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Towards Exemplary Teaching Through Collaborative Inquiry Into
Curriculum Redesign

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And Curriculum Redesign

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Abstract Teachers of professionals in Singapore universities and polytechnics are guided and stimulated to reflect on their own practices and social contexts independently and collectively with a view of working towards exemplary teaching in their own classes. They are participants in a formal education programme- the Postgraduate Diploma of Teaching in Higher Education programme which is organized by the National Institute of Education, Nanyang Technological University for new lecturers in tertiary institutions. This paper presents eight cases of reflective teaching based on a collaborative reflective inquiry framework which is made up of five R-stages of thinking :

reflection, recognition, realization, response and resolution. Each case focuses on a faculty member and his/her concerns with the improvement of a particular aspect of teaching and/or student learning in diverse disciplines such as bioscience and nursing, business studies, computer and information sciences, engineering, medicine, and teacher education. The tertiary teachers report on the curricular changes made following reflections on their teaching problems, collaborative problem solving in class and attempts to engage the students in active learning.

Overview of the Frameworks for Cognitive Apprenticeship and Collaborative Reflective Inquiry

In recent years, educational theorists have begun to emphasize the importance of situated learning in authentic meaningful contexts to facilitate cognitive apprenticeship. Organizational psychologists have also advocated problem-based learning and reflective practice to overcome barriers to organizational development and change. Cognitive apprenticeship emphasizes the social context of instruction and draws its inspiration from traditional apprenticeship (Collins, Brown, & Newman, 1989). Problem-based learning provides a model for creating problem contexts that enables students in schools to see the use of knowledge, to understand the conditions for its use and to use the knowledge effectively in work situations. When integrated, these two approaches to learning provide a powerful framework for thinking about a kind of teaching that will facilitate problem solving in difficult situations.

Interestingly, educators who are involved in the improvement of teaching and learning in higher education have also in recent years emphasized the importance of active student involvement and learning in meaningful contexts. They see the importance of helping their students to acquiring knowledge and expertise in different disciplines through active involvement and practice in workplaces, and solving real life problems (Brown & Duguid, 1991; Cryer and Elton, 1992; Ramsden, 1992). A Practicum (Practical or industrial attachment) has therefore been built into all professional education programmes to provide opportunities for performing authentic tasks in real life situations. University teaching strategies have been progressively changed to focus more on facilitating active learning and demanding higher standard of learner performance. In mass lectures, a number of strategies for promoting active learning and creative problem solving have been emphasized. These include asking challenging questions to encourage

critical thinking (Cryer & Elton, 1992), note-taking (Brown and Atkins, 1988), short tests (Menges, 1988), buzz groups (Cryer, 1992), interactive handouts (Entwistle, 1989) and the use of advance organizers (Ausubel, 1963, & Gibbs, 1992). But effective teaching is not merely about teaching strategies and learning techniques. These can be quite easily acquired. It is the depth of understanding how and when to use or not to use these strategies that require constant practice and reflection. Hence the importance of linking clinical or teaching practice, or business and industrial attachments to educational principles by constant and deliberate reflection.

Reflective teaching in higher education, therefore, deals with exemplary teachers who are sensitive to students' needs, their thinking and teaching styles, teaching strategies and interpersonal communication techniques, their creative problem solving skills, and commitment to life-long learning with their peers and students in a collaborative inquiry manner. Reflective teaching is focussed on problem solving, sustained by curriculum reconstruction and design, framed by individual and collective reflection and inquiry and given administrative support.

Key Principles of Reflective Teaching and Collaborative Inquiry Into Problematic Learning Situations

In general reflective teaching appears to have been shaped by teachers who subscribe to certain principles and display a wide range of intellectual and social behaviours. They appeared to be able not only 'to reflect -on-action and reflect-in-action' as advocated by Schon (1983, 1988) but also simultaneously translate thought into action according to Chen and Seng's finding with Singapore student teachers (1992). Based on the 1992 findings, a grounded theory of Reflective Thinking and Teaching emerged. The theory resulted in a model with four stages: reflection-on-action (analysis of learning or teaching problem), action-on-reflection (lesson planning), action-in-reflection

(action taken and changes made to action during interactive phase of a lesson), and reflection-in-action (thinking-on-the-spot). From the model, a number of observations was made and interviews conducted with student teachers. The model was later tried out and refined with the Postgraduate Diploma of Teaching In Higher Education (PGDipTHE) participants. This became the basis for generating principles that guided our research into reflective teaching practices. The following emerged as the key characteristics of a reflective teacher. These characteristics could be generalised to tertiary teachers to a great extent despite the difference in the level of teaching.

A reflective teacher seems to have the following characteristics:

1. has a genuine concern for their students and a deep understanding of his/her discipline, profession, institution and society;
2. is able and willing to identify and formulate current teaching problem(s), and to articulate them in a focussed and objective manner in the course outline as well as the assessment modes;
3. adopts most of the time a Constructivist approach to teaching . S/he is consistently trying to relate students' past experience and personal goals and purposes to the learning objectives and design appropriate tasks and activities. At the same time, s/he is modelling instructional behaviours appropriate to the situation e.g. a lecture or a tutorial, and adapting strategies that suit her/his own personality, values, goals and beliefs;
4. creates situations and materials for students to be actively engaged in learning and problem solving;
5. is constantly engaged in a creative dialogue with her/his peers about improving university teaching and learning informally or formally in seminars, research and publication.

Despite differences in their thinking and teaching styles, these teachers show a high degree of competence, a deep understanding of their disciplines and professions, and a sound judgment of their students' learning problems and their own inadequacies. Sternberg's Mental Self- Government: A Theory of Thinking Styles (Sternberg, 1994, pp169-187) will be used in conjunction with Chen's Collaborative Reflective Inquiry Framework (Chen, 1996) in the analysis and discussion of the cases. The Collaborative Reflective Inquiry Framework is a generic thinking and teaching process model that can be used to elaborate theoretical issues relating to the functions, forms, levels, scope and 'leaning of government' as identified and expounded by Sternberg in his Framework for Mental Self-Government: A Theory of Thinking Styles (1994).

An Exploration of Cases of Reflective Teaching Linking With Strategies for Individual and Collaborative Inquiry

The case method has often been chosen to facilitate active learning and to generate reflective practice. In the Postgraduate Diploma of Teaching in Higher Education (PGDipTHE) Programme, participants are requested to identify their teaching problems and create a case of their own practice to be shared with the other participants. The emphasis for improving practice is therefore on cognitive apprenticeship with guidance or coaching and mentoring provided by experienced teacher education practitioners from the National Institute of Education.

Participating in a carefully designed and structured programme, the university and polytechnic lecturers take three core modules which deal with the essential and critical issues, processes, strategies and techniques of tertiary teaching, learning and assessment. In addition, they select two out of four elective modules that further elaborate the topics dealt with in the core modules. These include discourse analysis and oral delivery techniques, technology-enhanced instruction, small group collaborative learning, and curriculum design. Records of the participants inquiry into their own students' learning and significant aspects of teaching and professional practices are usually documented in journals and cases which are written by the participants as part of the fulfilment of course requirements.

The case method provides a rich source of information about contextualized learning environments and is also the method employed

for this study. Teaching is viewed as a form of educational research. The teaching act facilitates analysis rather than its object (Elliott, 1989). Based on the medical and business schools model, most of the cases are problem-centered stories about teaching situations, developed from the actual experiences of tertiary teachers. For the purpose of this presentation, the stories are told in phases in contexts following a structured framework: the 5 R-stages of reflective thinking about teaching and learning by the tertiary teachers in Singapore. The stages consists of reflection, recognition, realization, response and

resolution. Each case focuses on a faculty member and her/his concerns with the improvement of a particular aspect of teaching and/or student learning in particular discipline, and subsequent curriculum reconstruction in a higher education institution. Their concerns and manner of interaction in groups are verified by close and prolonged observation of the researcher-facilitator.

The lecturers came from disciplines such as bioscience and nursing, business studies, computer and information sciences, engineering, medicine, and teacher education in two universities and four polytechnics in Singapore. The tertiary teachers' self report on the changes made following reflection on their teaching problems, collaborative problem solving in class and attempts to engage their students in active learning are used as the basis of analysis. Wherever possible, students' responses and reflections are also recorded and used in the reports.

Framework for Reflective Thinking and Teaching

In a formal and structured programme for lecturers in higher education - the PGDipTHE programme which is organised by the National Institute of Education, Nanyang Technological University, Singapore, the participants from the universities and polytechnics in the past three years are expected to take three core and two elective modules. Though most of the modules were 'taught' in seminar situations, participants tend to be passive expecting to be given a bag of teaching tips and techniques to improve their teaching. To ensure that active learning and curriculum reconstruction take place, the participants are asked to identify their own learning goals and formulate their own 'teaching problems' through reflection right from the beginning of the Programme. In class, the participants were unobtrusively guided to go through five stages of reflection in Module DT701: Teaching and Learning in Tertiary Institutions and DT707: Curriculum Design, which were led by the researcher. The framework for a thorough inquiry into problem situations consists of the following individual and group thinking processes: reflection, recognition, realization, response and resolution :

1. Reflect individually on their teaching by reconstructing past experience to better understand it and to identify teaching and learning problems;
2. Recognize the factors and causes of problems, and one's ability or inability to solve the problems, independently and/or collectively recognise the difficulty and problems of bringing about changes in students learning ;
3. Realize 'self' as part of the problem solving process independently or in group reflection;
4. Respond to the principles and practices learnt in class discussions; through a process of collaborative inquiry, mutual encouragement and reinforcement, the participants respond positively to comments and criticisms given resulting in deliberate action to improve student learning;
5. Resolve to redesign a course and/or tasks and activities based on sound active learning principles, and social learning and cognitive apprenticeship theories. learned from individual reflection and group discussion and critique, and implement any decisions made.

Characteristics of Collaborative Inquiry Into Problem Situations

Collaborative, not individualistic, inquiry into problem teaching and learning situations in higher education is proposed for a number of reasons. The reasons are forwarded based on some universal assumptions, propositions and research findings:

First, there are some common teaching goals and learning problems among students of professional schools in postgraduate diploma and degree programmes. These students are being prepared to be not only efficient but also effective and wise professional practitioners for the 21st Century. Australian, British, Canadian, Singapore and United States university teachers believe in teaching students 1) to analyse ideas or issues critically, 2) to develop their thinking skills and

ability to make wise judgments, 3) to comprehend principles or generalizations, 4) to creatively solve problems, 5) to use and integrate resources and to transform information into knowledge, 6) to develop communicative, networking and team work skills, and to develop reflective and committed professionals (Entwistle, 1984; Knapper, 1990; Lee, 1993; Chang, 1994; Chen, 1993, K.C.Tan 1994).

Second, tertiary teachers are not only competent and knowledgeable educational leaders, they are expected to be skilled researchers. In the professional schools, they should be the kind of researcher-practitioners whom Schon described as "reflective practitioners" (Schon, 1983, 1987) and what Argyris calls professionals in organizations that are able to learn, develop knowledge for action and help to produce learning organizations (Argyris, 1993), and Senge described as people who are able to do systems thinking and team learning in organizations (Forrester, 1969, Senge, 1990). Schon (1983, 1988) submits that trained professionals are already skilful, that is they have competence and artistry. What differentiates the skilful practitioner from the reflective practitioner is the additional qualities of creative design and practical wisdom which can be identified in the process of reflection.

Third, tertiary teachers reflect on their practices because they want to improve their own practices and the products, that is, students' learning to attain specific academic and professional goals. The practitioner in this instance seems to be able to act autonomously, creatively and wisely in a problem contexts. There seems to be a distinct connection between action and reflection, and action and beliefs - theories-in-action, espoused theories and theories-in-use (Argyris and Schon, 1974, Chen, 1992, 1994). As a result of their curriculum design, teaching strategies and action, their students become skilful and knowledgeable too. They learn how to learn, even on a job. They are able to be engaged in creative and critical thinking and problem solve in messy real life situations.

The PGDipTHE programme in Singapore is an attempt to meet with this need of preparing competent and thoughtful professionals of tomorrow. The teachers of professionals appears to be the natural and most direct contributing factor in preparing the desired types of professionals. They should exemplify professional behaviour and expertise in their teaching. A Framework of Reflective Thinking and Teaching has been created to facilitate the instructional behaviours advocated.

The premise of the 5 R- stages of Collaborative Inquiry about teaching is that teaching is a very complex act which must be reviewed every now and then to ensure it meets the needs of the students, the professions and the society. They have to recognize that some of the problems are student-related and some context or curriculum related. Some of the problems may even have originated from a lecturer's own personality, thinking, teaching or learning style, one's knowledge and expertise in teaching, and one's understanding of the students' needs, abilities, interests and motivation. The realization of self as part of the problem solving process could be the result of individual reflection or collaborative inquiry in class discussions. When the

lecturer positively responds to the problems identified and tries to apply the principles of effective active learning to solving the problems, the problem situations are being analysed and treated in ways that may best approximate what is known is wisdom of practice. Through mutual encouragement and reinforcement in collaborative inquiry situations, the participants of the PGDipTHE programme have all succeeded in reporting positive results in terms of their students' learning and their own resolve to continue with their self-developed reflective practices.

The following eight cases clearly illustrate the relationship between the concepts of active learning, reflective teaching and cognitive coaching (Schon, 1988, p.158) using the 5 R- Stage Collaborative Reflective Inquiry Framework. It is used as a conceptual frame for reflection as well as for analysis of the lecturers' reflective teaching developmental stages. All the cases were reconstructions of the lecturer- participants' self - reports on their reflection on their own teaching, their students' learning abilities and preferred styles. They reported on the changes made to their teaching which include their justification for curriculum redesign, changes made to the approach in teaching. All the eight cases have shown qualities of Schon's characterisation of 'reflective practitioners', that is, they show not only competence and artistry in their practices, but also practical wisdom in their reflective judgment and teaching behaviours.

Table 1: Case Studies on Reflective Teaching (A)

Sing Kong- Senior Lecturer in Biology
Chiu Ming- Senior Lecturer in Chinese Literature

National Institute of Education, NTU
National Institute of Education, NTU

Stage 1: Reflecting -Concerns before the PGDipTHE Course

Problem: First Year DipEd students do not know how to
Problem: First Year Dip Ed students have little knowledge

synthesize and apply knowledge . How to get
the science students to be more active learners,
of the Histroy of Chinese literature to have a good
appreciation of literature within a short semester.

think deeply about what they have learned, &
apply the knowledge gained in new situations.
How to get them to master a great deal of facts
without resorting to memorization & still enjoy

different types of writing is a problem.

Stage 2 Recognition- Contributing Factors to the Learning Problem

I used traditional lecture method with handouts. Students
I taught too much and gave too many handouts. Students

memorised the facts with little understanding. This is a
did not know how to assimilate all the facts, see patterns in

problem in both the method of teaching & learning.
I am scientifically trained and believed in systematic inquiry and
accuracy in definition and classification.

Students do need a lot of facts and figures about biology
before they can analyse and synthesize data and information. How to get
the students to learn alot of facts yet engage in higher order thinking
within a short period of less than two years is a real problem.
literary styles, and make literary judgement.
In Chinese tradition, the transmission of knowledge, which often means
facts and established views, constitutes the most important part of
learning. Modern educationalists, however, emphasize more on thinking
about what one learns. How to balance the demand of "established
Chinese views" with "modern education principles" is a real challenge
for me.

Stage 3: Realisation - What Needs To Be Changed

How can I include elements in my teaching that
How can I balance historical facts & literary styles with

will encourage active student participation ? My
literary judgement which requires not only knowledge

previous lecturing mode based on talk & slides
& understanding of literary genres and writers but ability

has resulted in students memorising facts and
to do critical analysis & appreciation & making literary

not motivated to read further & think deeply.
judgment?

Stage 4: Response to problem identified

I must do something to enable the students to
I believe a change of teaching strategy may help to

acquire the knowledge base, synthesize whatever
kill two birds with one stone. First, a redefinition of

they have learned, integrate the parts into the whole and with previous
experience, and be able to apply the knowledge in new situations.
lecturer and students' role. Lecturer's role is not just to present
facts and students' is not just to take down notes.
I will give organised & detailed notes on factual yet

I will restructure the course and change the instructional strategies

by incorporating a few short challenging questions at the end of every lecture. The questions are a kind of "homework" for thinking over the literature they are expected to read up. The students will be asked to give answers to these questions at the beginning of the next lecture. fundamental literary facts and background for reading before class and interactive notes during the class.. In class, students are asked to analyse literary writing, compare characteristics, appreciate and discuss styles and forms, and use interactive notes to complete a poem and writing couplets e.g. filling in the blanks in poems according to appropriate rhythm and rhyme patterns.

Stage 5:Resolution to change and implement

Through peer influence in sharing sessions and personal reflection during the PGDipTHE course, I felt compelled because of my determination to get the students to really love literature and remember the key facts,

to implement the new strategies. I was thrilled to find concepts and themes at different times, I find the.

the students becoming more active and asking more questions in class. Their end-of-semester reports they appreciate to the interactive notes which they

showed a marked improvement in content & presentation as they ably synthesized and applied knowledge e.g. about the diversity & unity of organisms very effectively.

enjoy when doing creative couplet writing in class. They understand Tang prosody better after they have been given time to practise writing couplets in class. They also become more sensitive to the choice of words when they are doing literary criticism.

Table 2: Case Studies of Reflective Teaching (B)

Chong Thim- Sr.Lecturer in Physiology, Medical
Uma- Sr. Lecturer in Bioscience, School of Nursing

Faculty,National University of Singapore (NUS)
Nanyang Polytechnic

Stage 1: Reflection on Concerns before the PGDipTHE Course

Problem: First Year Medical students do not
Problem: First Year nursing students have difficulty

know how to integrate knowledge gained
in learning on their own and assimilate all

in various physiology modules with
the facts about anatomy of the human body.

clinical practices.

Stage 2 Recognition- Contributing Factors to Students' Learning Problems

We lecturers have been teaching a great deal of
My handouts, which were given before my lectures to the

facts without showing them the close link between the
students, became a distraction as they were too full &

facts but also the relevance of this knowledge for
students tend to read them during class instead of

clinical practices e.g. knowledge about blood types, some diseases, and
their relations to blood transfusion before
listening to me. Anything "extra" given usually
bring about chaos as the students desperately search

and during surgery.

for the points made in the notes during class time in vain.

Stage 3: Realisation- What Needs To Be Changed

I realized we have been packing in a lot of facts
After attending the PGDipTHE course and reading

into a one semester course because of curriculum
revision and shortening the hours of the non-
a number of articles on active learning, I realized I have to
restructure my lectures and introduce a few active

clinical subjects in the First Year of medical
training in the NUS Medical School. Students
learning strategies such as group presentations, buzz groups, to enable
the student nurses to learn all the essential

have less opportunity to reflect on what they have
material about different parts of human anatomy for

learned and relate these non-clinical subjects to clinical practices.
effective clinical practices, e.g. what to do and not to do in the
event of a fractured limb.

Stage 4: Response to Problems Identified

I redesigned the sequence of the Physiology course and in
For the series of lectures on the lower limb, I defined

my lectures on organ systems relate it to other modules
clearly the learning objectives, & the important

e.g. blood. For example, the discussion on oxygen uptake
facts that are relevant to their practice as nurses.

by haemoglobin in the respiratory physiology module. I also try to
relate the cardiovascular system to the heart blood vessels modules in
Anatomy which the students
I introduced the lessons with an advance organizer on the topic. The
students are enthusiastic when they can anticipate what is coming. I
also used dialogue by asking students

have studied earlier in the Semester. This is the result of close
coordination between the two departments. Further, lecturers in
Physiology try to relate to the other
para-clinical and clinical course and the practice of medicine by
arranging for discussion panels with clinicians explaining how they
diagnose and administer treatment
stimulating questions such as those related to superficial veins and
their relations to clinical conditions. In addition, I used a number of
teaching strategies that will encourage active participation.

Stage 5: Resolution To Change and To Implement Changes

My resolve to redesign the Physiology course within the department and
to change our teaching strategies is not
I am glad that my resolve to implement active learning strategies pay
dividends. Beside using advance organizer

sufficient if the other non clinical departments do not
I also use a 10 minute break in 2-hour lecture during

cooperate with us. Therefore, when I was approached by
during which I try to get to know the students' learning

the Vice Dean to be a member of the Curriculum
problems, conduct small class tests & buzz group.

Review & Teaching Methodology committee, I gladly accept the
appointment. Though an uphill task, I would like to try to bring about
improvement in medical teaching despite disapproval from students &
colleagues,
DT701 has certainly changed the way I thought about teaching and the
way I teach.
My student evaluation has in fact improved.

Table 3: Case Studies of Reflective Teaching (C)

Zhou Wei- Lecturer in Mechanical & Production Engg.,
Nanyang Technological University (NTU).
Liao Ziqi -Lecturer in Business Computing, Nanyang
Business School, NTU

Stage 1: Reflection-Concerns before the PGDipTHE Course

Problem: Third Year Engineering students do not
Problem: Second Year business students do not know

know how to synthesize and apply knowledge.
How to get my students to learn material test-
ing within only 6 hours of lecture? How to
help them to learn by self study?
how to apply knowledge about computing and to
learn to construct and information superhighway . They
know how to learn independantly but not cooperatively.

Stage 2 Recognition- Students' Learning Problems

Students have problem in learning a great deal of
Business students are inclined to learn on their own . They
material within 12 hours of lecture on all types of steel and 5 major
non destructive testing methods. Providing students with specially
designed instructional materials do not really solve the problem
because they do not
really study on their own. They are directed to learn with specially
designed instructional materials.
lack interpersonal skills which are really important aspects of
management. I have been giving the students traditional lectures which
further reinforce their independent learning style. How to get them
to work in a team and communicate to each other is a real problem.

Stage 3: Realisation of Student Needs and Things To Be Done

I believe in teaching my students to relate new concepts to previous
knowledge , their everyday experience and common sense. I would like
to impress upon my students the importance of common sense in effective
I must do something to change my teaching style and to force
the students to think together and to work together. The case
method of teaching and cooperative learning seem to be methods worth a
try. They students have to learn to work

learning. It is better to know well some general
methods worth a try. The students have to learn to work in

engineering principles and techniques and to learn
small groups and participate in group discussion and group.

specific new techniques by self study.
decision making.

Stage 4: Response to the Problem

I decided to spend 2-hrs of lecture focussing on just one
material testing method- Ultrasonic Testing :
I decided on using cooperative learning principles to structure
the students' learning. The case of developing an informa-

1. The importance of understanding basic principles
-tion superhighway - a multi-channel telecommunications

(e.g. reasons for stainless steels to be stainless, pulse -echo
principle of ultrasonic sound, etc.
network and a multimedia channel or multiple forms of messages
carrier was used. Although the case is in the field of

2.The application of everyday knowledge & common
information technology, it is related to management because

sense to make complicated phenomenon easy to understand.

3. I helped the students to "visualise" by giving them more than 100 illustrations and a video presentation to make things easy to remember.

4. I used question-and-answer method to gain student attention and to emphasize important points. there are many implications for design, scope, and use of information systems in an organization.

The 21 students are divided into 5 groups for discussion. The students are given the opportunity to form their own task groups. They are task groups because each member is responsible for different tasks and one of them is expected to present the group's findings. My role is to facilitate discussion by giving the key discussion questions and giving encouragement and providing immediate feedback.

Stage 5:Resolution To Change and Implement Changes

Since my efforts seemed to pay dividends when I received wonderfully evaluation from the students, I persisted in getting the students to remember the key

I find that small group work actually improved the students' learning from a shallow mode to a deeper learning mode. As the students questioned one another, they are forced to

learnng methods taught. As they are related to everyday cooperate and to think and inquire together in tutorial

knowledge and common sense., the students find it very situations. I do have a problem in accomodating five

easy to remember and transfer. I only taught in detail & in a systematic way one method of testing steel & the discussion groups in a small tutorial room,. Not only is the noise level high and discussion often distracted, the fear of

students have to learn to analyse the other four methods on their own. My reservation about poor student evaluation was unfounded. disturbing our neighbours is there. But the advantages of cooperative learning far out-weigh some of the disadvantages of small group learning & my fear of poor student evaluation.

Table 4: Case Studies of Reflective Teaching (D)

Yan Sam- Lecturer in Computer Studies
Ngee Ann Polytechnic
Agus -Lecturer in Computer Studies
Ngee Ann Polytechnic

Stage 1: Reflection -Concerns before the PGDipTHE Course

Problem: First Year Computer Studies students in the
Problem: Third Year Computer Studies students are

Ngee Ann Polytechnic do not know how to shallow learners and have difficulty in

solve given problems. They tend to rote learn deep learning and problem solving. They are not

rules and procedures. How do I get the learning well partly because they are weaker

students to learn to solving problems and doing programming in LISP without resorting to drill and practice in tutorials? students in the polytechnic with only 'O' level qualification. Most of the 400 Computer Studies students are not ready to do problem solving.

Stage 2 :Recognition- Students' Learning Problems

The students have problem to use higher cognitive skills
I recognised the poorer quality of the students in Computer

such as problem solving to learn LISP. The most
Studies and the number of students have been greatly

essential technique is recursion which appears to be
increased. in recent years. The polytechnic solved the

obscure, difficult and mystical to students. The reason is
problem by packing more students in mass lectures and

that unlike other problem-solving techniques which have
closely related counterparts in everyday life, recursion is
an unfamiliar idea and often requires thinking about problems in a
deeper way. I am a lecturer & a tutor of 3 groups of First Year
students who have no idea at all about problem solving.
multiple tutorial sessions. I have to restructure my course on
Information Technology Application to facilitate learning
since I am a lecturer and one of the tutors.

Stage 3: Realisation of the factors related to the problem

I chose cooperative learning to encourage the students to
In mass lectures, it is not feasible to pitch the lectures

cooperate in solving problems. I realise that students are
at the so-called right level because of the range of abilities.

often confused because both procedures and data in Lisp
are represented in the same form as lists. What is a
powerful feature of Lisp enabling it to construct another
programme and then execute it, has become a real
Instead, a clear statement of objectives, the selection of appropriate
and demanding tasks, in relation to the students' interest, conditions
for learning such as available time and other resources. are important
considerations. I emphasized

problem to the students. The students must learn to use
higher order cognitive skills to solve complex problems
Information Technology Application from the personal and organizational
perspectives so that the students feel more.

by using the technique of recursion.
prepared for their future employment.

Stage 4: Response

I adopted cooperative learning to get the students of
I chose the problem-based teaching and learning method

mixed abilities to work and stay together until they have
achieved the shared learning goals, or have completed
specific tasks or assignments. The students were encour-
aged to first work independently referring to the lecture
notes and previously solved problems. If they failed to
proceed, they should then discuss with their peers or me.
I would monitor their progress and provide help accordingly. The result
was very satisfying as 77.7% of
the students managed to solve all the problems in class
to improve students' learning. In the mass lectures, a clear statement
of objectives is enunciated at the beginning of every session.
Illustrations given emphasize how software engineering principles can
be incorporated into the problem domain. Answers to queries received
during tutorials will be given during the lectures. The tutorial class
is divided into groups to encourage peer interaction and cooperation.
in learning the three topics of the course: personal productivity

tools, multimedia application, and current and emerging

and in mock tests could do so by discussing with or getting help from
their peers. During lectures, I also
technologies. Notes are given on the topics covered in the Tutorials.
In the Lab sessions, the groups use

encouraged my students to recaptulate concepts learnt or
new points taught or to summarise the day's' learning to

application tools such as OLE, ODBC, Word 6.0, Excel 5.0 and Powerpoint 4.0 to develop materials for

one's partner in pair situations.
their assignments for the English Department.

Stage 5:Resolution

In all the lectures, tutorials and practical sessions, I used
I resolved that all the tasks demanded of the students must

peer tutoring and the cooperative base groups as a means of getting the
students to think deeply, solve problems,
be related to real working life situations. They are problem-
based. All the assignments given to the students are

and work together to solve problems.
applicable to businesses, education and industries.

Discussion On Issues In The Organization and Implementation of A Formal Teaching Improvement Programme

From the above case studies, a number of issues emerged in connection
with the organisation and implementation of a formal teaching
improvement programme at a Singapore university. The issues can be
categorised into three main clusters of concerns: individual lecturers'
concerns, programme concerns, and institutional concerns.

Individual Concerns

Most of the participants of the PGDipTHE Programme joined the course
with the intent of improving their understanding of student learning,
and their own competence in teaching. They were guided in the first
Core Module and the Curriculum Design Module to reflect on their
practices. They adapted Chen's Reflective Thinking Framework to their
own reflection. They all were able to identify the students' learning
problems, change their own teaching strategies or curriculum redesign
to adapt not only to students' needs but also provoke active learning,
critical and creative thinking, and problem solving.

In the case of the five lecturers from Nanyang Technological University
NTU) and the National University of Singapore (NUS), their primary
concerns are focussed on students' learning and on achieving the goals
of the curriculum and that of the universities. Though their
disciplines and professions may be different, even their personalities,
pedagogical beliefs, thinking, teaching and learning styles are
dissimilar, yet all of them subscribe to training their students to be
competent and reflective practitioners, critical and creative thinkers
and problem solvers. The lecturers themselves model behaviours of

life-long learning. By participating in the PGDipTHE programme and
being engaged in individual and collective reflection, they show
humility and willingness to learn, to be critical of existing practices
and creative in problem solving. They may not be more knowledgeable and
skilful teachers than their colleagues but demonstrate a deep
conviction and commitment to their beliefs and the values of their
professions and the ethos of the universities.

Both Sing Kong (Biology) and Chiu Ming (Chinese Literature) from the
National Institute of Education (NIE) appear to be 'executives' in
their mental self-government functions (Sterberg, 1994, pp174-175).
According to Sternberg, persons with this type of thinking functions
prefer to follow rules and figure out existing ways of teaching their
subjects. On closer examination, they turn out to be 'legislative' in
style. A legislative style characterizes people who enjoy creating,
formulating and planning for problem solving. Sing Kong led the
students to seek new ideas of categorizing living things before he
taught them the techniques of classification. In the case of solving
the problem of learning a great deal of facts about five thousand years
of Chinese literary history, and the essence of Tang poetry, Chiu Ming
reconstructed and organized literary facts and genres into notes for
student teachers' self-study and notes for interactive classroom
teaching in the past year. His form of mental self-government is
'hierarchic', that is, attending to multiple goals, each of which may
have a different priority, whereas Sing Kong's is 'monarchic', that is,
a single goal or way of doing things dominates in his teaching of
Biology in the past two years. Their level of mental self-government

are opposites. Chiu Ming begins with the 'global', then moves to 'local' and the more specific. For example, Chiu Ming teaches genres of literary types - poems, essays, etc before specific rhythm and rhyming patterns of Tang and Sung poetry. Sing Kong talks about specific elements of classification of living and non-living things before going on to deal with more global issues regarding the diversity and unity of organisms in lectures. Field trips to study specimen of what has been taught is a permanent feature of Sing Kong's class. Sing Kong tends to be more 'external' in scope, that is, he is more people-oriented, outgoing, and socially more sensitive, whereas Chiu Ming is more 'internal', that is, he tends to be introverted, task-oriented and more aloof socially speaking. In the matter of leaning of mental self-government, Sing Kong is more 'progressive' that is going beyond existing rules, whereas Chiu Ming is more 'conservative' in his thinking and the manner they plan for student assessment. Their thinking styles have influenced their teaching styles (both are executive most of the time but facilitative sometimes) but these thinking and teaching styles have no effect on their pedagogical commitment and beliefs, as well as their practice on reflective thinking and teaching. They are able to improve their teaching with appropriate guidance and reflection. Being fully aware of the implications of student evaluation, they do not have much fear how these student evaluations would affect their performance evaluation. They practice what they believe to be beneficial for the students. Both Sing Kong and Chiu Ming are now Heads of Divisions, the latter is covering head's duties for a full semester after completing the PGDipTHE course in April 1996.

The other two NTU lecturers, Zhou Wei (Mechanical and Production Engineering) and Liao Ziqi (Business Computing), are relatively new lecturers originally from mainland China with about three years of teaching experience. They are quite worried about student evaluation. According to NTU rules, student evaluation being the only instrument to measure teaching performance will, to no small measure, determine their confirmation and promotion to senior lecturership. However, their

anxiety has not really influenced their teaching and learning styles, nor their personality, nor their commitment to improving their own teaching and their students' learning. Both of them have very different mental self-governing functions, forms, levels, scope and leanings in their mental self-government. Zhou Wei is 'judicial' in function, and loves to judge and evaluate students' abilities, study skills and habits, 'oligarchic' in form and gives almost equal importance to different types of material testing using one analytical strategy. Zhou Wei is global in the level of thinking, internal in scope and progressive in leaning, while Ziqi is executive, hierarchic, local, internal and conservative. Yet they have adapted very well to the Reflective Thinking and Teaching framework for analysing their students learning habits and their own teaching inadequacies. They have made great progress in their teaching. Zhou Wei and Ziqi are now confirmed lecturers in NTU and have been sponsored by the university to become naturalised Singapore citizens.

Chong Thim (Physiology) from NUS has more than 12 years of teaching experience before joining the Programme in 1993. He is senior and secure enough to think about improving the entire pre-clinical curriculum for medical undergraduates for the sake of strengthening the medical education programme. His peculiar mental self-government style has reinforced rather than hindered his life-long learning endeavours and teaching goals. Chong Thim's thinking style is legislative in function, 'anarchic' in form that is his thinking is often unstructured depending on the situation. This is particularly apparent in his accounts of his attempts to negotiate for changes in the sequencing and delivery of the para-clinical curriculum. Chong Thim is sometimes global and sometimes local in his level of thinking, external in scope and progressive in leaning in his mental self-government. He has learned to implement Schon's technique of reflect-on-action and reflect-in-action besides going through the stages of reflective teaching before attempting to redesign the pre-clinical medical curriculum. Chong Thim is not only a member of the Teaching Methodology Committee of the Medical Faculty, he is also a member of the Medical Curriculum Revision Task Force.

The three lecturers from two of the five polytechnics in Singapore : Nanyang and Ngee Ann are equally committed to students' learning but their main goals seem to be more for short term purposes. For example, their main concern is that the students upon graduation will become competent nurses or competent computer programmers. The lecturers are more concerned with the students learning the appropriate, specific nursing treatment methods and bedside manners, or problem solving skills for computer programming. Their differential thinking and

teaching styles also do not seem to influence their commitment to their teaching and profession, or their adopting the Reflective Thinking and Teaching Framework for identifying and analysing their teaching problems, or their taking appropriate actions to improve their own teaching and the students' learning.

Uma, the anatomy lecturer with a medical degree is an experienced lecturer who had joined the Nanyang Polytechnic after teaching in NUS for about five years. She is executive in mental self-government function, oligarchic in form, local in level, external in scope, and progressive in leaning. She believes in imparting the essential knowledge on anatomy and skills in getting the students to be versed in identifying the body parts before the student nurses' clinical practice. Yan Sam, the computer science lecturer at Ngee Ann, has only six months of teaching experience when she joined the PGDipTHE programme in July 1994. She has worked as a research assistant at NUS for about a year before becoming a lecturer.

Yan Sam is executive in mental self-government function, monarchic in form, local in the level of thinking, internal in scope and conservative in leaning. However, she has introduced cooperative learning to her tutorial groups with some success. Her students learned to solve problems in pairs and groups. Agus, on the other hand, is an experienced computer science lecturer with about five years of teaching experience. He has worked in industries before joining the Ngee Ann Polytechnic. From his sharing and assignments, Agus has shown himself to be an effective 'reflective practitioner'. He is committed to problem-based learning for his computer science final year students though his thinking style is almost identical with that of Yan Sam. He is executive in mental self-government function, hierarchic in form, local in level of thinking, internal in scope, and conservative in leaning.

All the three polytechnic lecturers have done extremely well in the PGDipTHE programme. Their expertise is recognised by their respective institutions in various staff development measures.

Programme Concerns

While the objectives and expectations of the PGDipTHE programme are clearly spelt out in the Programme Handbook and Folder with reference to the role of tertiary teachers and the importance of reflection individually and collectively speaking in the improvement of tertiary learning and teaching, the interpretation, emphasis and fulfilment of programme goals may not always be on-target.

The first and foremost difficulty is in creating a programme that will meet the needs of both university and polytechnic participants. The expectations and goals of Singapore universities and polytechnics are quite different. Professional programmes in universities aim at training competent and effective professionals who will function at managerial levels in classrooms, industries and business. Polytechnics are established to train skilled manpower for the industries and businesses. Hence the criteria for admission to the universities and the polytechnics are markedly different. Universities only admit students with excellent 'A' level results while the polytechnics accept students with good 'O' level results (Note 1).

Even though the two universities have identical admission criteria their students do not have identical learning abilities and characteristics. This is not only due to Singapore's structured assessment system but the ethos of the two universities are different. NTU being more progressive focuses mainly on professional programmes while NUS being the established university with a long tradition for conducting courses in a wide range of disciplines and professions is more conservative in orientation. Their background and ethos have to some extent influenced staff recruitment and development policies, even the types of research funded and types of delivery strategies, teaching techniques and assessment methods adopted. Again these differences may vary from discipline to discipline and from institution to institution. Hence the participants from different institutions do express different needs and concerns about large group teaching of 500-100 students in mass lectures or small tutorial groups and workshops.

The polytechnics also vary in their vision and strategies though they seem to have similar missions. The Nanyang Polytechnic is one of the newest polytechnics and is very progressive like the Temasek Polytechnic. It is the only polytechnic which runs a Bio Science Department in the Nursing School while computer science and engineering

are available in all the polytechnics. Ngee Ann, a clan association sponsored institution, is the richest institution with the most up-to-date technical expertise and facilities among the polytechnics until very recently. The Singapore Polytechnic, the oldest of the five polytechnics, has been conducting its own staff development programmes and has not sent any participants to the PGDipTHE course in the first three years. Three SP lecturers enrol July this year and are now enjoying the course.

With such varied backgrounds, it is not surprising lecturers from the different tertiary institutions who join the PGDipTHE Programme have very different needs, expectations, and level of expertise, professionally and pedagogically speaking. This makes the implementation of the programme more challenging, but it may also lead to more problems for matching participants' needs with Programme goals and lecturer-facilitator roles.

The second concern is related to the types of participants. Generally speaking, all the university participants have doctoral and postdoctoral degrees and some working experience while the polytechnic lecturers have first degrees and relatively little working experience. Most of the participants are sponsored to join the Programme and have a positive attitude towards it, the curriculum, and the NIE facilitators. A few of the participants, however, believe that they did not need the course since they have been excellent learners and achievers and there is no reason for a so-called 'lecturer training' course because of poor student evaluation. While expecting their students to be conscientious and be able to perform at quite a high level, a few of these lecturers have different views of themselves as "students". With much less effort than their students, university participants in particular, expect their lecturer-facilitators to be generous and understanding, make allowances for late submission of assignments, and rewarding their efforts with high grades.

The third concern is related to the rigour of a postgraduate programme. Since the PGDipTHE programme is a university course for lecturers, many of the tasks are demanding and the standard of inquiry into the students' learning problems and their own teaching problems is understandably high. Many of the participants, however, could not understand why they have to attend 100 hours of evening class with five assignments and one very substantial Project Report of 10,000 words when another reputable overseas university runs a similar course as a Masters Degree course in Singapore. It is quite natural for the participants to expect the reward of a masters degree on completion of the Programme rather than a postgraduate diploma. This is another matter of concern and requires some rethinking and attention..

Institutional Concerns

The PGDipTHE programme was requested by the NTU President in 1993 for the purpose of achieving excellence in teaching in the University. This is one of the ways to ensure that the goals, mission and vision of NTU in training excellent and reflective professionals can be attained. In the spirit of sharing and collegiality, the programme is also open to the other tertiary institutions. To ensure success, the Programme admits only a small number of participants annually, that is, about 20-25. As such, it is not surprising that the university administration has high expectation of the Programme and the performance of the participants since all of them are sponsored by their respective institutions.

Since its inception 3 1/2 years ago, the Programme has fulfilled its main objectives. It has even joined the academic audit exercise in the School of Education, National Institute of Education, Singapore to demonstrate in concrete terms its leadership in teaching and in ensuring NTU's high standard of teaching. Most of the participants have done extremely well. They have been recognized and rewarded by promotion, or by becoming speakers in Excellence in Teaching Seminars or presenters and organizers in professional and educational conferences. A few have managed to publish their research papers in various types of professional journals.

Conclusion

A number of lessons have been learned from the experience of using the Constructivist and situated learning approach to organize and implement a Postgraduate Diploma of Teaching in Higher Education Programme. Some of the more significant lessons learned evolve around three areas.

First, the success of using cognitive apprenticeship as a

Constructivist approach to facilitate reflective thinking and teaching in tertiary institutions. With a facilitative style of teaching most of the time, lecturers in the PGDipTHE Programme have managed to engage the participants at a high level of thinking and problem solving, self and collective critique and group learning. Through mutual shaping and collegial discussions, participants learned a great deal from one another in the real context of tertiary teaching in specific institutions. Second, the relative insignificance of academic backgrounds and levels of professional status, personalities, thinking or teaching styles, in influencing the effectiveness of reflective teaching practices. It is more the participants' humility and willingness to learn and their commitment to their professions and the institutions that make the difference in their becoming excellent teachers. These qualities are often not reflected in a singular student evaluation exercise and in a singular lecture or workshop. Third, the overriding importance of total commitment to tertiary teaching and one's own profession for achieving excellence in teaching. The latter appears to be the most significant factor in contributing to excellence in university teaching. It far outweighs research output, pedagogic beliefs, teaching styles and strategies, even teaching facilities and administrative support in achieving a high standard of student learning.

The success or failure of the PGDipTHE Programme is ultimately linked to the non-quantifiable factors called care and concern for student learning, and a strong commitment to university teaching. It is only when all concerned, coach-facilitators and participants, administrators and academic leaders, are committed to excellence in teaching, then teaching can become a treasured "community property" in Lee Shulman's words (Shulman, 1993). Then, and only then will teaching for the highest level of student learning and professional training be achieved.

Note 1

The Cambridge 'O' Level Examination is taken by all Singapore students at the end of their secondary school studies, that is, after 10 years of schooling. The Cambridge 'A' Level Examination is taken by higher achieving students at the end of another two years' of post-secondary education.

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