent the reader is in language, the better he or she can reconstruct a replica of the text.

Rumelhart and McClelland (1977) enriched Goodman's model by suggesting that new information be integrated with old information in order to be confirmed or rejected in reading, in line with Carroll's (1971) description of the reading process as one in which newly extracted information was checked against one's own experience. Block (1986) regarded the searches and struggles for meaning as the core of reading comprehension, categorising strategies into two levels: those for general comprehension, and those for local, linguistic aspects.

Kirby (1988) distinguished eight levels at which reading-related processes could occur (moving from lowest to highest): features, letters, sounds, words, chunks, ideas, main ideas and themes. When comprehension begins from word level, it is a "bottom-up" process. When readers read on with expectations created by confirming and rejecting the hypotheses of meaning generated by the text so far, it is a "top-down" process.

Proficient and less proficient readers. Proficient and less proficient readers adopt different strategies in reading. Goodman (1975) suggested that proficient readers would recover quickly from the wrong predictions since they would more often make use of their world, language, and reading knowledge to derive the meaning of the text, while less proficient readers would have to sample much more from the text in order to derive the same amount of meaning.

To summarise, good readers make efficient use of short-term memory by effectively bringing to bear their prior knowledge of the world and language; they are good at forming and inferring relationships among meaningful units. Poor readers are characterized by their inability to identify intrasentence idea units, as their processing of text is inadequately facilitated by their limited world knowledge; they read in a piecemeal, word-by-word manner. Poor readers' low word identification skills block access to the utilization of larger idea-bearing language units in the reading process, impeding integration of the text information with prior knowledge (e.g. Risko & Alvalez, 1986). Vocabulary, knowledge of syntactic structures, story grammar, and connectives, have also been shown to be deficient in poor readers (Pearson, 1970; Vellutina, 1979).

Reading in a second language. Coady (1979) extended Goodman's model to the reading of English as second language (ESL) students. He viewed the ESL students' reading processes as essentially consisting of a more or less successful interaction among three factors: conceptual abilities (intellectual capacity), background knowledge, and process strategies ranging from concrete to abstract. In agreeing with Goodman that reading was a process of meaning reconstruction in which information newly extracted is tested with old information, Coady thought that ESL readers were at a disadvantage in reading comprehension since their background knowledge of the target language was limited. However, the fact that some readers who are proficient in language yet read very slowly and comprehend poorly suggests that language competence and reading strategies both play important roles in reading.

Field (1984) applied Coady's ESL reading model to Chinese students and found that the process strategies of Chinese students were influenced by transfer from L1 to L2, by cultural attitudes, and by traditional Chinese study habits. Chinese students were reluctant to give up dependence on concrete strategies and had found it particularly difficult to move on to the abstract ones.

Detection of textual inconsistencies. A common task of testing reading strategies is the inconsistency detection task which refer to contradictions inherent in the meaning of the text. Poor readers are less sensitive than good readers in the detection of inconsistencies (August, Flavell, & Clift, 1984).

Vosniadou, Pearson and Rogers (1988) have conceptualized the inconsistency detection task as follows:

1. Read or listen, encode, and represent the propositions in working memory.
2. Compare the representations of the inconsistent propositions to one another.
3. Detect the inconsistency.
4. Report it.

General approaches to learning. Besides the specific influence of language competence on reading, it is likely that learning approach

can affect learning (see Chapter 1). Readers with a predisposition to a surface approach would be likely to focus on memorising the words and phrases used by the author, thus treating the text as comprising discrete units. Deep readers would see the text as a whole, focusing on understanding the semantic content, forming hypotheses about what would happen next and are eager to know.

Aims of the present study

The present study attempts to look into the reading processes of 24 subjects through an inconsistency detection task, when reading an English (L2) text, and at relationships between awareness of reading strategies or "metacomprehension" (Schmitt, 1990), and general approaches to learning. In particular, it is expected that:

1. students who usually employ a deep approach and who are language competent should be most sensitive to the inconsistencies in the text, and would score highly on their understanding of the given text, while students who are less competent in English and employ a surface learning approach will be least sensitive and would score low on comprehension.
2. the performance of the subjects in the inconsistency detection task should be significantly and positively related to their comprehension and metacomprehension.

STUDY DESIGN AND METHODOLOGY

Subjects and Design

At the beginning of the school year, three classes of fifth form (S5) students were given the Learning Process Questionnaire (LPQ) and classified as Deep or Surface learners, according to their decile scores. Students were categorised as "surface" if their decile scores were 9 or 10 on the surface approach scale, with the other scale scores being 7 or lower; and "deep" if their decile scores were 9 or 10 on the deep approach scale, with the other scale scores being 7 or lower. Students not fitting these criteria were not considered further

in these analyses.

Four months later, students ranking at 60 percentile or above in their mid-year English examination which has the same format of the HKCEE (Hong Kong Certificate of English Examination) were classified as high competence (HC) students; students ranking at 35 percentile or below were classified as low competence (LC) students.

Students with different learning approaches and English competence were then selected to form four comparison groups: Deep-HC, Deep-LC, Surface-HC, and Surface-LC. Each group consisted of six students.

Subjects so classified were then given the following tasks as described below.

Reading Task Material

The passage used in the present study was extracted from a reading reference, "English Comprehension 100", a collection of articles at the level of secondary school leavers (S5), and consisted of 180 words divided into 10 segments. Four inconsistencies were deliberately put down in the passage (Appendix 1):

1. *The title: "Women and Hunting"*. The original title for that passage was "How women changed history?" The present title creates an inconsistency because, according to the passage, women invented and did agricultural work while men went hunting. There is no direct relationship between "Women" and "Hunting".

To detect this inconsistency, students need to have a global view of the text.

2. *Missing words*. In segment 3, two words "important thing" were missed out from the sentence "women invented one very". The last word of that sentence, "very", should not be put at the end of the sentence. The capital letter "I" from the word "It" indicated a beginning of a new sentence but there was no punctuation between "very" and "It" to support this.

To detect this inconsistency, students need to question or reread the sentences of incomplete meaning.

3. *Inconsistency in women's job*. In segment 3, it was said that "men invented agriculture" whereas in segment 10, it was said that "women

invented agriculture". The description of how women invented agriculture in Segment 6 is to provide evidences to confirm segment 10 and reject segment 3.

To detect this inconsistency, students have to integrate information in different segments.

4. *Inconsistency in men's job*. In segment 4, it said that "men were hunters" whereas in segment 9, it said that "Then the wives did not have to go hunting for meat. They stayed at home. They built villages and cities". "Wives" was deliberately put down to replace the "husbands" in the original text.

To detect this inconsistency, students need to integrate information occurred in segment 4 and 9.

Procedure

The 24 subjects invited to participate in the study were told that the Hong Kong University Press was going to publish a reader for fifth form students in Hong Kong. The writer who was a foreigner would like to collect opinions from some fifth form students so as to know whether the text was too difficult for the fifth form level. Subjects were asked to do two things: complete a questionnaire on students' metareading, and carry out an inconsistency detection task that included four readings.

Inconsistency detection task: The subjects were asked to read a given passage, and to think aloud while answering questions about it. Before they began reading, the interviewer would demonstrate the think aloud method and answer questions. Then each subject tried out the first segment. Correction was given as necessary.

The reading task was given individually. The session was tape-recorded and transcribed. The interviewer also recorded observations of the subject's behaviour. The subjects were reminded of the purpose of the interview and were asked to read the passage four times.

- 1) *The first reading*. The interviewer showed the subjects the title, the two pictures and 10 segments. The subject had to read the passage in short segment or one or more

sentences. After reading each segment, he or she would be asked to tell what the segment was about, whether there were any difficulties in understanding, why that caused hindrances, and how he or she solved the problem. Probe questions were followed as necessary to encourage the subject to speak out what he or she was thinking while reading. Subjects were allowed to read the passage in English and express their understanding in their mother tongue, Cantonese. There was no time control. The subject could seek help from the interviewer only when they got stuck by difficult words.

- 2) *The second reading.* The subject was asked to retell the main idea of the passage. He or she could choose to read the passage the second time or not. The interviewer would ask the subject whether there were any difficulties in understanding.
- 3) *The third reading.* The subject was asked to do 10 multiple-choice questions. He or she was reminded to read the passage again before attempting the questions, and after the subject had finished answering was asked why that option was circled.
- 4) *The fourth reading.* A transparency with the four inconsistencies highlighted was shown to the subject. He or she was asked to read the passage again and explain why he or she was not aware of the inconsistency in the previous three readings, or he or she was invited to further explain what they had been aware of already.

Questionnaire on self-reflection of reading strategies. Subjects were asked to grade their usual reading behaviour on a 5-point scale on metareading items questionnaire (based on Schmitt, 1990). There were fifty questions collecting the subjects' own retrospective reflection of their metareading or non-metareading habit. A Chinese version of the questions was provided in order to eliminate any invalid answers due to poor English. There were twenty-five questions testing metareading and another twenty-five for non-metareading. Questions were shuffled so that subjects could not predict what answers were expected.

Scoring

1) *Awareness of Inconsistencies.*

a) Complete awareness with or without explanation:

In each reading, if the subject was aware of every single inconsistency, whether explained or not, would score 4 points. Take Subject 14 as an example:

i) *Inconsistency 2:*

"I do not understand 'one very It'. What does 'one' refer to ?
One thing?"

"I want to guess what the author wants to say -- silk? Silk was invented by women."

Subject 14 scored 4 points here because she was aware of the inconsistency--the missing words, and attempted to guess what the missing words would be and supplied some words to bridge the gap intentionally.

b) Partial awareness:

If the subject showed partial awareness of the inconsistency, he or she would score 2 points only. Take Subject 3 as an example:

i) *Inconsistency 2:*

"Women had invented *one thing*. It had changed history."

Though Subject 3 had supplied some words to make the sentence complete, she showed no intention or awareness of what she had said.

c) No awareness:

After reading aloud the text, if the subject did not notice the inconsistency, he would score no point. For instance, all subject had failed to detect the inconsistency 1 in the first, second and third reading.

2) Multiple-choice score:

There were suggested answers for the 10 multiple - choice questions. Subjects could score 2 points if their answer was correct and they were able to supply reasons. Correct answers but without good reasons would score 1 point only. However, if the incorrect answers are provided with good reasons, 1 point would be scored. Incorrect answers with poor reasons would score no marks.

3) Five-point scale score of metareading:

The metareading questionnaire aims to measure the usual reading behaviour of our subjects. If a subject chooses the highest point, 5, in all the questions of metareading, he or she tends to be a metareader. On the other hand, if he or she chooses the highest point, 5, in all the non-metareading question, he or she is supposed to be a non-metareader. Metareading and non-metareading were mutually exclusive. The higher the subject scores in non-metareading, the lower he or she scores in metareading. Therefore, the score in non-metareading can be reversed to metareading score as follows: 5 to 1, 4 to 2, 3 to 3, 2 to 4 and 1 to 5. The inclination of subjects towards metareading was calculated by adding up the total score of the metareading questions and the reversed score of the non-metareading questions. That is:

$$\text{Mean metareading} = \frac{\text{Total meta score} + \text{Total Reversed non-meta score}}{\text{Total number of questions}}$$

Analyses

All data analyses were performed using SPSS/PC+. The mean scores for Awareness of Inconsistency score, MC score, Meta-reading strategies score were obtained for each group and three Approach (Surface/Deep) by Language Competence (LC) ANOVAs were carried out with the Awareness of Inconsistency score (AIS), Comprehension (C) and Metareading (MR) scores as dependent variables. Correlation analyses were used to examine the relationship between AIS, C, and MR.

RESULTS

The means of each group on the three dependent variables are presented in Table 8.1.

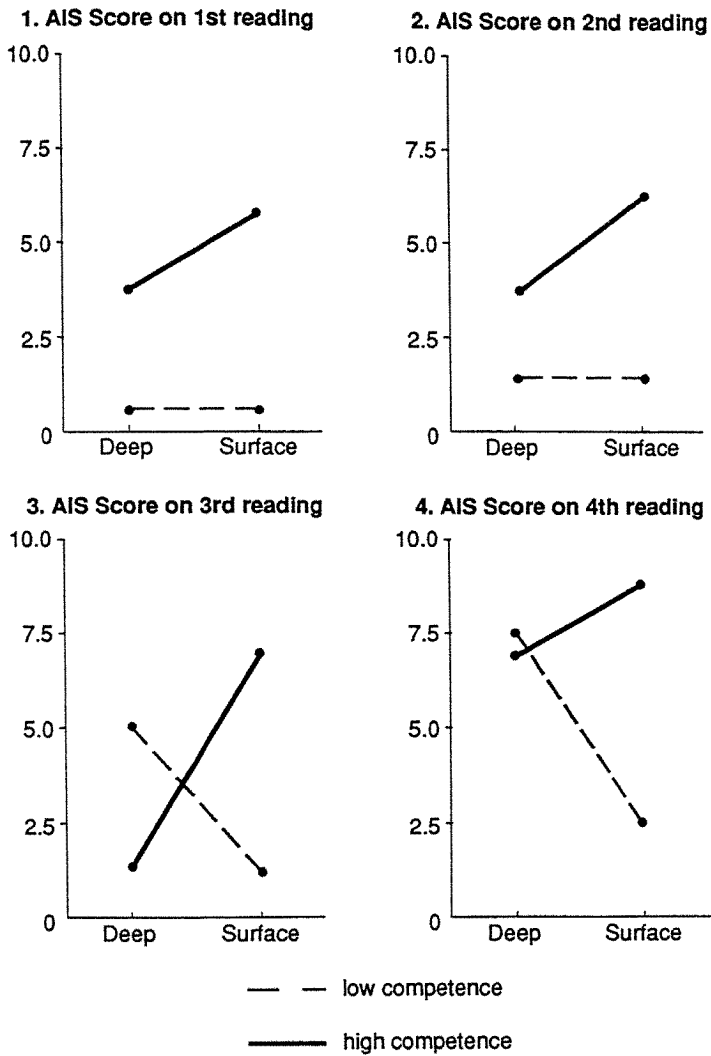
Table 8.1: Means (and Standard Deviations) of the Approach x Language Competence (LC) Groups on Awareness of Inconsistency (AIS), Comprehension (C), and Meta-Reading (MR) Scores.

Group	N	AIS	C	MR
Deep-High LC	6	5.58 (3.99)	7.83 (1.47)	3.15 (0.09)
Deep-Low LC	6	4.33 (1.21)	4.83 (0.75)	2.90 (0.14)
Surface-High LC	6	8.83 (3.39)	7.33 (1.75)	3.11 (0.08)
Surface-Low LC	6	2.59 (1.18)	4.50 (0.55)	2.90 (0.16)

Approach (2 levels) x Competence (2 levels) ANOVAs were carried out, with the above variables as dependent. Results were as follows:

Awareness of Inconsistency in Text (AIS). No significant main effect of Approach [$F(1,24)=0.45$, ($P < .01$)] was found on AIS but English competence was significant [$F(1,24)=11.11$, ($P < .05$)], as was the Approach x Competence interaction [$F(1,24)=4.93$, ($P < .05$)], over each of the four reading occasions (see Figure 8.1):

Figure 8.1: Approach x Language Competence on AIS over four occasions



Comprehension. There was a significant main effect of English competence [$F(1,24) = 33.47, P < .05$] but no main effect of Approach and no significant interaction of Approach and English Competence on MC scores.

Meta-reading Score. There was only a significant main effect of English competence on meta-reading strategies [$F(1,24) = 21.11, p < .05$].

Correlation Analysis. There were no significant correlations found among the AIS with competence, MC and Meta-reading strategies. AIS was not correlated with MC score and with Meta-reading strategies, contrary to expectations.

DISCUSSION

Awareness of Inconsistency

English Language Competence (LC) had a direct effect on the Awareness of Inconsistency Score (AIS), but as the interaction with learning approach indicates, the effects of competence were much stronger in the deep-biassed than in the surface-biassed subjects.

In the inconsistency detection task, the Deep-Low LC students outperformed the Surface-Low LC). In the reading process, the subjects encountered problems of decoding very often. The number of difficult words that each group of subjects had reported is shown in Table 8.2.

Table 8.2: Mean number of difficult words in the inconsistency detection task

Group	No. Difficult Words
Deep-high	3.0
Deep-low	3.6
Surface-high	3.3
Surface-low	9.5

The effect of approach can clearly be seen here. Perception of difficulty is about the same for all deep and for competent surface; it is the surface-low competent students who experience the difficulty. It looks as they have nothing to fall back on, whereas the others have competence or failing that, a deep approach.

The influence of English competence on reading strategies was however found to have most effect in the present study. High competence students:

1. were significantly more sensitive in detecting inconsistencies than the less competent students,
2. obtained higher comprehension scores, and
3. obtained a higher meta-comprehension scores.

The hypothesis that language competence has a significant influence on reading strategy is therefore verified. None of the Deep-High LC and Surface-High LC students reported that difficult words were their major difficulty in reading the passage given, whereas 3 out of 6 Deep-Low LC and all Surface-Low LC subjects indicated vocabulary as a major difficulty in reading. Thus, it is not as simple as that Deep- and Surface-High LC students were doing better than the low language competent: Surface-Low LC students were extremely weak even at word decoding.

The effect of approach on AIS, then, is not as a main effect, but in interaction with language competence. When the less competent subjects had difficulties in decoding or in comprehension, deep learners would actively guess for meaning, making use of their world knowledge or their expectations as to meaning to extract more from the sentence. Surface learners simply left the problem unsolved.

Approach to learning did not have this effect on the high competence subjects; the Surface-High LC outperformed Deep-High LC subjects. It is possible that some of the deep learners had been exhausted by examination, some science students were not interested in passage of historical events, or some happened not to concentrate on that reading task. It may be possible that there were some achieving students in the deep group who would not be motivated to work hard in a voluntary task; one (deep) subject confessed in the interview that he would not reread a text unless he was taking an

examination in which marks were counted.

The learning process of learners may also be affected by situational factors. When it happened that the test article was not interesting, or simply because these students were fed up with the numerous tests and examinations in Fifth form, they would not treat the interview seriously, and thus obtain a lower AIS in spite of being classified as Deep-high students at the beginning of the study.

The Surface-High LC students did best in the inconsistency detection task. They could survive and do well as long as their language competence facilitated their comprehension. The Surface-low students had no motivation and no tools to extract meaning of the text and therefore performed badly.

Review of the four inconsistency detection tasks

The mean scores of Awareness of Inconsistency Score for the four inconsistencies were 0.42, 5.34, 2.58, 1.36 respectively, the first (irrelevant title) thus being the most difficult inconsistency to be detected. To detect this inconsistency, students who knew what the real jobs of men and women were in ancient times might have been favoured. In other words, the successful detection of inconsistencies 3 and 4 did not help in detecting the irrelevant title, possibly because the subjects did not have a global view of the entire passage.

The awareness of inconsistency of the twenty-four subjects in the present study remains low. After four readings, students can only at best score 5.34 out of a total of 16 (full score in 4 attempts) in the second inconsistency. Possibly Chinese readers' reading strategies are shaped by their cultural assumptions and by the background information (Field, 1984). Reading Chinese text is different from that of English. Every Chinese word bears an independent meaning, which may lead to a habit of investigating each word without always understanding the general concepts of the text. The low AIS of inconsistency 1,3 and 4 illustrate that the subjects are generally weak in reading strategies of integration of information, rereading, questioning meaning of a sentence (Block, 1986).

Markman (1979) suggested that some of the reasons for students failing to detect inconsistency may be due to poor memory. Some subjects in the present study were able to tell the meaning of the

inconsistent sentences but they failed to discover that there was inconsistency. For instance, Subjects 05, 21, and 24, were able to retell segment 3 and segment 10 in Cantonese early in the first reading, but they did not notice the inconsistency.

Some subjects had different interpretation of the same sentence in different occasions and yet they had not the slightest idea what they had given as an explanation; for example, Subject 16 gave three different interpretation of who were hunters -- men, men and women, and women respectively.

When the students failed to encode or store the information, draw the relevant inferences, retrieve and maintain the inferred propositions, it is impossible for them to compare the two different statements and then detect the inconsistency.

Markman (1979) found that it was difficult to detect inconsistency if time and information had passed between the two inconsistent sentences. In the present study, inconsistencies 3 and 4 were written quite apart. This may add the difficulty for the subjects to keep what the readers had read in mind and then retrieve the information out for testing of inconsistency.

Some of the subjects had noticed the problem but they made some sort of assumption to resolve the contradiction. For instance, Subject 08 was aware that segment 3 and segment 10 were inconsistent in telling who invented agriculture, but he assumed while women invented agriculture, men developed agricultural technology. In that case, it was correct to say that men invented agriculture too.

It is also possible that those subjects were unwilling to criticize or doubt a passage which was to be published by the Hong Kong University Press, or simply that students might be too embarrassed to admit they had not understood something.

Finally, we should recall that the ability to detect inconsistency depends on several things, such as the nature of the task, the manner in which the components, such as premises and conclusions, are presented, and how familiar children are with the material being processed (Tunmer *et al.*, 1986). It must be admitted that the passage content was quite new to the subjects, especially the science students.

IMPLICATIONS

Some researchers suggest that language competence goes hand in hand with reading performance, while others argue that reading strategies are influenced by learning approach. Thus one is left with the question: Is reading a language problem or a strategy problem?

Expectations that both learning approach and language competence should have a promising influence on reading strategies were verified. Though the Deep-High LC students did not read the best, Surface-Low LC, who did not have the advantage of either learning approach or English competence, read worst.

Thus, as Kirby (1988) suggests, readers who are stuck by difficult vocabulary can hardly move up to comprehension or metacognition. Our Deep-low subjects have vocabulary problem as well. Nonetheless, they tried every means to guess and thus reduce their reading difficulties. Surface-high students did well in the present study, but may not survive in reading other material which contain some difficult words to them. That remains to be investigated further.

Failure by all subjects to detect the irrelevant title in the first and third reading implies that most of these students are quite weak in summarising the main idea and supporting idea of the whole text. Global comprehension and integration of the ideas could hardly be observed during the interview of the four readings. It was not until the four inconsistencies were shown to them in the fourth reading that the subjects noticed the irrelevant title. Comparatively, the second inconsistency was the easiest one to be detected.

Deep approach students did not focus on the text theme, but did focus on sentence and intra-sentence meaning while they deal with the inconsistencies 3 and 4. Their neglect of text theme and title is not a surprise as the teaching of reading for the fifth form nowadays simply means coaching in comprehension exercises.

Some suggestions to teach reading strategies in Hong Kong

At present, the teaching of reading in Hong Kong lacks of proper guidance from the Education Department. The 1983 English Syllabus seems to be the Bible of the English teachers. There is only an introduction of some reading skills, such as skimming, scanning,

intensive and extensive reading. But it should be clear to every English teacher that knowing what is to be taught is not helpful. What is more important is how we can help our students to acquire these skills and use them strategically later in their lives.

The keen competition in the HKCEE has turned the attention of many schools to examination results, which in fact deprive students of the opportunity of acquiring a metacognitive knowledge of reading. Having less competent students know more vocabulary is important, but it is even more important that they adopt a deep approach so that they may approach their readers with a view to comprehending and therefore enjoying them.

Thus, educators should make efforts in two directions:

1. Help students use deep approach in reading.
2. Help students become strategic readers.

Reciprocal teaching (Palincsar, 1986), direct instruction (Paris & Jacobs, 1984) and the experimental curriculum suggested by Cross and Paris (1988) are some pioneering approaches in the teaching of reading strategies.

Studies and discussion of reading strategies are needed. Conferences should be held more frequently so that current ideas and information can be exchanged; the Education Department should be the source of information, introduce and spread new ideas of learning and teaching of reading to teachers, and give guidance and advice to the teaching of reading.

Suggestions for further research

The responses of some subjects in the study have been quite unexpected. For instance, the Surface-High LC outperformed the Deep-High LC in the inconsistency detection task. Instead of looking at the examination performance of students once and for all, a standardised test is needed so as to better classify the language competence of students. Consideration of several situational factors, like examination pressure and interest of certain kind of material should be taken beforehand so that the performance of subjects would not be altered simply by some coincidences. It is thus hoping

that more accurate groups of subjects can be selected.

The present study has attempted to investigate the reading awareness of some fifth form students on their performance of the inconsistency detection task. Nonetheless, there are some other factors such as age, intelligence and reading level which may have a profound impact on children's reading. Further studies are needed to examine the impact of other factors on reading strategies.

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Appendix 1

Appendix 1 presents the inconsistencies. The tests for comprehension (C) and reading strategies (C) and metareading (MR) can be found in the original dissertation.

The Passage with *four* inconsistencies (numbered in **bold**)

WOMEN AND HUNTING (1)

1. Men sometimes say: "We are better and cleverer than women. Women never invented things. We do."
 2. It is true that men have invented a lot of useful things: the alphabet, machines, rockets and guns, too.
 3. But scientists and archaeologists now agree that women invented one very (2). It had changed history. **Men invented agriculture.**
 4. Before the invention of agriculture, **men were hunters.** They went out every day. Sometimes they killed animals - sometimes animals killed them. Life was difficult and dangerous.
 5. Women had to go out every day, too. They collected roots, fruit and grasses. (4)
 6. Then, one day, more than 10000 years ago, a woman dropped some grass seeds. She dropped them near her home in the Middle East. They grew -- and the first wheat was born. The idea grew, too. (3)
 7. Women planted roots and fruit trees. Then they could stay at home and look after the children -- and the animals.
 8. Women liked baby animals: dogs, cows, sheep and goats. That idea grew, too.
 9. Then the **wives did not have to go hunting for meat.** They stayed at home. They built villages and cities.
 10. Men began civilization -- after **women invented agriculture.**
-

CHAPTER 9

THE PLACE OF KNOWLEDGE OF GENRE IN THE TEACHING OF WRITING

Moira Morgan

INTRODUCTION

When I was a secondary school student composition writing was always a mystery. Grammatical errors I could understand, the dictionary and grammar text books made correction and improvement possible and understandable, but content remained a problem. Either you had it or you didn't.

There was no problem writing essays in other subjects such as geography, history or science. That was more successful and more rewarding because the goals and expectations were made clear. Having taught English to first language English students in the U.K. and English to second language students in Hong Kong, it seems in both countries and with both first and second language learners the frustrations are common. What then can be done to demystify composition writing?

RESEARCH IN COMPOSITION WRITING

Research in composition writing has focused either on the process of writing or the product of writing. The process versus product issue arises out of the belief that focusing on the product cannot help improve process. Murray (1980: 3) amusingly writes: "Process cannot be inferred from product any more than pig can be inferred from a sausage". The contention is that only by studying and analysing process that process can be improved and in turn improve product.

A pioneer in studying writing processes was Emig (1971), who introduced the think-aloud technique as a means of understanding the

processes writers used. The think-aloud protocol entailed the writer speaking his/her thoughts into a tape recorder while engaged in the writing activity. This may not be the perfect way to record the process of writing, but it can be rather illuminating. One important distinction arising from that work was between two types of writing: reader-based, and writer-based. Reader-based writing is written with a sense of audience, i.e. to be read by someone apart from the writer, whereas writer-based writing shows no awareness of audience or regard for someone reading it.

Characteristics distinguishing expert from novice writers were also discovered. Expert writers can interpret the demands of the question and integrate it with knowledge from long-term memory, and then set goals for how the writing process will proceed. Information relevant to the goals can be taken from long-term memory organised into new knowledge and expressed as written concepts. Writing is therefore more than a process; it requires prerequisite types of knowledge. Such knowledge includes (i) an awareness of the difference between writer and reader-based text, i.e. a sense of audience, and (ii) an awareness of the genre rules that apply to the social context in which the writing takes place. Knowledge of genre is the focus of the present Chapter.

Genre describes those aspects of a text which are the result of structuring the immediate social context, and the occasion in which the text is produced (Dudley-Evans 1990). Put simply, genre refers to the kind of text that is to fulfil a communicative function. Genre is therefore a cultural convention that stipulates the structure of a text. By analysing the genre of a text one is able to learn something of the patterns of organisation of that text, and even the appropriateness of the language of the text for that genre. Common genres met with in secondary school include narrative, argument, compare-and-contrast, causal explanation, and the like. The study and application of genre is likely to carry pedagogical, practical, and theoretical benefits.

It seems likely, however, that students are in a confusing situation with regard to genre. On the one hand, they are widely exposed to the genre of text books, and in varying degrees to the genres of journals, papers and types of literature; on the other, they are expected to produce subject essays, compositions, book reports and laboratory science reports. To be successful in their writing they

must somehow discover and learn to meet the implicit demands appropriate to the various genres. It seemed to me that perhaps understanding genre was the key to demystifying composition writing.

THE LEARNING OF GENRE

Swales (1985) envisaged a genre-based syllabus founded on the identification and analysis of the specific genres the students are required to read and write in their subject-based studies. Without a genre-based curriculum, student and tutor goals are not necessarily explicit and do not always coincide. However, with a genre-based curriculum the goals of the subject teacher and the students are explicit and can be made to coincide. Martin (1985) claims that language teaching in Australia, with its focus on process, favours the middle-class student whose home provides models of writing which do reflect different genres, and went so far as to say that this form of "liberalism" in language teaching is the "major enemy of children, women, working class children, migrants and Aboriginal children." (*op. cit.*: 41).

How can genres be learned so that they enter into the repertoire of forms available to learners? Writing courses might encourage the combined process of reading and writing, as a genre-centred approach to classifying, interpreting, and composing texts. However, students should not be taught to imitate models of genres they are given to study, but to develop an awareness of genre by relating reading and writing. Writing then intensifies awareness when reading, and encourages the process of correcting reading to specific problems faced when writing.

In addition to cultivating uses of genres, students will more easily be able to analyse critically any other genre they are asked to produce. Critical analysis serves not only to improve the quality of the students' reading, but also heightens awareness of all that they are learning when they write. Such considerations in class are process-orientated but here the meaning of process is extended to include numerous activities such as critical reading and cultural analysis so as to cultivate the resources writers draw on during all stages of the writing process.

The basic objective of these activities is not simply to get

students to submit good written products, but to get them to learn a process of writing in such a way that they use the knowledge gained to improve their writing. Students also learn to see how reading is important to their development as writers. They should become aware of the process by which they can gain writing competence through generic reading. Through this process writers build a repertoire of genres and sub-genres. They store these cultural forms that inter-relate features of reading subject matter, organisation, language tone and effects and in doing so their writing would be expected to mature. Indeed, the process of composing includes a writer's active dialogue with the generic models of his or her time and culture. The study of genre ties the unique acts of composing and understanding to the cultural conditions of that process. Genre as the centre of both interpretative and composing strategies facilitates reading and writing.

Genre and English as a foreign language

Where else can the need for a genre approach be so great as with students learning English as a foreign or a second language? In educational environments where English is the medium of instruction, but is not the mother tongue of the students, two language systems may emerge and co-exist (Swales 1985): a formal, and an informal one. The informal one makes it possible for students with very little English to achieve educational success through a variety of means, the most popular of which is memorising the text. Evidence of this can be found each year in the Hong Kong examination system when the Examinations Education reports are released:

Once again some candidates produced memorized scripts which were detected by examiners and heavily penalised.

(Use of English, 1990: 155)

Students who rely on such strategies will leave school lacking communicative competence and a creative capacity in their second language. This situation though immediately recognisable in the field of English applies also to other subjects.

In many countries English is welcomed as a means to an end

because English contributes to economic, political and technological independence. English is used as a means to get access to science, technology, business, international law and world diplomacy. Even native speakers lack the language ability necessary for use in all situations. All language learners should learn the language of specific fields of genres so as to fulfill his/her target communicative needs. When native or second language speakers have difficulty dealing with specialised material it is largely because they haven't been exposed to the types of genre appropriate to the particular situation they encounter. Once they are engaged, knowledge of the appropriate genre provides a means of effective engagement as well as a goal for learning.

Though genres might not be the sole form of written or spoken communicative organisation, they are a stable and widely used means of organisation. A genre approach offers the learner a series of keys by means of which he/she can engage in many of the structurable, communicative events of academic, business, or professional life.

A Theory of Genre Acquisition

In becoming aware of genre, students develop a *schema*. Schemata are abstract generic concepts constructed by the individual, based on patterns of experience. An early form of schema is the "story grammar", acquired from an early age, which gives stories their structure and their meaning (Mandler, 1984). The European fairy tale, for example, has a prescribed beginning ("Once upon a time, there was...") and end ("... and they lived happily ever after."), with fairly rigid stipulations as to plot and character: characters are unidimensionally good or evil, and good must triumph in the end.

In the present context, the development of appropriate schemata can be enhanced by viewing the text to be read as belonging to a different genre or sub-genre. Students therefore need to be trained as both readers and writers, as coders and as decoders. In this way a student's awareness of different genres will not only help comprehension but also facilitate the top-down process involved in writing.

The idea of top down and bottom up approaches to reading relating to several levels of textual unit was put forward by Kirby

(1988), whose model of text processing has been generalised to apply to writing (Biggs & Telfer, 1987). In the latter model, the writer can focus on the syntactical aspects and the rhetorical aspects of writing from one of eight levels of textual unit; theme, main idea, idea, chunk, words, sounds, and letters. Writers who at the planning stage of their writing focus on the lower levels of ideation, up to sentence level, have thoughts that are no more than one or two sentences away. This comprises a surface approach to writing, which is likely to produce a text that lacks coherence and structure. Writers who at the planning stage focus on the higher ideational units, keeping main ideas and themes in mind, adopt a deep approach to writing and are likely to produce a text that is coherent in structure (Biggs, 1987).

It seems that one thing missing from this model is genre, a unit higher still than theme, and which is likely to be most influential in the planning stages of writing, as shown in Figure 9.1.

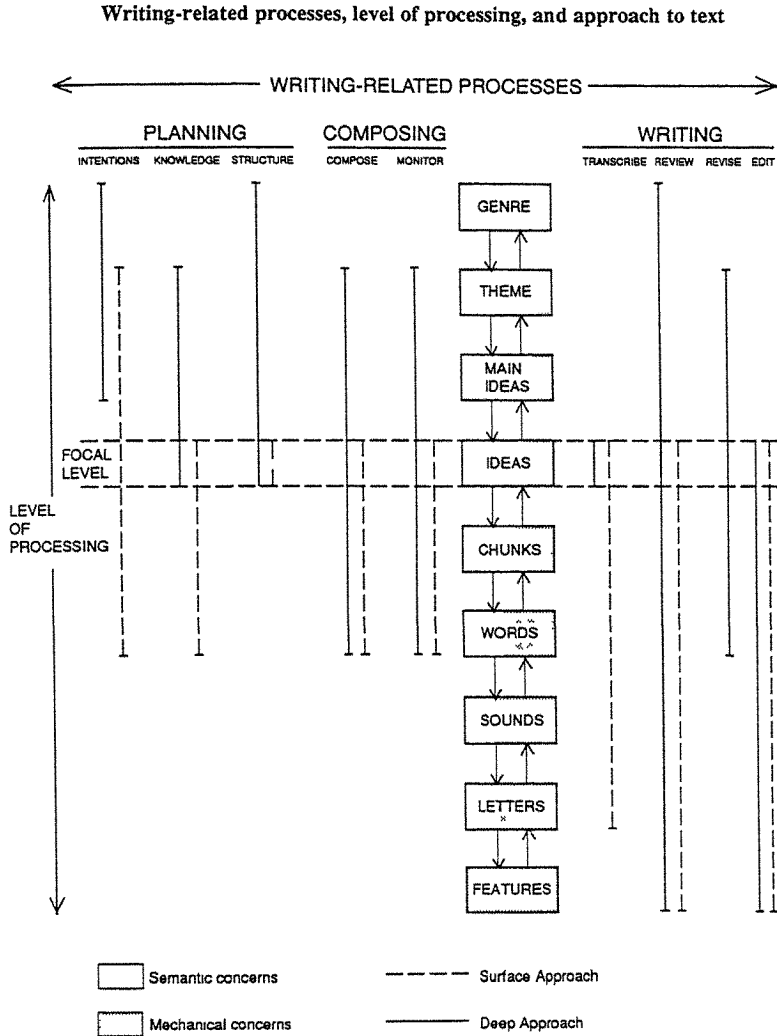
Students therefore need to be exposed to different genres and to be able to appreciate those characteristics and features that make up different genres. In the scope of this research, it was not possible to look in detail at all genres and subgenres within and across the curriculum, so attention is restricted to a common genre within the curriculum of English language composition writing, namely argumentative prose writing.

THE PRESENT STUDY

Genre in Argumentative Writing

The type of argumentative writing expected of secondary school students appeals to emotions and prejudices. The argument challenges the consistency of the speaker's beliefs and practices, and though it may not settle the point at issue, it forces scrutiny of the proposer's proposition. In secondary school writing students are expected to present a clear thesis. The content may or may not contain the writer's own personal comment but must include at least one conflict. The argument may or may not reach a resolution. There are expectations of the classical schemata of an argumentative composition.

Figure 9.1: Eight Levels of Ideation In Writing-Related Processes



(Adapted from Biggs & Telfer 1987)

The purpose of the present study is to investigate the knowledge used in writing compositions of the argumentative genre, and to observe if the process of writing or the product are affected after students are exposed to the characteristic features of the argumentative genre. This genre was selected for two reasons; time and space did not allow for a more extensive research on all types of genre, and students have much less exposure to this genre than to others thus making observation, after intervention, easier.

Method

Two groups of five students each comprised the experimental and the control groups. It was first necessary to establish the extent to which students already had a schema of the argumentative genre. In a pretest, students wrote an argumentative composition using the think-aloud protocol. The title was "A Woman's Place Is In The Home. Discuss". This protocol demanded that the students verbally expressed all their mental activity as thoroughly as they were able while engaged in writing the composition. The students commented, and planned what they wanted to write, and re-read what they had written. These activities were done aloud and were recorded on tape. The tape ran throughout the time spent working on the composition. Although the nature and purpose of the research was not explained to the students, it was stressed that they should verbalise all their thoughts, in Cantonese if necessary, although all used English (they were writing in English).

The tape transcriptions offered some insight into students' thinking processes and the knowledge they used in writing. By comparing the tape script with the completed composition it was possible to identify two writing phases:

1. Parawriting, when the student planned the entire content of the composition with or without the use of rough notes;
2. Composing, when the student worked directly on the composition.

Both the parawriting and the composing phases could be subdivided into three processes:

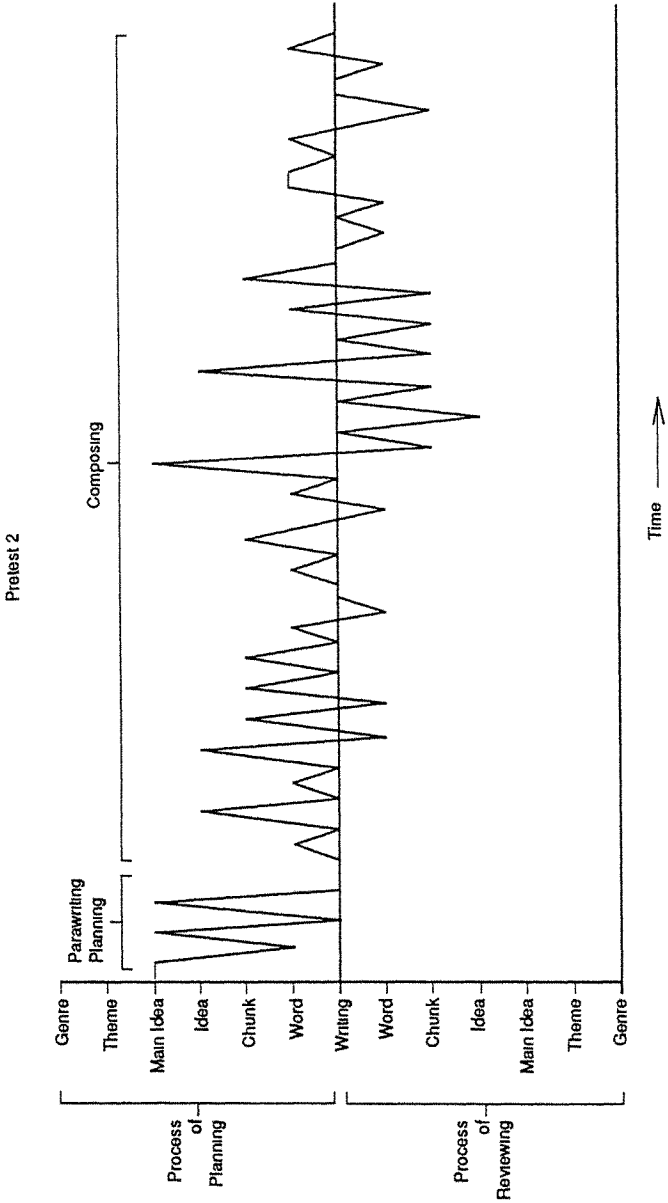
- (a) writing, when the student was saying aloud what he/she was actually writing at the time,
- (b) planning, when the student was engaged in thinking aloud what to write next, and
- (c) reviewing, when the student was engaged in reading aloud what he/she had just written.

Within the two processes of planning and reviewing it was possible to identify at what level of ideation -- genre, theme, main idea, idea, chunk, or word -- the writer was operating. The majority of students did not in fact begin with the parawriting phase, but went straight into composing. The data were represented graphically in two dimensions. The top half of the vertical axis represented the planning activities, focusing on genre, theme, main idea, idea, chunk, to word; the bottom half represented the reviewing activities, focusing on word through to genre. The horizontal axis represented the time the student was actually engaged in writing. Figure 9.2 gives an example of what the graph for student 2 from the experimental groups pretest looked like.

The focus at the various levels was decided as follows:

- *genre*: an awareness of or reference to the expectations of an argumentative essay i.e. presenting the situation, followed by the proposal(s), counter-proposal(s) and a conclusion that may or may not include a resolution.
- *theme*: relating concrete ideas of content to genre.
- *main ideas*: reference to topics of the paragraph.
- *ideas*: reference to complete thoughts, usually clauses that made up part of the sentence.
- *chunks*: reference to a group of words often a phrase which contributed to part of an idea.
- *words*: reference to individual words.

Figure 9.2: Level of focus of ideas



Pretesting. The pretest graphs show two features common to all students; (1) all students exhibited the recursive behaviour pattern of reviewing and planning either before, during, or after writing; (2) no student went beyond the level of theme, whether planning or reviewing. Out of the pretest batch all the students in the control group started at the level of theme, whereas out of the experimental group only two students started at the level of theme; the remaining three in the experimental group started at the level of main idea. No student in either the control or the experimental group showed any awareness of genre. The number of times subjects changed their level of focus varied enormously as did their preferred activity. Some students engaged most in reviewing activities while others engaged most in planning.

The ten scripts from the experimental and the control group were then ranked 1-10 by the researcher and two independent markers to whom the nature of the research was not explained. All three raters, for the sake of ecological validity, used the weighted rating scale they would normally use in school: Accuracy (grammar, spelling), 30%; Content (student's own ideas), 40%; Style 1 (sentence level skills), 12%; Style 2 (paragraph level, connectives) 18%. The final mark was thus a weighted mixture of the marker's judgment of these characteristics, and it was used as an overall index of the essays' quality.

When the ranked compositions were compared with the graphs showing level of focus, compositions ranked 1-5 by at least two markers showed that students divided their activities (when not writing) fairly evenly between planning what to write next and reviewing what had been written. In contrast, scripts ranked nine and ten by at least two markers showed, in their level of focus, to be more pre-occupied with reviewing than with planning (see Figure 9.2).

Treatment. Following the pretest, the control and experimental groups were exposed to eight samples of reading material of the argumentative genre. The samples were approximately 400 words long and there were such titles as "Television is harmful to children. Discuss." and "Examinations are a necessary evil. Discuss." The control group used the material to engage in various language skill

exercises whereas the experimental group disassembled the various texts to show how texts of an argumentative genre are constructed.

Posttest. Following treatment the students wrote another composition "It is foolish to give money to beggars. Discuss." Just like the pretest the students were asked to use the think-aloud protocol. On completion the tapes were transcribed and the researcher then attempted to identify whether the activity focused on the word, chunk, idea, main idea, theme or even genre. The findings were registered on the level of focus graph. As with the pretest findings the data showed that students were again recursive in their writing activity. Some were more occupied with preceding their writing activity by predominantly reviewing while others engaged in more balanced activity.

As before, the ten posttest scripts were ranked 1 to 10 by the 3 markers. Once again, though not unanimous, there was some agreement among the ranking of scripts especially at the extremes, that is those ranked 1, 2, 3, 9 and 10. Scripts ranked 1, 2, and 3 were those which preceded their writing by planning and reviewing at higher levels of focus such as at theme and main idea and are even at the genre level. This implies that being able to abstract ideas at a higher level of ideation improved the quality of content. Writers of scripts ranked 9 and 10 tended to precede their writing activity by reviewing lower levels of focus such as words and chunks.

RESULTS

The experimental posttest group showed marked improvement, both in an upward shift in level of focus at the start of parawriting, but especially when composing, and in the overall quality of the essays in terms of mark awarded.

Level of focus

From each individual graph, it was usually possible to note the level of focus at which each writer began parawriting and composing for pretest and posttest essays (Table 9.1).

Table 9.1: Level of Focus of Ideation at the Start of Parawriting and Composing

Essays	Parawriting, Planning	Composing
Pretest E1	Main Idea	Chunk
Posttest E1	-	Theme
Pretest E2	Main Idea	Word
Posttest E2	-	Theme
Pretest E3	Theme	Idea
Posttest E3	-	Theme
Pretest E4	-	Theme
Posttest E4	Genre	Idea
Pretest E5	-	Main Idea
Posttest E5	-	Theme
Pretest C1	-	Theme
Posttest C1	Theme	Theme
Pretest C2	-	Theme
Posttest C2	-	Theme
Pretest C3	Theme	Chunk
Posttest C3	Theme	Idea
Pretest C4	Theme	Main Idea
Posttest C4	Theme	Idea
Pretest C5	-	Theme
Posttest C5	-	Theme

It can be seen that 4 of the experimental group focused at a higher level when composing on the posttest, for which process complete data are available, whereas only one of the control group did. Statistical testing is dubious for such a small sample, but when these data are collated in a contingency table (Table 9.2). The chi-squared value is 3.6 ($P < .05$) for a one-tail test), which suggests that the experimental group changed their process in terms both of frequency and of level of focus from lower towards higher levels of ideation.

Table 9.2: Direction of shift in level of focus following intervention

Number of Students Shifting Focus:

	Upwards	Downwards	Total
Experimental	4	1	5
Control	1	4	5
Total	5	5	10

Chi-squared = 3.60 ($P < .05$ for a one-tail test)

Quality of script

The 10 scripts were ranked from one to ten according to each markers' score, separately for pre- and post-test (Table 9.3).

**Table 9.3: Individual marker's rankings
of script quality**

Rank	Researcher		Independent Marker 1		Independent Marker 2	
	Pre Test	Post Test	Pre Test	Post Test	Pre Test	Post Test
1	E3	PTE4	C1	PTE3	E4	PTE4
2	C2	PTC3	E3	PTC3	E3	PTE1
3	E4	PTE3	C5	PTC2	C3	PTC3
4	C5	PTE2	E2	PTE5	C4	PTC4
5	C1	PTC1	C4	PTE4	E1	PTE3
6	C3	PTE1	C3	PTC5	C2	PTC1
7	C4	PTE5	E4	PTE1	E2	PTE2
8	E2	PTC2	C2	PTC1	E5	PTE5
9	E5	PTC4	E1	PTE2	C1	PTC2
10	E1	PTC5	E5	PTC4	C5	PTC5

Key: E Experimental
 C Control
 PT Posttest
 1-5 Student

The ranks were pooled, and it was noted which scripts, E or C, improved their rank from pre- to post-test (Table 9.4).

Table 9.4: Shift in pooled markers' rankings of script quality from pre-to post-intervention

Number of Scripts Moving:

	Upwards	Downwards	Total
Experimental	4	1	5
Control	1	4	5
Total	5	5	10

Chi-squared = 3.60 ($P < .05$ for a one-tail test)

Thus, in terms of quality, there is evidence that the experimental group significantly improved following the intervention.

DISCUSSION

During the writing pre- and post-intervention, the students did not start in a chronological fashion by planning first then composing, but typically shifted from one process to another, as has been mentioned. Thus, these results support Christie's (1986) study of first language English writers; second language, like first language, writers do not produce writing in a linear form as a single act but usually work through parawriting or planning to producing text, re-reading, planning, revising, reviewing and finally editing, though not necessarily in that order. As Christie says:

Thoughtful attention to linguistic structuring of the essay genre robs the process and argument of persuasion and discussion of the aura of mystery that surrounds them. (*op. cit.*: 239)

Not all students spent a great deal of time thinking about the compositions at the start. Once their writing was underway it generated new ideas itself. Other students relied on associative writing, that is, by reviewing the last word or chunk as a means to generate text.

Implications For Teaching

The arguments for a genre based curriculum meet a need for reading and writing goals to be made explicit. By integrating reading and writing students can become aware of different genres and develop their top down writing processes. In this way process and product no longer compete for priority as an approach to writing but complement one another.

The value in using a genre approach is that it develops top down processing or in the ingredients that gets process and product to work together. Nevertheless further research is needed particularly in the area of cultural transfer of genre so that the student's existing knowledge and schemata in his/her mother tongue can be identified, utilised, and developed to facilitate and mature the writing as well as reading skills in English.

It is already accepted that a genre approach to teaching is well supported on practical, pedagogical, and research grounds in a student's mother tongue (L1). The present study extends this, showing empirically that it is just as if not more relevant in the case of second/foreign language learners (L2). This makes the case for a genre approach to teaching especially English language compositions in Hong Kong secondary schools very strong.

English is considered to be the desired language for the medium of instruction and the language of international politics, economics, technology, science and education. Every effort should be made to facilitate the understanding and use of English in these varying social contexts; hence the particular power in the argument for teaching genre in schools in Hong Kong.

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WHAT MIGHT BE

CHAPTER 10

CLASSROOM ENVIRONMENT AND APPROACHES TO LEARNING

Grace Chan

INTRODUCTION

Students feel differently in different kinds of classroom environment (Walberg, 1969; Moos, 1974). Students' interest and motivation are encouraged in a socially cohesive and satisfying classroom environment, and growth in achievement and understanding are encouraged in an intellectually challenging classroom environment (Moos & Moos, 1978).

Many studies have investigated the person-environment fit hypothesis that pupils achieve better in their preferred classroom environments. Teachers have used information about discrepancy between actual and preferred classroom environment as a practical basis to guide improvements in their classrooms (Fraser, 1983; Fraser & Fisher, 1983; Hattie, Byrne & Fraser, 1986). Everyone would like to learn in a favourable, rather than an unfavourable, learning environment. If teachers know more about student preferred and actual classroom environment, they may reduce the discrepancy so as to improve the achievement of students.

Students in Hong Kong are trained to get the right answer under the examination-oriented system. Students as well as teachers have become examination-oriented, experts at achieving high grades. Hong Kong teachers see public examinations as the main influence on their teaching and they believe that an expository teaching style is the most efficient way of meeting what the examination syllabus requires of them and their students (Morris, 1985). Even Hong Kong post-secondary students have been criticised for their learning approach, in particular their tendency to be extrinsically motivated and to rote learn (Murphy, 1987). The aims of education here appear

no longer to be for broadening one's horizon, expanding one's mind and developing one's potential to the fullest, but for achieving high marks, passing examinations, getting a place in the university, and striving for the future "rice bowl". On the other hand, there is counter-evidence that Chinese students generally are lower on the surface and higher on the deep approach than Australian students (Biggs, 1990). Therefore, it is of interest to investigate the actual learning approach in Hong Kong.

The approach to learning investigated in past research is a student's *actual* approach to learning. However, human beings may like to explore and understand what is going on in the world, so the *preferred* learning approach becomes an interesting area to study. The actual learning approach reflects what is currently adopted by students, whereas the preferred learning approach reflects the intention which will in return influence the motivation of students in studying.

If we further relate the preferred learning classroom environment to the preferred learning approach, we can see a full picture of student preferred learning. Of course, different students may prefer different kinds of classroom environment which most fit their learning approach and learning behaviour. Hattie and Watkins (1988) found that there is a relationship between learning strategies and student preference for the classroom. Ramsden, Martin and Bowden (1989) found that school environments are associated with learning. The present study is an attempt to investigate the relationship between classroom environment and approach to learning by answering the following questions:

1. What kind of classroom environment is preferred and perceived as actual by S3 students in Hong Kong?
2. What kind of learning approach is preferred and actually adopted by S3 students in Hong Kong?
3. Are there any discrepancies between the preferred and actual classroom environments and between the preferred and actual learning approach?
4. Is there any relationship between preferred and actual classroom environment and preferred and actual learning approach?

METHODOLOGY

Instruments

Preferred and actual classroom environments were measured by the Classroom Environment Scale (Moos & Trickett, 1974). There are nine subscales in the Classroom Environment Scale (CES): Involvement, Affiliation, Teacher Support, Task Orientation, Competition, Order and Organization, Rule Clarity, Teacher Control and Innovation (Table 10.1). There are 36 items in the Short form S. The items are short statements of the true-false type.

Table 10.1: Nine subscales of the Classroom Environment Scale

-
1. *Involvement.* Extent to which students have attentive interest, participate in discussions, do additional work and enjoy the class.
 2. *Affiliation.* Extent to which students help each other, get to know each other easily and enjoy working together.
 3. *Teacher Support.* Extent to which the teacher helps, befriends, trusts and is interested in students.
 4. *Task Orientation.* Extent to which it is important to complete activities planned and to stay on the subject matter.
 5. *Competition.* Emphasis placed on students competing with each other for grades and recognition.
 6. *Order & Organization.* Emphasis on students behaving in an orderly, quiet and polite manner, and on the overall organization of classroom activities.
 7. *Rule Clarity.* Emphasis on clear rules, on students knowing the consequences for breaking rules, and on the teacher dealing consistently with students who break rules.
 8. *Teacher Control.* The number of rules, how strictly rules are enforced, and how severely rule infractions are punished.
 9. *Innovation.* Extent to which the teacher plans new, unusual and varying activities and techniques, and encourages students to contribute to classroom planning and to think creatively.
-

In this study, the CES was designed to be used in two different forms (the preferred and actual). Students were asked to answer the Short Form S which consisted of 36 items on a 5-point scale (from 1 = never to 5 = very often). The internal consistency of the preferred and actual CES subscales alphas within the range of 0.13 to 0.78 and -0.03 to 0.67 respectively is reflected in (median alphas of 0.64 and 0.52, respectively). There was a tendency for preferred CES subscales to be more reliable than the actual CES subscales. The reliability of subscale 5, Task Orientation, was so low that it was dropped from further analysis. These figures were also consistent with the reliabilities of the CES subscales reported by Cheung (1982) and Cheng (1984). Thus, care had to be taken to interpret results using those subscales of moderate internal consistency.

The subjects also completed the Learning Process Questionnaire (see Chapter 1). In this study, the LPQ was designed to be used in two different forms: student's preferred approach and actual approach to learning. The median internal consistency coefficients for the preferred and actual motive and strategy scales were 0.68 and 0.57, respectively. There was a tendency for the students to be more consistent in reporting their preferred rather than their actual learning approaches.

Subjects

Five aided schools, which are typical of the majority of schools in Hong Kong, were chosen for the main study. They are subsidized Anglo-Chinese Co-educational schools, with English as the medium of instruction. Five classes of S3 students (85 male, 94 female) were chosen. The data were coded and analyzed with the assistance of the SPSS(PC) program.

RESULTS AND DISCUSSION

Table 10.2 shows the mean preferred-actual discrepancy of CES subscales with standard deviations in brackets. Mean scores were higher for the student preferred form than the student actual form for all the CES subscales. That is, students tended to prefer a more positive classroom environment to the classroom environment actually

encountered.

**Table 10.2: Mean Preferred-Actual Discrepancy
for CES Subscales (N=180)
(with standard deviations in brackets)**

Subscales	Preferred	Actual	Mean Difference
Involvement	15.69 (2.9)	11.48 (2.1)	4.20 (3.5)**
Affiliation	17.17 (2.7)	12.88 (2.8)	4.29 (3.1)**
Teacher			
Support	16.32 (2.6)	13.16 (2.7)	3.16 (3.4)**
Competition	14.92 (2.7)	14.34 (2.9)	0.58 (3.5)
Order &			
Organization	15.91 (3.0)	11.73 (2.4)	4.18 (3.4)**
Rule Clarity	15.50 (2.9)	13.51 (2.8)	1.99 (3.0)**
Teacher			
Control	15.36 (2.9)	14.12 (2.4)	1.24 (2.9)**
Innovation	14.53 (3.3)	11.19 (2.6)	3.34 (3.6)**

** $p < .001$

The subscale of Affiliation had the largest discrepancy between preferred and actual form and the subscale of Competition had the smallest discrepancy. The subscale of Affiliation also produced the highest mean in the preferred form, indicating that students in general preferred a more affiliative classroom environment in which they can help each other with homework and have good relationship with others. While the subscale of Competition resulted in the highest mean in the actual form, there was no significant preferred/actual discrepancy on this subscale. This suggests that students in Hong Kong are greatly influenced by the examination system in that they prefer the actual very competitive learning environment in order to achieve higher grades.

The overall picture of the preferred classroom however

combines an affective concern with students as people who need help and support from each other and an intellectual challenge, but tempered with a necessary *current* preference for working hard for academic rewards. This suggests that classrooms should be intellectually challenging to encourage growth in achievement and understanding, while cohesive and satisfying classroom environments encourage student interest and motivation (Moos & Moos, 1978). Table 10.3 (p.159) shows the mean preferred-actual discrepancy for the learning motive, strategy, and approach. Students reported greater preferred-actual discrepancies for deep and achieving motive, strategy, and approach while there was no significant difference in discrepancy for preferred and actual surface approach. In other words, many of the students would prefer to adopt a deeper and/or a more achieving approach, but would not prefer to be any more surface than they already are.

Table 10.4 (p.160) shows the relationship between preferred CES subscales and preferred learning approach. A strong correlation between the preferred CES subscales and deep learning approach and achieving learning approach means that positive classroom environment is correlated with a deep or achieving approach. The correlation between the preferred CES subscales and preferred deep approach to learning was found to be slightly stronger than the correlation between the preferred CES subscales and preferred achieving approach to learning. As school attainment has been found to correlate positively with deep learning approach and intrinsic motivation, if teachers can adjust classroom environment in the direction towards student preferred environment, intrinsic motivation and deep learning may be achieved and better school attainment can be obtained.

Table 10.3: Mean Preferred Discrepancy for Learning Motive, Strategy and Approach (N=180) (with standard deviations in brackets)

Motive	Preferred	Actual	Mean difference
Surface	19.95 (4.2)	20.18 (3.5)	-0.23 (3.8)
Deep	23.55 (3.9)	18.37 (3.4)	5.18 (4.2)**
Achieving	21.46 (4.1)	17.62 (4.0)	3.84 (3.7)**

Strategy	Preferred	Actual	Mean Difference
Surface	18.00 (4.2)	18.60 (3.4)	-0.60 (3.6)
Deep	21.71 (4.1)	18.19 (3.5)	3.52 (3.4)**
Achieving	23.85 (4.5)	18.11 (3.5)	5.74 (4.6)**

Approach	Preferred	Actual	Mean Difference
Surface	37.92 (7.3)	38.72 (5.9)	-0.80 (6.0)
Deep	45.33 (7.3)	36.55 (5.9)	8.78 (6.8)**
Achieving	45.43 (6.9)	35.81 (6.1)	9.63 (6.9)**

** p < .001

Table 10.4: Relationship between preferred CES subscales and preferred learning approach (N=180)

	Preferred learning approach		
	Surface	Deep	Achieving
Involvement	-0.13	0.54**	0.39**
Affiliation	-0.14	0.59**	0.30**
Teacher			
Support	-0.26*	0.42**	0.29**
Competition	0.11	0.33**	0.27*
Order &			
Organization	-0.27*	0.54**	0.37**
Rule Clarity	0.02	0.51**	0.36**
Teacher			
Control	0.08	0.48**	0.37**
Innovation	-0.09	0.55**	0.40**

* $p < .01$ ** $p < .001$

Table 10.5 shows the relationship between actual CES subscales and actual learning approach. No significant relationships between actual CES subscales and surface approach were reported. The subscale Affiliation, Teacher Control and Innovation were correlated with deep approach while the subscale Affiliation, Order & Organization, Rule Clarity, Teacher Control and Innovation were correlated with achieving approach. The subscale of Affiliation got the highest correlation with the actual deep learning approach while the subscale of Teacher Control got the highest correlation with the actual achieving approach. Furthermore, the correlations between the preferred CES subscales and the preferred learning approach was found to be stronger than the correlations between the actual CES subscales and the actual learning approach.

Table 10.5: Correlations between the actual CES subscales and the actual learning approach (N=180)

	Actual learning approach		
	Surface	Deep	Achieving
Involvement	0.11	0.21	0.14
Affiliation	-0.04	0.36**	0.22**
Teacher			
Support	0.10	0.14	0.18
Competition	0.17	0.11	0.15
Order &			
Organization	-0.04	0.05	0.24*
Rule Clarity	0.10	0.19	0.25*
Teacher			
Control	0.17	0.24*	0.35**
Innovation	0.08	0.32**	0.22**

* $p < .01$ ** $p < .001$

CONCLUSIONS

This research has extended previous knowledge by analysing the relationships between both preferred and actual learning strategies and learning environments from the viewpoint of Hong Kong students. Generally, their perceptions of secondary school as highly competitive and teacher controlled, and as encouraging rote learning, are much as expected. Clearly, many of the students would prefer their classrooms to be a friendlier place, where both students and teachers enjoyed working together and planning a variety of interesting but challenging activities. Such an environment would encourage both deeper and more achievement oriented learning strategies that most of these students would actually prefer. Fraser and Fisher (1983) discuss ways by which feedback to teachers about the students' perceptions of the classroom atmosphere can lead to

beneficial changes in the learning environment.

This research also indicates that the relationship between learning environment and approach to learning is stronger for the preferred rather than the actual form. This finding suggests that in the day-to-day Hong Kong classroom, students who would prefer to be learning in a deeper way are constrained by the actual rigidity of the learning environment and the assessment system to adopt more superficial learning strategies. Thus, some will modify their preferred learning approach, possibly against their will, but others will stick to their own preferences. However, when responding in terms of their preferences, they are no longer constrained by reality; they choose the classroom environments that they believe would allow them to learn in their preferred way. Student who prefer deeper or more achieving approaches have clear preferences for desired classroom environments, but surface oriented students do not. As the former's preferences are usually in an educationally desirable direction (more deep and achieving oriented), it would be worthwhile discovering factors which may encourage students to stick to their preferences, despite the realities of the classroom. The research literature suggests that variables such as self-monitoring, self-esteem, and locus of control would be worth investigating in this respect.

This study is just a first exploration of the relationship between the two areas, learning environment and learning approach. Further research is required to help teachers understand what they can do in their classroom in order to have a happier place for learning and teaching.

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CHAPTER 11

THE PLACE OF MASTERY LEARNING IN TEACHING BIOLOGY

Patrick L.K. Lai

THE NATURE OF MASTERY LEARNING

Mastery learning is based on the assumption that learning is a function of time, the learning history of a student, and the quality of instruction (Carroll, 1963; Bloom, 1976). It was developed as a way for teachers to provide more appropriate instructional strategies for their students. Under these more favourable learning conditions, the theory was that nearly all students would be able to learn a subject to the point of "mastery" (Guskey, 1985).

The term "mastery learning" refers to a diverse category of instructional methods, but the principal defining characteristics are: the establishment of a criterion level of performance to represent "mastery" of a given skill or concept, frequent assessment of student progress, and provision of corrective instruction. In order to ensure that most students are able to master instructional objectives, time and resources are reorganized; those failing to reach the objectives initially are given more time in which to do so in subsequent attempts. Bloom (1976) also includes an emphasis on appropriate use of such instructional variables as cues, participation, feedback and reinforcement as elements of mastery learning.

There are three primary forms of mastery learning. The Personalized System of Instruction (PSI), or the Keller Plan, is used primarily at the postsecondary level. A related form of mastery learning is continuous progress (e.g. Cohen, 1977), where students work on individualized units entirely at their own speed. The third form of mastery learning is called group-based mastery learning, or Learning for Mastery (LFM; Block & Anderson, 1975), commonly

used in elementary and secondary schools, and it is that is adapted for the present study.

The teacher instructs the entire class at one pace. At the end of each unit of instruction, a "formative" test is given, with a mastery criterion, usually in the range of 80-90% correct. Any students who do not achieve the mastery criterion receive corrective instruction, which may take the form of tutoring by the teacher or by students who did achieve the criterion level. Corrective activities are different from the kinds of activities used in the initial instruction as suggested by Block and Anderson. Following the corrective instruction, students take a parallel test. The class then moves on even if several students still have not got a passing score. All students who achieve the mastery criterion at any point are generally given an "A" on the unit, regardless of how many attempts it took for them to reach the criterion score.

Effectiveness of mastery learning

There have been many studies of the effectiveness of mastery learning teaching strategy, recently reviewed and evaluated in a meta-analysis by Kulik, Kulik, and Bangert-Drowns (1990). With regard to final examination or test performance, it was found in 67 out of 96 studies that the performance of students in mastery programs was significantly higher than in control classes, the remaining differences being nonsignificant. In no case were mastery groups significantly worse off than controls. Gains in mastery groups were greatest for low ability students. Best results were found when using locally designed tests (in which it is easier to incorporate items specific to the program objectives) rather than standardised tests.

No research seems to have been conducted relating students' approaches to learning, or even the cognitive level of learning outcomes, to mastery learning programs. Given the apparent success of mastery learning, this is a serious gap as it could be that success is bought at the price of learning quality.

This possibility is raised, because the design of mastery learning programs would seem to encourage surface learning, as success is defined in terms of passing test items usually quite specific to the content taught. Although each test attempt is contingent on success

in a previous test, students are not encouraged to integrate material, or even to remember material previously tested but not in the upcoming unit. Further, test items tend to be of a low cognitive level, because of the requirements of precise and frequent testing (Cole, 1990).

OBJECTIVES OF THE PRESENT RESEARCH

After the introduction of 9-year compulsory education in Hong Kong, with the abolition of the secondary school entrance examination, all students have to stay in schools until the age of 15. The allocation policy of students to S1 by the Education Department tends to place the top batch of candidates in well established schools. However, with the development of new schools in the New Territories and outlying islands, educationally disadvantaged students will be allocated to these standardized schools. These students often cause a lot of disciplinary problems and have no motivation to study under the conventional teaching system.

As a teacher in a newly-established school in Tsuen Wan, I have a strong sympathy with this group of students, who are placed in the type of schooling that is unsuitable for them. They are down-hearted for they cannot understand the materials taught in English. They hate the classroom situation and usually copy homework from their fellow classmates. Worse still, they become associated with bad elements and cause a lot of disturbance in schools and elsewhere. Under the present examination system, which is norm-referenced, they are destined to fail. The existence of this group of educationally-disadvantaged students in school definitely leads to serious social, economic and educational problems (Levin, 1987, 1988). Hence, we must try to solve the problem by shifting to a more encouraging teaching strategy.

Mastery learning, which helps the weak learners to absorb the materials gradually as they go through individual short learning unit, would seem to be well suited for this purpose. This study focuses on the teaching of Biology to S3 students of my school, using the learning for mastery teaching strategy.

The objectives of the present study are to look at the effects of mastery learning teaching strategy on:

1. the learning outcomes in S3 Biology of students with different learning approaches; and
2. on the cognitive level of the outcomes elicited.

METHODS AND TECHNIQUES

Subjects

The subjects employed in this research paper are 196 S3 students. S3 was chosen because these students are not pressurized by examinations, and so the syllabus can be taught flexibly.

The students of high ability were allocated to A and B classes, average to C and D classes, and low to E and F classes, respectively. Two teachers were assigned to teach the six classes of S3 Biology, with each teacher taking 3 classes. The assignment of teaching duties to the various classes is stated in Table 11.1, with students' respective mean Integrated Science scores and English Attainment Test scores from the previous year.

Table 11.1: Mean scores of students in Integrated Science (IS) and English (from S2), and assignment of teaching duties in S3 Biology (N=196)

Class	3A	3B	3C	3D	3E	3F
IS	74.8	66.8	48.5	54.7	46.9	46.1
English	61.3	44.4	40.8	37.6	35.6	30.8
Treatment	C	E	C	E	C	E
Teacher	A	B	B	B	A	A

C - CONTROL GROUP

E - EXPERIMENTAL GROUP

* 3A was deleted from the study because both Science and English scores deviated greatly from the mean scores of the other classes.

Data collection

Learning Process Questionnaire. At the start of the first term, the Learning Process Questionnaire (LPQ) was given to all the students. The raw scores were then coded as decile scale scores using the Hong Kong norms. The students were then classified into surface biased and deep biased categories accordingly. The basis of classification was as follows:

- (i) Surface bias - Surface decile scale score is greater than deep decile scale score by two.
- (ii) Deep bias - Deep decile scale score is greater than surface decile scale score by two.

For the purpose of interview, 16 students were selected (see Table 11.2).

Table 11.2: Distribution of students of different categories for interview

Ability/ Approach, treatment	High	Low
Deep, control	2	2
Deep, experimental	2	2
Surface, control	2	2
Surface, experimental	2	2

Performance tests. The final grade for Biology was based on summative test given to both Experimental and Control groups at the end of the LFM program. Formative tests A 1 to 4 were also used as repeated measures of performance by the experimental group.

Interview questions

The following basic questions were asked, with opportunities allowed for elaboration:

Attitude to mastery learning: "What is your attitude towards the mastery learning teaching strategy?"

Approach to mastery tasks: (a) "When you prepare for the test, how do you approach the task first?"; (b) "What do you do next?"

Interest or attitude towards Biology: "After the first term, how would your interest towards Biology change? Give your reason."

In order to test the level of thinking of students in Biology, a simple classification task was given in the interview:

Classification Task: "You are given a snake, a tortoise, a bird, a bat, a fish and a dolphin. How would you be able to classify the organisms into different groups. Give your reasons in detail."

Research design

The research is a non-equivalent control group design, and is set out as follows:

Pre-entry characteristic	Treatment	Outcomes
S2 English scores	1. Mastery learning	1. Biology scores
S2 Science scores	2. Conventional	2. Classification
LPQ decile scores		3. Learning approach
		4. Attitude

Treatment

For the implementation of learning for mastery teaching procedures, the learning materials were divided into smaller learning units to be covered within one cycle (six days) of the learning time. Students learned the subject matter in a class with about 35-40 students per

teacher. The instruction on each learning unit was administered in a 4-phase cycle - initial instruction, formative test A, corrective/enrichment instruction, and formative test B. The initial instruction was similar to those in the conventional non-mastery classes. After the teaching, assignments were given to students of all classes.

During the next double period, a short formative test A that carefully assessed mastery of the learning objectives was given. It was usually in the form of a short quiz, covering the materials learned in a particular learning unit. The test was criterion-referenced and was not counted in the final grade. The test was given approximately once per cycle for the purpose of feedback, typically taking about 15 minutes to complete, and was marked by the subject teacher concerned and returned to students in the next class session. These tests were mainly used to diagnose the learning weaknesses of students so that both the teachers and students can get immediate feedback to improve their instructional or learning activities.

The teachers concerned retaught the items which caused several students some difficulties. Those students who did not attain 80% mastery standard were given corrective exercises to be done in school outside class time. Those who had demonstrated mastery were given enrichment opportunities, which included tutoring their fellow classmates who needed corrective activities. The corrective exercises were designed to help students identify their errors; the materials were presented in simple English with annotated diagrams to help maintain interest of students. After the corrective exercise, a parallel formative test was given to the non-masters to check their progress. The parallel formative test was usually given two or three days after the first one. Owing to time constraints, all the other students then went on to the next learning unit.

Data analysis

Mean scores of Biology of the experimental and control group in the summative test after treatment were obtained. A two-way ANCOVA with approaches to learning and treatment as independent variables, the Biology scores as dependent, and English scores as covariate, was then performed.

The test scores of the control and experimental groups of learners with different learning approaches were also calculated. A repeated measures two way ANOVA with approaches x test occasion was performed on these means.

Interviews. Sixteen students were selected randomly from each group to attend interviews between January and March to investigate further how mastery learning affects their learning attitude, their approach to learning, and the quality of their learning as judged from their responses to the classification question (see above).

RESULTS AND DISCUSSION

Quantitative analyses

First, the results on the summative test were examined. The approaches x treatment ANCOVA indicated that both approaches and treatment had significant main effects on the Biology scores ($F=3.26$, $P<0.05$; $F=5.06$, $P<0.05$, respectively), as did their interaction ($A \times T$: $F=3.12$, $P<0.05$). The treatment main effect appears to support previous research findings that mastery learning teaching strategy does have a positive effect on learning, but the interaction shows that this is mainly limited to surface students (see Table 11.3).

Inspection of Table 11.3 shows that those who had a preferred surface approach to learning appeared to do considerably better in the mastery learning group, differences being much smaller for those with a deep bias to learning, while those with no preferred approach may actually have done a little worse under LFM..

These data do not however show how students with different preferred approaches to learning might react from test occasion to occasion within the mastery treatment. Accordingly, it was decided to use a repeated measures ANOVA, with Tests 1 to 4 as the dependent variables and preferred approach as the independent variable (Table 11.4). There were no significant main effects for Approach or Test Occasions, but a significant Approach X Test Occasions interaction ($F=7.17$, $P<0.01$), which is graphed in Figure 11.1.

Table 11.3: Cell means (and Ns) of Biology scores of different groups of students arranged on 4 tests

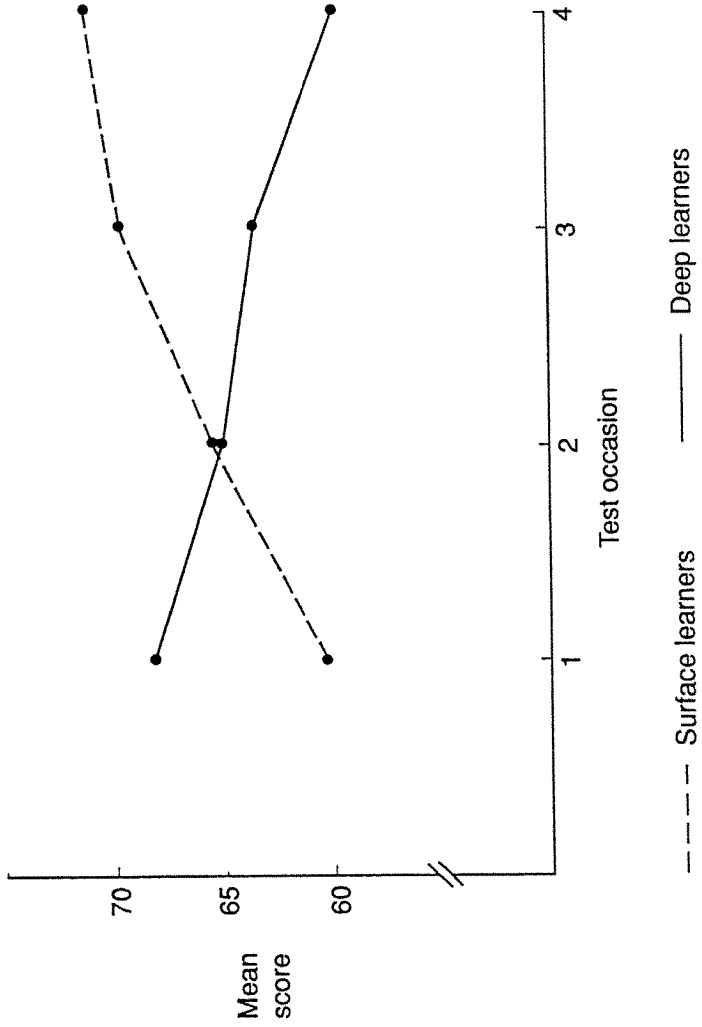
	Control	Experimental	Difference
Surface	47.42 (24)	65.41 (34)	+17.99
No bias	63.22 (9)	57.21 (19)	-6.01
Deep	52.35 (31)	58.69 (42)	+6.34
Total	55.78 (64)	60.80 (95)	+5.02

Figure 11.1 shows clearly that the Biology scores of the surface learners improved sharply from Tests 1 to 4, while the scores of the deep learners, initially higher than those of the surface learners on Test 1, steadily declined thereafter, finishing over 10 points lower than the surface learners on Test 4.

Interview data

The quantitative results were supported and elaborated by the content of the interview protocols, where the focus was on the students' perceptions of the effects of mastery learning on interest in Biology, their studying approaches, and their cognitive skills.

Figure 11.1: Formative test results from tests 1-4 of surface and deep learners



Analysis of the protocols clearly showed that deep and surface learners perceived the mastery learning teaching strategy in a different way. Students from the control group were told about the nature of mastery learning and asked how they thought they would like it. Deep learners from the control group thought that mastery retesting would require students to attend to the tests in a different way and this would be a positive challenge, while the surface learners expressed dislike for the notion of continual retesting.

The picture completely changed, however, when the experimental group actually experienced mastery learning. Surface learners saw that they could pass by sheer diligence. This motivated them and drove them to study, but the deep learners who reported this as tedious, rejected the idea of repeated testing.

When their studying approaches were probed, it was clear that the mastery teaching strategy tended to shift the studying approaches in the surface direction, in that students narrowed their study materials to the assignment and past papers only. For the surface learners, especially those of low ability, this strategy encouraged them to adopt the extreme end of the approach, by remembering the biological materials in notes word by word and phrase by phrase, thus enabling them to succeed in the tests.

Thus, mastery learning appears to provide an incentive for studying for the surface learners, by giving them a second chance to obtain a pass. However, the same mastery strategy is seen as tedious by deep learners, long term use tending to diminish their interest and performance in the subject.

Finally, the treatment had little or no effect on the analytical and cognitive skills of the learners, as became clear in the responses to the classification problem in which students were asked to classify animals, but approach to learning did. The task requires an integrated concept framework with which to respond. The students with a deep bias obtained nearly three times the scores as the surface learners in these responses. As the interviews made evident, students with a deep bias usually had a hierarchical arrangement in mind before going into details, while surface learners usually centred on the details of individual organisms. Those of low ability forgot the characteristics of most of the organisms (the interview was carried out a month after the treatment, to test retention).

We can therefore conclude that the mastery strategy does have a positive effect on surface learners, which is cognate with the findings by Kulik *et al.* (1990) that mastery learner especially benefits those of average or low ability. The present results go further, however, showing that mastery learning is preferred by surface learners, and indeed it is likely that the strategy actually promotes surface learning, and thus in the long term has little or no benefit in terms of improving the cognitive skills and analytical power of students in Biology. Surface students made no effort to link up concepts learned in these units, hence, their cognitive response for the classification question indicated no improvement as compared to the deep learners.

CONCLUSIONS

Many studies have reported positive effects of the mastery learning teaching strategy on student achievement: general achievement, specific achievement by grade level and subject area, knowledge retention, time-on-task, and learning rate. However, these studies have been limited to low level learning outcomes (productivity and retention), and have not investigated the effects of mastery teaching strategy on cognitive and analytic skills, and on students' study approaches.

The present Chapter looks at the effects of mastery learning teaching strategy on students' study approaches and cognitive skills. Quantitative results showed that over repeated trials deep and surface biassed learners increasingly diverge, surface learners doing better each trial and deep worse. These data were supported from the interviews, which confirmed that mastery learning teaching strategy promoted the engagement of surface study approach with rote learning and low level cognitive processes. On the other hand, surface students of low ability did seem to be motivated to study as they are given more chances to secure a pass.

Thus, although the findings of this paper indicate that mastery learning promotes better quantitative results in Biology for surface learners, there are dangers. One of the main aims of learning, to increase higher level cognitive processes, seems actually to be discouraged in this mode.

This study therefore adds to the mastery learning literature. As frequently implemented, it can be seen to promote quantitative rather than qualitative conceptions of learning and surface approaches to learning. It may be more important pedagogically then for teachers to pay attention to students' ways of thinking and to facilitate students' realization of these different ways of thinking (Marton, 1986).

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CHAPTER 12

COOPERATIVE LEARNING IN A GEOGRAPHY CLASS

Edith Lai

INTRODUCTION

Cooperative learning has distinct potentialities for improving student learning. Groups in general have several features that promote intrinsic motivation and deep processing:

1. a high level of activity; students are less likely to remain passive in well run groups.
2. students provide each other with immediate feedback, at a level each is likely to understand. They interact with peers, not with a more knowledgeable teacher.
3. group expectations provide students with a felt need to respond. Participants feel that it is important to become actively involved.

With regard to cooperative learning, previous studies demonstrate that cooperative learning does indeed enhance the achievement of cognitive and affective goals (Johnson, Marayuma, Johnson, Nelson, & Skon, 1981). However, there is little understanding of the possible effects of cooperative learning on different levels of learning outcome, or how these outcomes might be achieved through the approaches to learning brought about by group processes. Tang (1991) showed that tertiary students who spontaneously formed cooperative learning groups outside the classroom to do their assignments did appear to engage in deep rather than surface types of study activities, and achieved more structurally complex outcomes as assessed by the SOLO taxonomy.

Whether these effects would occur with secondary school students in teacher structured groups, however, is unclear.

Work to date, then, would suggest that formally structured cooperative learning groups in the secondary classroom would use deeper learning processes and therefore achieve higher level learning outcomes, but such a study has yet to be carried out. The present study is an attempt to look into these two areas. The research hypothesis is:

Students who participate in cooperative learning will show structurally more complex learning outcomes, better general knowledge of the topics taught, greater intrinsic interest in the subject matter, and deeper approaches to learning than those who learn through lectures and work on their own for most of the time.

METHOD

Research Design

The independent variable consists of two treatment conditions involving two separate classes: (a) cooperative learning, and (b) traditional classroom learning. In the cooperative learning condition, described in detail below, students spent much of their class time working in small heterogeneous learning groups in which they helped one another in their learning. In the traditional classroom learning condition, students spent much of their class time receiving lecture and working on their own.

The dependent variables are the quality of learning measured in terms of the structural levels of students' responses using the SOLO taxonomy (Chapter 1), general knowledge in the topics covered, intrinsic interest in the subject matter, and general learning approach.

Subjects

The subjects were 61 sixth-form students aged between 17-19 in two intact geography classes of an Anglo-Chinese secondary school. The experimental group consisted of 32 students taught by the author; the

control 29 students were taught by another teacher.

Instruments

The following instruments were used for pretesting:

- (a) a cognitive test of 4 SOLO ordered-outcome items (Courtney, 1986) to measure the structural characteristics of students' responses,
- (b) a knowledge test of 30 multiple-choice items to measure the students' general knowledge in the subject,
- (c) a questionnaire of 20 Likert items on a 5-point scale, to measure intrinsic interest in the subject matter,
- (d) the Learning Process Questionnaire (LPQ), see Chapter 1.

Posttesting consisted of parallel forms of (a) and (b); (c) and (d) were repeated.

Cooperative and traditional treatment conditions

Subjects in both classes attended two 35-minute consecutive lessons daily, for four days in a week, for 8 weeks. They studied the same content: 2 curriculum units including 7 topics.

On the first day, the experimental class was briefed on the goals of working together, and were instructed to work as a group cooperatively in completing the assignments for their group. They formed small learning groups of 4, and were instructed to work as a group cooperatively in completing assignments, with all group members sharing material and ideas, helping each other find answers, and making sure that all participated and understood. Students were encouraged to seek help and clarification from each other rather than from the teacher. To avoid the possibility of any interpersonal and intergroup competition, evaluation of the daily assignments was criterion-referenced using the SOLO taxonomy, the framework of which they were taught. Students were graded on the basis of their group's performance in order to promote positive interdependence among the group members.

Learning in the control class was mainly in the receptive mode, with the teacher expounding, and the students seated facing the blackboard and listening.

Interviews

After the intervention 16 students were interviewed, 8 experimental and 8 control, chosen on the basis of achievement level (top or bottom third of the previous term's geography test results) and learning approach "bias" (determined by a difference of two or more between deep approach and surface approach decile scores). The interview was semi-structured. Students were encouraged to express their feelings toward any cooperative learning experience and their attitudes toward studying the subject; and to reflect on their way of going about a group task or a task done on their own, and their study strategies in general.

Data analysis

Four sets of $2 \times 3 \times 3$ analysis of covariance (ANCOVA) were run on the four dependent variables using their pretest scores on the control test items as covariates. The two treatment conditions, the three achievement levels (including the middle third), and the three biases in learning approach were the levels of analysis.

RESULTS

Quantitative

The means of students in the cooperative and traditional learning classes are given for the three achieving levels in Table 12.1 (a), and the results of the ANOVAs in Table 12.1(b).

Table 12.1 (a): Mean Scores of the Dependent Variables by Ability Groups in the Two Treatment Conditions

Dependent Variable	Cooperative learning			Traditional learning			F for Ability Main Effect
	H	M	L	H	M	L	
SOLO closed	6.64	6.10	5.88	5.25	5.38	5.15	A,0.77
SOLO open	6.71	6.00	6.13	6.00	5.38	4.08	A,7.20***
Knowledge	13.07	11.50	11.38	10.63	9.00	9.46	A,2.39
I. M.	43.71	41.60	37.38	37.50	39.88	33.31	A,5.73***
DA deciles	7.43	8.20	5.75	6.63	5.38	5.38	A,0.94
SA deciles	7.00	8.50	7.25	7.38	8.38	7.62	A,2.00

Table 12.1 (b): Analysis of Variance and P levels (Significant F-ratios in text)

Effect	SOLO (Closed)	SOLO (Open)	Know-ledge	IM	DA	SA
Treatment (T)	(.10)	.01	.01	n.s.	n.s.	n.s.
Achievement (A)	n.s.	.01	n.s.	.05	n.s.	n.s.
T x A	n.s.	.05	n.s.	n.s.	n.s.	n.s.

Significance levels: ***P < .01

On the closed SOLO questions, Ss in the cooperative learning condition tended to perform at a higher level than the traditionally taught, but on a two-tail test, the difference did not reach significance at the .05 level ($F(1,61) = 3.51, P < .10$).

On the open SOLO questions, however, Ss in the cooperative learning condition did perform better than subjects in the traditional classroom learning condition ($F(1,61) = 8.37, P < .01$), but to differing extents over the three achievement levels, as shown by the significant treatment by achievement interaction ($F(2,61) = 3.48, P < .05$). Medium and low achieving students benefited the most from cooperative learning, in comparison to the traditionally taught. The cooperative learning group scored on average 3.17 on the open SOLO question, which suggests that most are working at or beyond the multistructural level, while the mean score for the traditional classroom learning group was 2.49, indicating that while some students are working at the multistructural level, many responses would be unistructural.

Subjects in the cooperative learning condition also scored significantly higher than traditionally taught on the knowledge test ($F(1,61) = 11.66, P < .01$) over all achievement levels, suggesting that better structured learning was not at the expense of breadth of learning.

Cooperative learning was not however associated with intrinsic interest in the subject matter; the mean rating was generally higher in the experimental group (41.47 as opposed to 36.28), but this difference did not reach significance. Ability was however related to intrinsic motivation ($F(2,61) = 5.73, P < .01$): high- and medium-ability subjects had more intrinsic interest in the subject matter than low-ability subjects.

There was no significant treatment effect on the learning approaches, although there was a consistent trend for subjects in the cooperative learning condition to score higher on the deep scale, and lower on the surface scale.

Interview data

The interviews provided qualitative data that give a fuller picture of the effects cooperative learning has on increasing motivation, and

increasing metacognition and deeper approaches to learning.

Motivation. The interview data suggested that motivation is closely associated with (a) students' perceptions of how effective the cooperative learning method was in helping their own learning, and (b) peer relationships in cooperative learning groups.

All the subjects interviewed had some experience of working in groups. Most of them said that cooperative learning aided their own learning. They found the group learning experience enjoyable, and the extra time taken up in group work worthwhile. Their participation in the group activities was high. They showed greater information search, read more about the subject, and discussed it more with classmates. On the other hand, there were those who found working together a burden to their academic progress rather than a help, and these students generally showed low involvement in the group learning activities.

Peer academic support is a strong motivational force for student learning. There is evidence that with peer mutual support, the subjects found learning more lively and less anxiety-arousing. They felt freer to express themselves and ask for explanation and clarification. Furthermore, they were motivated to think more, read more about the topics, and work harder for the accomplishment of the group tasks. Most of the subjects interviewed regarded peer feedback, support and encouragement as one of the most important gains from working in groups, feeling that the cooperative learning method provided a supportive atmosphere for their learning.

The low achieving students generally showed greater interest in learning more about the subject matter after the cooperative learning experience, elaborating the quantitative finding that cooperative learning brought about higher level cognitive outcomes in low achieving students relatively more than in brighter students. It is possible that low achievers understand the lessons better through interacting with one another in the group, peer support and encouragement providing them with the extrinsic rewards that they need. Cooperative learning provides opportunities for the low achieving students to learn from better students and be positively influenced by them, for example, learning better study methods.

Subjects who did not perceive a supportive learning atmosphere in group learning generally do not show greater interest in the subject after the group learning experience.

Learning approach. Cooperative learning enhances metalearning capability by promoting interaction between the learners. They become more aware of their own learning processes, their own strengths and weaknesses, and how the tasks can be better handled when they see themselves in the light shed by others. Metalearning may change students' conception of what learning is, from a basically quantitative view to a more qualitative conception which emphasises gaining meaning from a learning act and how that meaning may change their ways of seeing, experiencing and conceiving aspects of the real world around them.

Metalearning activity was present at varying levels in different achievement and bias groups. In general, the deep bias subjects showed a greater number of metacognitive responses than the surface bias subjects in the interviews, indicating that the deep bias subjects engaged in more reflective learning than the surface bias ones.

In approaching a task, the high achieving-deep bias subjects in both experimental and control groups engaged in high level cognitive processes, such as "analysing the question", "thinking about the task requirements", "preparing an outline", "organising the material", "commenting on each other's points", and "reviewing the draft". High achieving-surface bias subjects tended to engage in surface strategies like direct copying from the reading material, but in the experimental group they also cared about their results in the group tasks. The latter had actually encouraged them to take a look at what others were doing and how, if only briefly.

Amongst the high achieving subjects, then, deep bias Ss generally possessed the procedural knowledge, the appropriate motivational state, and appropriate degree of metacognitive readiness essential for the deep approaches to tasks, which were more effectively realised in the experimental group. Surface bias Ss, however, generally lacked the appropriate motivational state for deep approaches. With the surface motive to increase the quantity of knowledge, cooperative learning failed to bring forth deep approaches in these subjects. Differences amongst higher achievers in high level

cognitive outcomes, as measured by the SOLO test, were minimal between the cooperative and traditionally taught students; the interview data suggest that deep-bias in learning is at this high level of achievement likely to be more important than teaching method. Amongst lower achievers, cognitive differences were greatest, and it seems likely from the interview data that this increasing difference between cooperatively and traditionally taught could be put down to the motivating effects and peer interaction of cooperative learning.

DISCUSSION

The results of the quantitative analyses supported the hypothesis that cooperative learning promotes achievement of higher level learning outcomes, and general knowledge of the topics taught better than does traditional classroom learning. However, the predicted positive effects of cooperative learning on intrinsic motivation to learn more about the subject matter, and deep approach to learning were not supported.

The results of this study also provided some evidence that cooperative learning promotes structurally more complex learning outcomes over all achievement levels, while in traditional classrooms medium and low achieving students seem to suffer academically from not discussing the material with other students. This is not surprising, since in mixed-ability groups the high ability students help the low ability in a teacher-learner relationship. Nevertheless, those adopting teacher-roles also benefit, as indeed has been found by other researchers (Allen, 1976).

Thus, it seems that when students' views and conclusions are challenged in group situations, they reflect on the logic of their arguments, try to understand their opponents' conclusions and rationales, and learn to take and accommodate themselves to each other's perspectives. In doing so, learning becomes more integrated, or relational in SOLO terms.

These higher level outcomes are not however at the expense of knowledge. The knowledge test measures a subject's knowledge base in the subject. The results on the knowledge test provided evidence that the exchange of ideas and materials among group members extended their range of ideas, and thus their knowledge base in those

topics, possibly initiating an active information search, which does not on these data appear to be confined only to the topic under review. The subjects doing the information search actually pick up more things in the subject, thus widening their knowledge base.

There was no evidence in the quantitative analyses that cooperative learning promotes intrinsic motivation. The ceiling effect offers a possible explanation. The frequency distribution of subjects' ratings on the questionnaire showed that the percentage of cooperative learning group subjects who rated 3 or above in the pretest was 84.4%, implying that most cooperative learning group subjects already rated very highly on the items in the pretest, and were thus restricted to a low mean gain on the posttest. This may help explain the absence of a treatment effect on intrinsic motivation.

Neither was there any quantitative evidence that cooperative learning had any significant immediate effect on students' approaches to learning. It may be seen that while cooperative learning tends to draw out students' deep motives and deep strategies, these are restricted to the topic in question, and would not affect their general learning approaches, which are governed by the interaction of a variety of other presage factors, both personological and their other in-school experiences.

These findings were however augmented by the qualitative data, which suggested that cooperative learning was effective in promoting understanding, in increasing students' interest in the subject matter, and in students becoming more aware of their own learning after working in groups.

These results thus support previous research findings that cooperative learning experience has a positive effect on students' cognitive and affective learning outcomes, but did not appear to have any significant impact on students' general approaches to learning. However, there is evidence that students engaged in more metalearning activity when learning in groups and that they showed structurally more complex learning outcomes, indicating that they were heading for the deep approaches. Therefore, it would be much too soon at this stage to deny the efficacy of cooperative learning in increasing students' deeper approaches to learning.

IMPLICATIONS AND CONCLUSIONS

The findings of the present study provide a good rationale for teachers to implement cooperative learning structures in the classroom more often because they are effective in promoting understanding and thinking, motivation to learn, and metalearning activity.

The results of the present study indicate that the average sixth-form student tends to work at the uni- and multistructural levels, and that cooperative learning encourages more relational learning and structurally complex learning outcomes. Therefore, the cooperative learning method provides a helpful alternative to teachers who wish to promote student understanding and thinking, and higher level cognitive learning outcomes.

Cooperative learning is found to be helpful to the poorly motivated students who need constant support and encouragement from external sources and a greater variety of stimulus and experience to keep their interest and concentration in academic work.

Cooperative learning experience helps students become more aware of their own learning: what they intend to get out of a piece of work and how to go about it in order to achieve the goal. Metalearning is the mediating factor for the deep approaches. Therefore, cooperative learning can help students work toward the deep approaches.

The absence of significant treatment effects on students' approaches to learning suggests that perhaps a contextual approach to improving student learning may be more effective since student learning is much influenced by the broader contextual variables such as course organization, assessment, expectations and norms of parents, teachers and students, and organizational climate of the school.

Limitations and recommendations

Generalization of the results of this study is limited by the sample size, characteristics of the subjects, length of the study, types of tasks, and specific operationalizations of the independent and dependent variables. Moreover, the teacher effects pose an intrinsic problem to

the design of this study.

The present study has only examined the effects of group reward for group product cooperative learning structure on student learning (Johnson *et al.*, 1981). The present findings may form the basis for comparison with other cooperative learning structures such as group reward for individual learning and individual reward. In doing so, it is hoped to find out the type of learning structure which is most effective and useful in achieving certain desired educational goals.

Since there is still very little understanding of the possible effects of cooperative learning on higher level learning outcomes and students' approaches to learning, further research effort should be directed into these areas. This is likely to open up a new dimension for improving the quality of student learning.

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CHAPTER 13

RESTRUCTURING MISCONCEPTIONS IN PHYSICS

David K.T. Tang

THE NATURE OF ALTERNATIVE CONCEPTIONS

From the seventies onwards, numerous studies have been carried out on students' alternative conceptions in science, that is, where students hold different ideas about particular scientific concepts from those their teachers try to teach them. Most of these researchers aim at identifying the alternative conceptions of the students in specific domains in science. The trend is ever increasing and is growing into other subject areas too.

There are some common features of alternative conceptions. Osborne and Freyberg (1985) suggest the alternative conceptions held by students:

- (a) are related to their informal knowledge. The terms used in science are part of their everyday language so they have attached different meanings for them.
- (b) are extremely robust and resistant to change.
- (c) are rational and meaningful to them.
- (d) share some general patterns, which suggests there may exist a predictable trend among individual constructs.

It follows that students holding alternative conceptions are hindered from learning scientifically acceptable conceptions. There have been several attempts to design better teaching methods to cope with the situation (e.g. Gunstone, Champagne, & Klopfer, 1981; Raman, 1980) but neither of these attempts were successful,

suggesting that the above attempts do not go to the root of the problem.

Saltiel and Viennot (1985) pointed out that the alternative conceptions of force and motion held by students nowadays are very similar to those held by experts at earlier stages in the history of science. The high degree of parallelism suggests that such alternative conceptions are not the consequence of off-track teaching, which is why ordinary assessment in schools cannot reveal the problem.

The predominant theory of learning accepted by workers in this field is constructivism (Driver & Oldham, 1986; see also Chapter 1), suggesting that we create our own constructs to understand the world (Kelly, 1955), so that knowledge is constructed personally. Thus, changing one's conception of a natural phenomenon is equivalent to restructuring the knowledge structure in one's mind.

Recent teaching strategies to promote conceptual change

Recently, some teaching strategies aiming at promoting conceptual change have been designed, most adopting the conflict model in their intervention programme. They differ from former ones by first eliciting the prior ideas of the students before the intervention activities, but with the exception of Rowell's discussion (1990), and the LISP and CLISP projects discussed below, the results are disappointing.

Learning In Science Project. The Learning in Science Project (LISP) was carried out in New Zealand from 1981 to 1982 (Osborne & Freyburg, 1985). The project aimed at changing children's ideas in different areas of science. The outcome of the group work includes teaching notes, slides, video tapes and other related teaching aids.

Children's Learning in Science Project. In the U.K., Driver and her associates established an even more comprehensive project known as the Children's Learning in Science Project (CLISP) (Driver *et al.*, 1987a, 1987b, 1987c). CLISP is more comprehensive than LISP in the way that complete learning packages are developed for teaching several topics in secondary science curriculum. All such learning packages bear the same constructivist teaching sequence which can be viewed to consist of the following five phases: orientation, elicitation of ideas, restructuring of ideas, applications of ideas and

review (see also Table 13.1 below).

The present study

The present study is an attempt to restructure the alternative conception "motion implies a force" (MIF), using a learning package developed from Driver's teaching sequence, and to see if any induced change is related to students' approaches to learning.

The relationship between students' approaches to learning and their existing misconceptions is not immediately evident, as approaches to learning refer to learning in the school context, while misconceptions are derived outside school. However, it might be expected that if intervention in school is successful, students predisposed to deep approaches would be more likely to change their misconceptions to accepted frameworks of science more than students with a surface approach. This is because such change depends mainly in the first instance on the recognition that the existing framework produces a conflict that has to be resolved (see below), and that perception of conflict and its resolution is more likely amongst deep students, who have a more integrative approach to learning than surface students.

This study explores the following questions in the context of Hong Kong Technical Institute students:

1. Is the learning package effective in changing students' conceptions concerning the framework MIF?
2. Is there a relation between the approaches to learning of a student and the degree of alternative conception held by the student prior to intervention?
3. Is there a relation between the approaches to learning of a student and the student's response, in terms of conceptual change, to the learning programme ?

METHODOLOGY

Subjects

The subjects are pre-technician students of two naturally occurring

classes which are almost identical in terms of achievement. Both of the classes belong to the mechanical engineering stream. One of the classes was randomly chosen as the treatment class, the other as the control class.

Students at this level are from three leavers that come from either grammar or technical secondary schools and all have received one year of craft-level education in the Technical Institute. They are very familiar with common machinery in the workshop. They have learned the basic ideas of Newton's three laws of motion.

They were told that they would have a revision programme in mechanics but they did not know they were chosen as subjects for research work.

Instruments

Questionnaires for pre- and post-test. Two similar questionnaires were designed for the pre-test and post-test to compare the degree that the alternative conception, motion-implies-a-force (MIF), was held by the students. The questions are mainly modified from Osborne's LISP papers, and the degree that a student holds the MIF misconception is given by the MIF score of the student. The maximum MIF score is 100, a higher score meaning that the student holds more alternative conceptions.

Learning Process Questionnaire (LPQ), as described in Chapter 1.

Study design

The learning package. The learning package, developed by the author on the basis of Driver's CLISP project, contains the constructivist's teaching sequence in an 11-lesson intervention program. Each lesson is of 50 minutes' duration. Activities in the programme include small group discussion, teacher guided class discussion, poster production, presentation of ideas, practical sessions, experiential demonstration, working through worksheet and watching video films. The overall design is summarised in Table 13.1.

Table 13.1: An Outline of the Learning Package

PART	LESSON	MAIN ACTIVITIES:	PURPOSE
A. Elicitation of students' ideas about force and motion	1	-Students complete WK 1 -small group discussion -poster production and presentation	Enable students to be aware of their own ideas and their classmates' ideas
B. Nature of Scientific Theory	2 & 3	-Game 1 and Game 2 -Students complete WK 2	Introduce the philosophy of science and rules for formulation of scientific theory to students
C. Restructuring of Ideas	4 & 5	-Teacher quotes counter examples of MIF -Video film shows -demonstration (WK 3) -students complete WK 3 and WK 4 -cooperative discussion	Expose students to conflict situations Brainstorming Recognition of alternative ideas
	6 & 7	-Students perform experiments in WK 5 & WK 7 -demonstration (WK 6) -demonstration (WK 8)	Extend, modify and replace the original ideas
	8	-cooperative discussion -Students complete WK 9 -Assign WK 10 as homework	Test the validity of the new ideas
	9	-small group discussion poster production	Construction of new ideas
D. Review of Accepted Theory	10	-Teacher relates the new ideas to students' original idea -Teacher relates the new ideas to daily experience and Newton's laws of motion	Enable the students to be aware of the change in ideas Consolidation of new ideas
E. Application of Accepted Theory	11	-Class discussion -Students complete WK 11	Ensure the students to be aware of the change in ideas Reinforcement of the newly constructed ideas

Restructuring of ideas is the most important part of the programme. According to Driver, restructuring can be enhanced by the following: clarification and exchange of ideas, exposure to conflict situations, construction of new ideas, and evaluation of the newly constructed ideas.

Revision programme for the control class. The revision programme for the control class was of the same duration as the treatment programme, but instead of an intervention programme, it was an extension of the normal lesson. Topics related to the alternative conception MIF are all included. Since the class had already completed the curriculum of mechanics, there is no more practical work for the control class. The activities for the class included whole class lecturing, individual tutorial in the class on request by students and working through Physics problems during and after the class.

Procedure

For accessing the approaches to learning of the students, the LPQ was administered to all the subjects well before the intervention learning programme, the MIF pre-test questionnaire one week before. The purpose of the MIF pre-test was to assess the degree to which the students held the misconception before the treatment.

About 25% of the subjects from both classes were interviewed after the pre-test. The aim of the interview was to ensure that the findings in the questionnaire were true reflections of the responses of the students. The 11-lesson intervention learning programme for the treatment class then started. The control class had a revision programme of the same duration as the intervention programme. The two programmes were carried out simultaneously and they lasted for about three weeks.

One week after the completion of the programmes, the post-test MIF questionnaire was administered to all the subjects to assess the degree of misconception held after the treatment. Subjects being interviewed before were interviewed again in order to validate the findings in the questionnaire.

RESULTS AND DISCUSSION

Effectiveness of the programme

To answer Question 1, we need to test if the MIF score in the post-test will be significantly lower than the MIF score in the pre-test for the treatment class while there will be no significant difference in MIF score between the pre-test and post-test for the control class.

First, we look at the difference in mean pre- and post-test MIF score between the two classes (see Table 13.2):

Table 13.2: Pre- and post-test differences in E and C classes and MIF score.

	Mean T-class	MIF score C-class	t-value	d.f.	P<
(a) Pre-test	82.42	76.67	-1.00	61	n.s.
(b) Post-test	10.30	80.77	12.19	57	<0.001

The difference in MIF score between the two classes is not significant for the pre-test, but is highly significant ($P < .001$) for the post-test. From the raw data, we find that the mean MIF score for the treatment class has decreased by 72.12 points. In other words, the extent of the misconception that motion implies a force has decreased in the experimental, but not in the control, group.

Secondly, we looked at the difference in individual MIF score, by calculating the change in MIF score for individual subjects of the two classes. Let us suppose that a decrease of 60 points or more in the MIF score indicates "probable" conceptual change, then 81.8% of the subjects in the experimental class show improvement after the treatment, and only one student in the control class shows improvement after the revision programme. A more stringent way to investigate the situation is to count those students whose MIF score decreases from whatever value to zero in post-test (no

misconceptions). Under such a condition, 72.7% of the students in the treatment class showed conceptual restructuring while there were none in the control class.

A paired t-test was performed to check pre-/post-test differences on a student by student basis. The result was similar to that in Table 13.2; the t-value for the control group was less than 1.0, while that for the experimental group was 12.09 ($P < .001$).

We therefore conclude that the learning package was effective in restructuring the MIF misconception of the students.

The effect of students' approaches to learning

1. *On conceptions held before intervention.* Correlation coefficients were calculated to investigate the relationship between students' approaches to learning and conceptions held before intervention. However, none of the correlations between the pre-test MIF scores and the decile scaled scores of the four components of learning approaches were significant.

It may therefore be concluded that students' misconceptions concerning MIF are independent of the students' approaches to learning.

2. *On extent of conceptual change.* A t-test was employed to check the difference in approaches to learning between the group of students with probable conceptual change and that without conceptual change after the treatment (Table 13.3).

There were no differences between the two groups in their approaches to learning. We may therefore conclude that there is no relation between the approaches to learning of a student and the conceptual change brought about by the learning programme.

There was, however, a significant difference between the two groups in their mean examination mark, which could suggest that the more able students benefited more from the programme, or possibly students who were more interested in science and who were more attentive when participating in the learning programme.

Table 13.3: Mean values of approaches to learning, examination mark, and students' conceptual change

Approach	Mean value		t-value	d.f.	P <
	NPCC	PCC			
Surface	6.50	6.96	-0.38	28	n.s.
Deep	4.83	5.83	-0.73	28	n.s.
Achieving	5.50	5.58	-0.07	28	n.s.
Deep-achieving	4.67	5.79	-0.87	28	n.s.
Exam-mark	28.33	55.89	-3.05	32	0.005*

PCC = Students with probable conceptual change

NPCC = Students with no probable conceptual change

CONCLUSIONS AND IMPLICATIONS TO TEACHING

From the statistical analyses performed, the following conclusions can be drawn:

1. The intervention learning programme was effective in restructuring the misconception motion-implies-a-force among the Technical Institute students.
2. Students' approaches to learning have no relationship to the degree of misconception originally held by a student, or to the extent of conceptual change brought about by the learning programme.

Driver's CLISP programme thus appears to provide a good starting point to deal with the problem of misconceptions held by students. The constructivist's teaching sequence is shown to be effective in this study. Although the topic motion-implies-a-force constitutes only a small sector of Physics, the idea and direction of the learning programme may also find its application in other untouched areas and possibly other disciplines.

The lack of relationships between the initial level of misconception, or the extent to which misconceptions are removed, and student's approaches to learning are counter-intuitive. They suggest that the processes by which misconceptions are established, and removed, are different from those involved in the students' typical approaches to learning.

Limitations of the learning programme

Backgrounds of student. Technical Institute students are unlike other students in Hong Kong. They work with machines or other equipment every day, and they are more career oriented. Since this study is carried out among Technical Institute students, the result may not be applicable to other students such as secondary grammar school. It would be important to find out.

The area touched. The topic dealt with in this research was solely confined to the specific domain of motion-implies-a-force in mechanics. Driver has applied a similar teaching strategy to the topics of energy, particle theory, and thermal conduction. Other topics in Physics need to be investigated.

Applicability in Hong Kong. It is observed that the students participating in the intervention learning programme like the activities very much. Very encouraging comments were received. However, if a teacher wishes to carry out such a learning programme in the class, much effort is required, including a lot of preparation. Careful planning, tailored programmes and materials, together with the everlasting belief in cognitive conceptual construction, are required. Are all the teachers in Hong Kong prepared for such a challenge? Probably not, given the examination oriented atmosphere in Hong Kong, but it must be remembered that correcting students' concepts was reflected in their examination results.

This study acts not only as a stimulus for further research, the learning programme developed is actually a ready-to-use package for everyday teaching. It is worth trying by any enterprising teacher. We teachers, being on the frontiers of educational field, should shoulder the responsibility of addressing and solving any problems encountered by our students in the process of learning.

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REVIEW AND CONCLUSIONS

CHAPTER 14

WHAT MIGHT THESE STUDIES MEAN FOR THE THEORY AND PRACTICE OF EDUCATION IN HONG KONG?

John Biggs & David Watkins

WHAT IS

What picture does the first set of studies (Chapters 2-5) paint of education in Hong Kong? First, we must declare the obvious; four interest-driven studies cannot claim to represent the most salient features bearing upon student learning in Hong Kong classrooms as they presently are. Apart from the language issue, some aspects of which are dealt with in the following section, important questions relating to motivational and social class dynamics, the social psychology of the classroom, teaching methods, reward and punishment systems, and the like, are not given the attention they deserve. Twelve dissertations can only cover so much.

The present picture thus cannot be considered complete, but it is consistent, and quite compatible with that obtained from popular accounts: a fairly rigid, examination-dominated system, involving heavy workloads with a strong if not exclusive academic focus. Bands 1 and 2 adapt well by tuning their study behaviour and approach to writing to cope strategically with task demands, mostly in what may be described as a surface-achieving approach, but the lower Bands of students feel increasingly alienated and adopt more restricted surface-approaches.

Teaching seems equally mixed. Some teachers see their role as completely instrumental in serving the demands of examinations, or as time-serving in the case of lower band students, where academic performance cannot be at issue. Other teachers, while acknowledging that exams have to be handled effectively in the short term, see the purpose of education more broadly and as serving the long term

interests of both student and of society.

In short, the overall picture is compatible with that an informed observer might form over a period of time, but that presented here has rigorous quantitative and qualitative support, and an interpretative framework that gives it coherence.

How lower band students see their schooling

Tommy Tang's study of lower band Secondary Two and Secondary Four students is depressing (Chapter 2). These students have little competence in English, hate school, and are locked with their teachers in a self-maintaining cycle of punishment, low motivation, and misbehaviour. Of those 20 interviewed, 15 had the conception that learning was simply memorising; 19 typically adopted one version or another of a surface approach, with only 1 being classifiable as deep. Tang further subdivided the surface approaches into "restrictive" and "elaborative". The majority (12) held the restrictive approach, which was limited to minimalistic memorising; only 5 used this memorised material to apply to problems or in any other elaborated way. To most of these students, a "good" teacher was one who was strict and explained well, but who was friendly after school.

Locked into an unfriendly system, in which they are forced to learn academic and to them irrelevant content in an alien and dimly understood language, these students suffer from low academic self-esteem; all they seem to want are teachers whose strictness shows that they care. Tang's model, showing that restrictive teaching strategies both maintain and are maintained by student expectations and behaviour, could not be a clearer example of a system at work, but unfortunately a defeatist one for both students and teachers.

Evidence for expert teaching

It need not be thus. Thomas Tang's focus in Chapter 3 was on teachers operating in quite different systems at the classroom level: those set up by expert and those by novice Chemistry teachers. The experts were selected from a list supplied by the Chemistry Inspectorate; all had more than nine years of teaching experience, and possessed master's level degrees. The novices were matched in

terms of academic level of pupils' taught, and had less than two years' experience. Tang adapted the LPQ deep approach items and reworded them with specific reference to Chemistry, and found that in both S4 and S5, students taught by the experts used a deeper approach in Chemistry than students taught by novices.

The expert teachers thought that the purpose of science education is broader than serving the needs of examinations; they held Level 3 conceptions of teaching, planned their lessons with student learning as the focus, not the content itself, and they taught interactively. Novice Chemistry teachers, on the other hand, saw their purpose as no longer term than getting students through their next exams, and their commonest observed method of teaching was by expository lecture. The students of the expert teachers liked the learning environment in which they found themselves, had deeper approaches (at least in Chemistry), and achieved higher level tested outcomes as classified by the SOLO taxonomy. Good teaching therefore does exist in Hong Kong, and it works.

Thomas Tang's hypothesis is that experts become so through reflecting on why their students do not come to understand. They focus on learning outcomes, and seeing them to be inadequate, do some meta-teaching, by matching outcomes with curriculum objectives (see Figure 1.1, lower half). Shifting their teaching practices, they check to see if their students improve their learning; if so, that shift in teaching is consolidated, forming a new equilibrium favouring higher level learning outcomes. The important point here is that they get to *know* that student learning is inadequate. As long as students continue to pass low level tests, that knowledge can never emerge; it will appear that students are learning adequately.

Examinations devalue the quality of students' writing

The dangers of such self-delusion are highlighted by Fan's study of the effects of examinations upon students' writing processes (Chapter 4). When students are writing for examinations, compared to writing at home, their concern for the grade they might receive becomes paramount; self-expression, communication, and sharing become of no account. The ideas are "either unwanted or half-baked", personal views are withheld, grammatical and spelling accuracy over-ride

content, model essays are memorised. Writing at home to many students is on the other hand enjoyable, more time is spent planning and revising ("I need time to cultivate ideas ... maybe the whole morning", as Yuet Sze puts it).

The positive conclusion to be drawn is one that recurs time and time again; students are strategically sensitive to context. Their preference for surface and deep approaches is tuned to requirements; they can bounce back after joyless maximising in the exam room and like Ping Kee, "At home if I like the topic, I'll make it more forceful."

Handling time stress

But the context may not always determine the approach, the approach may also determine the context, as we see in Lee's study of how different students react to time stress (Chapter 5). The context of study for part-time mature age students is hungry for students' time. That demand for more and more time easily becomes an excuse for surface-biassed students not to study much, if at all, outside class hours, but for deep-biassed students it becomes a positive challenge to make use of their spare time, using odd moments to think over aspects of their course content. All students, full- and part-time (the latter with more justice), think they have no time to do all their various tasks properly, but deep part-time students see that as a challenge to be met, not as an excuse for doing little.

Conclusions

We have, then, a view of Hong Kong classrooms as belonging to an exam-dominated and stressful school system, which at its worst produces low level cognitive engagement and gameplaying, but at its best challenges expert teachers to focus on the quality of their students' learning, and resourceful students to quickly shape their strategies to suit the perceived task demands. This kind of "cue-seeking" behaviour is a feature of students everywhere (Miller & Parlett, 1974), but it seems quite likely that Hong Kong students are more "classroom-wise" than students in many other countries in their ready adaptation to demanding and sometimes conflicting contexts.

LANGUAGE MATTERS

Such flexible adaptation to conflicting demands is no more vividly seen than in the issue of language in the classroom.

Language medium of instruction

Two studies address the English/Chinese medium of instruction issue from opposite ends. Would things be any better if, insisting on English, we commenced using English as the medium of instruction from P1 onwards instead of from S1; or alternatively, if we allowed Chinese to be used as the medium of instruction in secondary school?

Chan How Kei found one of those rare primary schools that used English medium and followed three cohorts of these students (EMPS) through secondary school, comparing them to otherwise comparable students taught in Chinese medium primary schools (CMPS). As he reports in Chapter 6, EMPS students when in (Anglo-Chinese) secondary school did significantly better than CMPS students in S1 and S3, but this advantage had virtually disappeared by S5. The only remaining differences were that EMPS were better in English language, and CMPS in Chinese language; and that EMPS did worse in Chinese Literature. This last finding could be evidence of a compensation effect, such that teaching in English actually penalised EMPS students' Chinese while not in the long term benefiting them in other academic subjects, but as Chan points out there are likely differential selective effects, whereby the lower performing students chose Chinese Literature. At any rate, both EMPS and CMPS students did well in the HKCEE: above the 75th percentile in most subjects, at the 90th percentile in English in both English and Chinese primary medium, but less well in Science and Chinese History although these were still at average or above. These important findings clearly implicate the rigorous language policy of the *secondary*, not the *primary*, schools, and no doubt the fact that we are dealing here with Band 1 and Band 2 students; a balance of presage, process, and product not usually obtained. The fact that all of Chan's students were girls could also be a factor.

In less than these highly favourable circumstances, Cheng found

(Chapter 7) that teaching S4 history in the mother tongue produced more effective learning, particularly in students of low English competence, and with meaningful rather than factual content being most affected. Differences were least between the two media when teaching factually and testing for factual recall, thus providing hard data and empirical justification for precisely the strategy that teachers and students have evolved for handling the awkward policy of teaching and examining in an exotic language: provide brief, readily memorisable notes that the students will easily learn. Here is the Hong Kong version of learning for mastery, which perhaps is why Patrick Lai's surface students took so readily to his learning for mastery program, reported in Chapter 11.

It is not so much, then, that teaching in English *causes* low level outcomes; indeed, there is evidence both in Cheng's study and elsewhere (e.g. Biggs, 1991) that for highly competent students, teaching in L2 helps develop a deep approach. Rather, the point is that what Tommy Tang in Chapter 1 calls "surface restrictive" teaching and learning provides one way of appearing to cope with this unrealistic requirement: "I remember key words, phrases and sentences for safety", as one of Cheng's surface-oriented students put it. Other, deep-oriented, students use quite a different strategy: "I try to use my own words in answering if I can't remember."

Thus, Cheng nominates at least two factors affecting how Cantonese-speaking students react to learning in English: their competence in English, and their habitual approach to learning.

Reading and writing

Wong investigated both factors in the case of reading from text (Chapter 8). She divided S5 students into those of high and low English competence, and deep and surface predisposition on the LPQ, and tested them for comprehension of English text and their ability to detect inconsistencies in the text (e.g. where the text says one thing in one paragraph and the opposite somewhere else). English competence was the most important factor in comprehension, but less competent students who adopted a deep approach were almost as able to detect inconsistencies as the highly competent but less deep; the former group were more metacognitive, less impulsive,

than surface-oriented students. In other words, a deep, metacognitive approach to reading appears to compensate for lack of competence.

Current approaches to teaching reading focus on word recognition, vocabulary, and grammatical knowledge, as if these subskills create a process. One effect of this is that even Wong's highly competent readers did not notice inconsistencies at the theme level; they decode from one sentence to another, understanding what each sentence says but missing the "big picture". This is a serious defect, and Wong's points about focusing on reading processes, and strategies for comprehending, need to be heeded.

Writing too tends to be taught in such a way as to focus on the sentence level, a tendency that we saw in Chapter 4 is greatly exacerbated by examination pressures, with the consequence that students write lists as an all-purpose genre to cover their writing needs. Stressing grammatical accuracy in teaching does not help students construct appropriate schemata of genres they need to use. Morgan's study of writing (Chapter 9) thus also focuses on process, specifically on the way students use (or do not use) their knowledge of text structure in their own writing.

Morgan concentrated on the genre for argumentative writing, a very common genre in secondary school essay writing. Her experimental group was exposed to eight samples of the genre, with analytic exercises to heighten their awareness of that genre. Results were positive; students with that experience wrote better structured (and more grammatical) argumentative essays than those who did the usual word and sentence level language skills.

Conclusion

This bracket of chapters on language has aspects of both *What Is* and *What Might Be*. Some, very few, primary schools do teach in English throughout, and while it undoubtedly makes transition from P6 to S1 very much easier to handle, the advantages fade in the long term. What Chan's results do say, very clearly, is that an English medium policy can work very well if implemented sensibly and rigorously in secondary school, with Band 1 and 2 students. Cheng's study, for its part, backs mother tongue teaching, particularly for lower English competence students and for teaching for meaning. Both studies, at

the school level, are good news for ECR4's language policy, which states that the top 30% be taught in a genuine immersion programme in English, the remaining 70% of students to continue their secondary education in Chinese.

The problem with the language medium issue is that it comes about because it is an attempt to serve two functions: to teach English as a language, and to teach other subjects. The problem is that it is attempting to teach English by teaching through English. If the issue is the learning of other academic content, then both Chan's and Cheng's studies agree: use mother tongue. There is no benefit in using English throughout primary school, and there is no benefit in using English in the secondary school (the good results of "School E" in the HKCEE were more likely to be due to their highly selective intake than to the students' bilinguality). But if the issue is the learning of English, then Chan's data do favour long term English immersion, but at the possible risk then of lower achievement in Chinese language subjects.

The studies of reading and writing processes showed the importance of the level of focus when students are engaged in handling text. Adequate reading comprehension, and writing that is to address a particular form of question, needs to be viewed at a molar or macropropositional level, so that the activities engendered by teaching and assessment should draw students "upwards" to be conscious of the theme of what they are reading or writing. Current teaching practice, emphasising sentence-level grammar and vocabulary, restricts the view to micropropositions: sentences and words.

Both Cheng's study on language medium, and Wong's on reading, suggest that a major determinant of success in handling language is (not surprisingly) existing competence, which ironically can sweep students through the kind of exercises they have to face with evident success; they *can* handle low level tasks such as being taught and tested factually, or responding to grammar and spelling tests. Students of lower language competence, but who for other reasons and probably in other contexts have developed a predilection for a deep approach, may handle text strategically and be aware of inconsistencies. But as Morgan shows, at least in the case of writing, creating an awareness of higher levels of text results in what appear

to be deep approaches to essay writing.

Collectively, then, these studies provide a degree of optimism. What teaching should do is deliberately to create a deep approach to handling text, instead of relying on sheer knowledge of language, which may do yoeman's service in handling the tasks that address lower levels of text, but leave the strategies leading to maximum comprehension to students' personal presage factors, such as their interests, out of school experiences, and particular competencies. As noted, one thing Hong Kong students are very good at is reacting strategically to context.

WHAT MIGHT BE

Student preferences

It emerged from *What Is* that many Hong Kong students would clearly prefer things to be otherwise. But what would they like? Teachers to be stricter still in class, but friendlier out of class, as Tommy Tang's alienated students said? Or a warmer classroom classroom climate, with more teacher support? Would students prefer more interaction with other students? Perhaps students with different approaches to learning would prefer different kinds of classroom? Maybe students would prefer to learn in ways that differ from those approaches they feel they have to adopt in response to present classroom circumstances?

Grace Chan investigated these questions, as reported in Chapter 10. She found that there were aspects of current classrooms that were associated with deep and achieving students' existing approaches to learning, such as affiliation, and a warm innovative, but controlled classroom. That in itself conveys a message, but further, these students' preferred environment was more closely associated with the approach with which they would prefer to learn.

Those students who wanted to learn in a more deep and achieving way, obviously felt they couldn't do that in classrooms as they currently are. Accordingly, deep and achieving oriented students preferred their classrooms to be warmer, more interactive, both between teacher-and-student and student-and-student, but also more challenging. Students with preferences for the surface approach,

however, had no particular preferred environment for learning; perhaps they didn't care.

Studies of teaching method

Mastery Learning. This last finding is elaborated by Patrick Lai in Chapter 11 in his study of mastery learning. Surface-oriented students *said* they didn't like the sound of mastery learning with all that testing, whereas deep did. But when push came to shove, and students were actually exposed to a mastery teaching strategy, in which students were regularly tested on just-completed segments of their Biology course, surface-oriented students did better and better, and deep-oriented worse and worse. Deep were initially higher than surface on Test No. 1, their paths crossed on Test No. 2, and by Test No. 4, surface-oriented students outperformed deep: a rare finding in the student learning literature. So if Tommy Tang's alienated students were wanting more structure, here is one academically positive way in which they can get it. Lai's study neatly encapsulates the advantages and disadvantages of mastery learning.

Cooperative learning. Another clue from Grace Chan's study is the declared preference of deep-oriented students for more interaction in the classroom. Cooperative learning, with a reward structure favouring cooperation rather than competition, has had a good press overseas, typically yielding high level cognitive outcomes and positive motivation. It should work even better in Hong Kong, since students here share in the collectivist culture that marks much interpersonal interaction amongst the Chinese, such that K. Tang (1991) found that tertiary students spontaneously formed their own collaborative learning groups to focus on set assignments. Would teacher structured cooperative learning groups work in secondary school? Edith Lai found that yes, they did (Chapter 12).

Lai's teacher-structured groups developed highly adaptive ways of handling their academic tasks, resulting in both better structured and more accurate geographical knowledge. However, again Leung (in progress) working with small group techniques and Tang (1991) also found, the effects were limited in that students' general approaches to learning remained unaffected. The change in learning strategies, in other words, is context specific, and at least in the

length and generality of the interventions here, did not enter the presage domain.

Restructuring students' misconceptions. David Tang looked at the problem of how to correct students' misconceptions of the concepts of force and motion (Chapter 13). The problem is familiar to constructivists: How do you get students to correct their misconceptions so that they are genuinely restructured, and not simply re-edited at a surface level? Tang adapted Driver's learning package, developed at the Centre for Learning in Science Project at the University of Leeds, to handle the concept "motion implies force". The essence is not that students are told that they are wrong, and please learn it properly this time, but that students' existing ideas are elicited and by demonstration it is shown that they are inadequate.

This imbalance in the students' conceptual thinking involves restructuring through demonstration and small group cooperative discussions; their knowledge is reconstructed through social interaction, with the teacher arbitrating in favour as the reconstructions come nearer to the accepted (Newtonian) ideas. An astonishing 70% of the students in Tang's experimental group showed evidence of restructuring; none did in the control group. It is important to note that extent of restructuring was also reflected in higher marks in a conventional exam.

Restructuring did not however depend on students' typical approaches to learning, nor did it produce a perceptible change in their approaches. As with the group interventions mentioned in the preceding section, the intervention may be too short term, or too specific, to significantly affect the approaches the student has constructed to handle the enduring demands of schooling.

Conclusion

Collectively, the studies reviewed in this last section, *What Might Be*, create an optimism that is a useful foil to the pessimism generated in *What Is*, and in *Language Matters*. Grace Chan's study pointed out some ways in which students would like to see change; the next two studies serendipitously showed that such preferences could work. Patrick Lai's mastery learning strategy achieved the remarkable result that surface-oriented students outperformed deep, while Edith Lai's

cooperative learning groups achieved much better qualitative and quantitative outcomes than the traditionally taught.

The dramatic results achieved by David Tang's use of the CLISP package are most encouraging for science teachers. A further, and in Hong Kong particularly important, result is that marks in a traditional exam were positively associated with successful restructuring. This is a useful reminder that teaching for better qualitative learning is quite compatible with improved test performance as demanded by parents and teachers. The frequent concern simply to maximise test marks is the hallmark of the novice or inexpert teacher (Chapter 3); both David Tang's and Thomas Tang's studies show that a concern for better learning in a qualitative sense will also bring the bonus of good marks. Note, however, that the reverse does not apply; a concern for better marks does not necessarily produce high level learning (or teaching) processes and outcomes.

Another finding that has been thrown up by both E. Lai and D. Tang (and in other studies referred to above) is that students in an intervention derive their strategies for working in that new context in ways that appear to be specific to that context and content, so that these changes are not registered by an assessment of general approach to learning as provided by questionnaire. This has some theoretical significance, which is discussed below.

THEORETICAL IMPLICATIONS

Development of theories of student learning

So far, we have viewed these studies as telling us about what is going on in Hong Kong schools, and how some improvements in learning can be expedited here. These studies also address more general questions, and have implications for student learning theory as a whole.

Systems theory. Construing educational practice in terms of the systems model is relatively recent, and these studies have contributed to that development by providing useful instances of the way the model works. The essence in this application is that the components determining student learning do so interactively. Few structures of

any importance exert the single effect for which they were designed; they will exert other effects, and will effect each other in often unexpected ways.

Hong Kong's hitherto single purpose curriculum, highly academic, with a view to tertiary preparation and selection, is obviously creating imbalance in lower band schools, with consequent alienation of students (and teachers) (Chapter 2). Is it too implausible to connect that situation with the very recent high rise in student participation in triad-like activities (*South China Morning Post*, 19 October 1992)? A headline in that same issue of *SCMP* reads: "Schools turn a blind eye to triads. Principals reluctant to admit problem for fear of a bad image", and the body of the article quotes school social workers and teachers as locating the problem in home-background. But denying the problem, or locating its cause somewhere else, is to isolate the school from the system of which it is a part. It could easily be that teaching Band 4s and 5s a curriculum designed essentially for Band 1s and 2s, and in a language the 4s and 5s do not understand, is creating enormous disequilibrium. Rather, the 4s and 5s and their teachers will set up their own equilibrium, pessimistically schematised in Tommy Tang's Figure 2.1; and very likely another result is precisely the increase in triad-like activities.

The examination "system" (as if that system could exist independently of the teaching/learning system) is basically designed to serve as a device for selecting the high fliers. But even in "good" schools with well motivated, interested students, examination strategies are clearly degrading the way students think and write (Chapter 5). Fortunately, it seems that many students run horses for courses; that the low level writing mode required by exams is temporary. Nevertheless, it seems to be unnecessary. Expert teachers are no less concerned that their students do well in exams, but fit that requirement into a higher order requirement of teaching for understanding (Chapter 3), and when they do, exam results do not necessarily suffer, but quite the contrary (Chapter 13; see also Chapters 7, 9, and 12). Even surface-oriented students can be turned on when the teaching and assessment allow a level of success, as is the case with mastery learning (Chapter 11).

In all these cases, presage factors, including student characteristics and the teaching context, processes engendered, and

outcomes mutually imply each other; instruction is "aligned" (Cohen, 1987), and the system is in equilibrium and works. A positive example of that is the language-instructional system set up in School E, which in five secondary years, apart from residual effects on the languages themselves, effectively abolished the effect of being taught in Chinese or English in six years of primary schooling.

The effect of the system extended to students' preferences. Most want to learn in deeper ways, but feel they can't as things are; accordingly they want classrooms that allow interaction with others, and a warm, affiliative but controlled learning environment. As with writing: they like writing at home, they hate writing for exams, and adjust their strategies accordingly. Hong Kong students are good practising systems theorists.

The use of learning process questionnaires. In several studies, either the LPQ (for secondary students) or the SPQ (for tertiary students) was used. They worked in some cases, but not in others. Where they were used as *presage* variables, to describe ways in which individual students had come to terms with their perceptions of the enduring demands of school, significant positive results were found in the sense that surface, deep, or achieving oriented students behaved differently and as might be expected: coping with stress (Chapter 5), reacting to medium of instruction, at least in interview (Chapter 7), reading for comprehension (Chapter 8), relating to actual and preferred classroom environments (Chapter 10), and reacting to mastery learning (Chapter 11).

Significant results were not found when scores were used as *process* or *outcome* variables to assess the effects of group interaction (Chapter 12) or the CLISP program (Chapter 13). Deep scale items did reflect outcomes in the assessment of expert and novice teachers (Chapter 2), but these items were reworded specifically for Chemistry.

This difference, between when questionnaires work and when they do not, clarifies their theory and use. In the systems model outlined in Figure 1.1, questionnaires assess students' typical or preferred approaches to learning in their general school context, and thus refer to the *presage* domain (see also Biggs, 1993). If the context is content-specific, as in a relatively short-term intervention, then particular learning strategies derived from that context will inhabit

the process domain in the 3P model (see Figure 1.1). It would take time for students to adopt these strategies to such an extent that their *general* approaches to learning would be affected. Thus, Edith Lai's geography students reacted strongly and specifically to their group experience, and learned strategies helping them to perform better in geography, but they did not appear to become part of the general repertoire of strategies, and thus to generalise to other subjects. However, by rewording the LPQ items, Thomas Tang could detect significant differences in the way students completed the items when taught by expert and nonexpert teachers.

Grace Chan's use of the LPQ, to compare students actual and preferred approaches to learning, is an interestingly different use of the questionnaire that has some practical implications, in matching classroom environments to students' preferences for more effective and more enjoyable learning.

Cross-cultural aspects

We raised the very important question in Chapter 1: Can a conceptual framework, and instruments deriving from that framework, that was developed in the context of Western schooling, be imported into a culture that uses Western "hardware" -- structures and architecture -- but is based on possibly very different conceptions of learning and schooling, relationships to authority, the functions of education in relation to familial as well as individual needs, and so on? The answer seems to be that it can.

There are obviously unique problems and issues in the Hong Kong educational system, but the application of concepts such as approach to learning, conceptions of learning and teaching, and text processing, only serve to cast light on these problems, not to obfuscate them. This is not, however, to commit the "pseudo-etic" fallacy of over-generalising Western concepts referred to in Chapter 1. The application of a construct such as "conception of learning" is not to say that the instantiation of that construct is identical in East and West, but rather that the construct is a useful frame in both cultures and that the contents contained within that frame may be interestingly different. These are complex questions, which are addressed in a forthcoming book focusing particularly on Chinese

learners (Watkins & Biggs, in preparation). What we would claim here is that the present studies demonstrate the usefulness of the frames provided by the general student learning literature.

The use of *instruments* such as the LPQ likewise seems appropriate, subject to the cautions already expressed about use as a dependent or outcome variable, and subject also to the caution that item content is referring much more directly to what the frames contain than to the frames themselves. Is a "deep approach" in the Hong Kong (or Mainland Chinese) context best defined by the *same* (translated) items as those used to define the construct in Australian (or North American) schools? We have found that on the whole the same item base does work, but possibly a different set of items would work better. There is a wealth of research in this area that has yet to be carried out.

The more technical question about comparing directly the psychometric properties of learning process inventories is addressed by Biggs (1992), in which a great deal of local research using the LPQ and SPQ is discussed and psychometric properties, such as factor structures, reliabilities, and internal consistency, are reviewed.

We discuss the viability of *techniques* derived in Western schooling, such as cooperative learning, mastery learning, the CLISP program, and so on, in the following section.

IMPLICATIONS FOR EDUCATIONAL PRACTICE IN HONG KONG

Allowing the cautions already expressed at the beginning of this Chapter, we feel it is appropriate to conclude with noting some of the local lessons to be learned from these studies.

"Hong Kong students don't like innovations; they want to be taught!"

How many times do professional educators hear this from teachers and parents? We have, several times. This statement is based on two quite reasonable premises. Traditionally, Chinese students hold teachers in high respect; teachers are the source of wisdom, and it is the role of the student to assimilate that wisdom. The teacher, then, is expected to perform in expository mode, not run group sessions or

throw the onus of learning onto the students. The second premise is much more pragmatic; parents, students, and teachers are united (particularly in the upper Bands) in demanding good examination performance. For that you need clear expository teaching, good notes, and a good memory; or so it is believed.

The answer to the statement is in this book. In short, Hong Kong students *do* like innovations. They prefer their classrooms to be different from what they are, and they learn better under innovative than under expository teaching. Several moderately radical innovations are described here: mastery learning, cooperative learning, and conceptual confrontation and restructuring. All the evidence suggested that the students not only liked the innovation in question -- Edith Lai's Sixth Formers, David Tang's Technical Institute students, even Patrick Lai's surface-oriented and disheartened industrial estate S3s -- but performed much better as a result (although the quality of learning under mastery might be in question).

As for the question of exam marks, we recall that early in this course, one of the present contributors, a secondary teacher, expressed strong agreement with the constructivist approach emerging from the coursework, but expressed grave qualms about its practicality in exam-dominated Hong Kong. The answer given then was that the two approaches, constructivism and good examination performance, were not incompatible. The problem was that teachers and parents *thought* that they were. David Tang's work on restructuring science concepts rather dramatically supports that reply; reconstruction was associated with significantly higher exam marks. But Thomas Tang's data on expert teachers are even more telling, and more encouraging in the long term, because these teachers were born and bred in the Hong Kong system. These teachers sought to increase their students' understanding, and their students performed better, with deeper approaches to Chemistry. Nevertheless, these teachers of course recognized that examinations were an important fact of life; it's just that they don't have to dominate all other considerations. More to the point, it is counter-productive if they do.

Even given the system as it is, expert teachers can teach in ways that facilitate *both* students' understanding *and* their examination marks. The trick is to focus on the concepts involved rather than on

the reproduction of facts. Thomas Tang's expert teachers showed that this is done by focusing on the understandings achieved by their students, by becoming "scholars of their own students' learning" as Ramsden (1987) puts it. That is difficult under expository teaching.

Finally, let us return to traditional beliefs. Hong Kong is a place of many contradictions, not least being the balance between student competition and cooperation. The norm-referenced examination system, and the limited number of tertiary places, encourages quite severe competition, yet Chinese socialisation practices emphasise the benefits of working together for the common good. The schools may emphasise competition, but students are programmed for cooperation, as is seen by the ease with which they adapt to cooperative methods, and the good results that come from doing so.

Teachers can easily introduce group activities, and any doubters should be silenced by the cognitive and affective outcomes so achieved. This paradox, why a group-oriented culture avoided group learning, was discussed with a group of teachers and their reply was very simple: "Groups are noisy, and in the principal's eyes, a noisy classroom is one that is badly taught." One set of traditional beliefs about good teaching is at war with another set about group cooperation. To which do you listen? Perhaps more principals should enrol in M. Ed. courses.

Assessment

Let us then turn to assessment. In Hong Kong, the thinking of teachers, students, and parents is dominated by examinations. To less than expert teachers, maximising results becomes the sole criterion of good teaching; which then becomes defined as reducing content to easily digestible bite-sized notes. Students' learning and writing strategies are correspondingly degraded.

Many students, particularly the more able, are well aware that "real learning" is not being required of them, and cope admirably. They would nevertheless welcome tasks that require higher levels of understanding, as no doubt would the more expert teachers.

It is ironic that the learning of less able students was maximised by mastery learning, with its frequent testing of clear, attainable objectives. Students disillusioned by repeated academic failure began,

under mastery learning, to see some purpose in schooling when they began to receive some reinforcement for achieving success. The difference between mastery learning and the normal run of education for Band 4s and 5s is that while both are dominated by preparation for testing, the material in the normal run is designed for Bands 1 and 2; the 4s and 5s have little hope. In mastery learning they have. The current system of one curriculum for all Bands is just as much the villain as the assessment system that is based on it.

It should be remembered that deep oriented students were however turned off by mastery learning, which sounds a warning for Hong Kong's Target Related Assessment approach. It is easier to apply low level rather than high level objectives. It is important that in designing the targets, a classification system is used that sends messages to teachers and students that focused reproduction will not do as a learning strategy.

Language of instruction

The studies on language medium here do support official policy. It seems that ECR4's proposals are about right. In terms of both the quality of learning in secondary school subjects and their attitude to school, the majority of students are almost certainly better off being taught in their mother tongue. However, for the more able 30% or so, an English immersion programme on a Chinese medium primary education, if carried out rigorously and no doubt with appropriate bridging work, will not harm educational outcomes, except possibly Chinese language.

The major issues here are political and social rather than educational: Is English language proficiency valuable to Hong Kong students? Will it continue to be? Should it be available to only a more able elite? As Cheng quotes in her introduction: "English is the passport ...". Do we issue that passport only to the top 30% of students?

Teaching reading and writing

The teaching of reading and writing in Hong Kong, especially in English, emphasises low level skills relating to grammar, vocabulary,

and spelling. More emphasis needs to be placed on the meaning rather than on the form of communication.

Again, we have to say that examinations play a negative role here, because they discourage students from expressing their own thoughts. Instead, they reproduce learned model answers. They do this because they know that spelling and grammatical mistakes will be penalised, and that content will be under-rewarded. Removing those criteria from the marking of external examinations is certainly an important objective, but it is equally important that the individual classroom teacher does not reinforce the same pathologies in reading and writing.

Teacher education

There are implications in every Chapter for the preparation of teachers. To summarise, we might suggest those that emerge as the more obvious:

- ways of assessing for high order learning outcomes
- the focus in teaching and assessment tasks in reading and writing
- catering for the needs of the majority of students who will not be moving on to tertiary education
- ways of implementing group approaches to learning
- how to be innovative within-the-system
- the need for teachers to reflect on their own and on their students' learning.

The last point is probably the most important. We are not saying that the present authors have discovered specific prescriptions in the course of studying their students' learning. Rather, it was precisely by doing the latter that they came to do the studies they did and reached the conclusions they reached. And in that process they became better teachers, within the present system.

Thus, the final message is that teachers can make a difference; there is room for becoming a much better teacher. The chapters in this book are a testament to that.

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