CHAPTER II

REVIEW OF THE RELATED LITERATURE

Before the study began, all the related literature was reviewed to form the theoretical framework of the study. The literature was reviewed in 5 topics.:

1) The CTPB curriculum

2) Purpose of evaluation

3) Criterion-reference testing and mastery decision

4) Taxonomy of educational objective (Cognitive competency)

5) Related study about feedback information

1) The CTPB Curriculum

In the 42 year history of Faculty of Medicine, Chulalongkorn University, the second oldest medical school in Thailand, its curriculum has been traditionally developed with a certain influence from the Western medical education. It is undeniable that the graduates have satisfactorily shown their competency as doctors; many of them have been nationally and internationally renowned in their profession. But this excellence appears to be in thespecific fields needed for tertiary care of the big urban hospitals, not for solving the health problems in poor rural communities of a developing country like Thailand. With this concern, Chulalongkorn University

created a parallel program called "Medical Education for Student in Rural Areas Project."(MESRAP) in 1976, and accepted students from 12 provinces in the catchment area, aiming to produce community oriented medical doctors for the needy rural community.

Eventhough the main objective of MESRAP has been achieved, certain qualities of good doctor, such as critical thinking, clinical reasoning,decision making and problem solving as well as leadership skills and the ability to work in a team, are still in need of improvement. These qualities have been accepted as being required by all medical graduates,following a resolution from the Fifth National Medical Education Conference (NMEC). The Conference suggested that the training sites and teaching /learning methods greatly affect the product, and that a new innovative medical curriculum which promotes the desired qualities inthe graduates must be sought.

According to the Fifth Five Year Plan of the National Economic and Social Development Board (NESDB), it was also about time for Chulalongkorn University to fulfil its commitment to accept 180 medical students per year, 30 more than previously. This led the Faculty of Medicine to discuss whether innovative medical education would be suitable. The University had been critically assessing the MESRAP program graduates for those qualities since its inception. Some experiences in problem based learning from medical schools with established problem based learning had been incorporated into appropriate sessions in the MESRAP program, but the desired result had not been satisfactorily
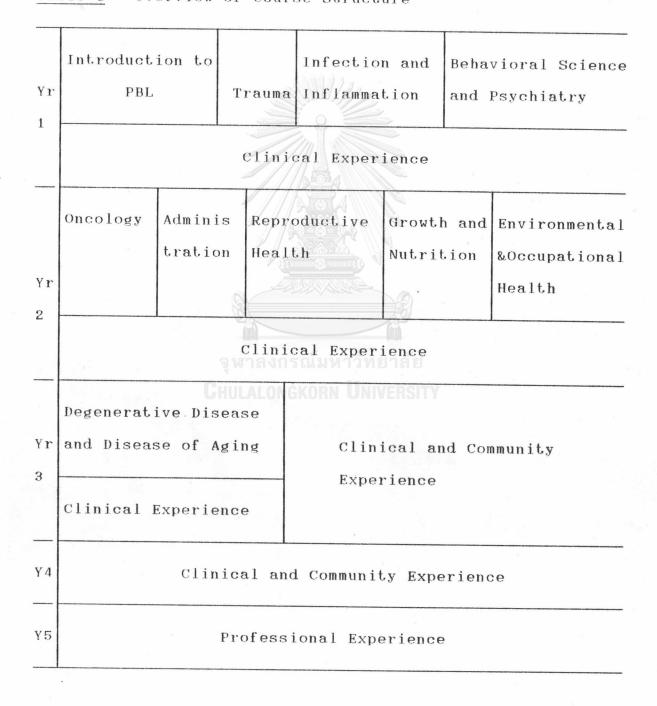
achieved. This failure could be attributed to the unreadiness of both teachers and students to follow the new innovative teaching/learning style.

Further investigation of problem based medical education continued. Medical educators were sent to study at McMaster and Maastricht to collect more information, and finally from the successful experience of the innovative parallel track of the Faculty of Medicine, University of New Mexico at Albuquerque. The problem based course was then launched as a third track in the Faculty of Medicine, Chulalongkorn University, for the first time in Thailand. It is called "Community Targeted Problem Based Medical Education Program"(CTPB), and nineteen students were accepted as a first cohort in May 1988.

CTPB program is a 5-year curriculum, admitting graduates of any bachelor degree graduate except health sciences, who has 26 credits in basic sciences. It consists of two phases, the first, of 2 1/2 years, covers 10 blocks concerning basic medical sciences, while the second covers the clinical sciences for another2 1/2 years at the affiliated Bhumibol Adulyadej Hospitals. All blocks offer sequences of burden of illness and age with the community targeted. The student activities in the community are integrated into each block, and take at least 3 hours in a week. Along with the block study, the curriculum requires the students to practice the essential clinical skills which appear in the clinical experience course.

The curriculum design was based on the combination of primary health problems, Thai medical standards for

medical practitioners, and the Faculty's educational objectives. Curricular structure emphasized the use of problem based learning and self directed learning as a means of medical study. The Doctor of Medicine degree will be conferred by Chulalongkorn University after the students have passed the comprehensive examination, the same requirement as the other programs, in the final year.

Table 1: Overview of Course Structure

Yr 1	Introduction to PBL		Trauma	Infection and Inflammation	Behavioral Science and Psychiatry
	Clinical Experience				
Yr 2	Oncology	Administration	Reproductive Health	Growth and Nutrition	Environmental &Occupational Health
	Clinical Experience				
Yr 3	Degenerative Disease and Disease of Aging	Clinical and Community Experience			
	Clinical Experience				
Y4	Clinical and Community Experience				
Y5	Professional Experience				

2) <u>The purposes of evaluation</u>

Test and other measurement instruments serve a variety of purpose:

1. <u>Selection</u>: To determine which persons will be admitted to or denied admittance to an institution

2. <u>Placement</u>: To help individuals determine which of the several programs they will peruse

3. <u>Diagnostic and remediation</u> : To help discover the nature of the specific problems individual may have

A test that is used to determine a person's strengths and weakness in order to improve performance serves a diagnostic function. Before teachers and counsellors can recommend remedial help, they must know in what specific areas and individual is having difficulty. (Gilbert,1990)

In medicine the ability to diagnose a patient's problem is a prerequisite of its treatment, diagnosis serves no end in itself, but it is needed if reasonable treatment decisions are to be made in education too teachers will be better able to recommend specific types of remediation if they know in what areas the student is deficient.

Diagnosing student learning difficulties involves two levels of evaluation. First, students who need some form of remediation must be identified. Consistently low test scores and low marks imply the need to intervene and modify student behavior. Second, the specific areas of weakness must be determined. Since these are numerous problems students can have, test can usually contain only a

very limited number of items designed to measure each potential source of difficulty. Ideally, diagnostic test should contain a relatively large number of items measuring very specific objectives. Since no test is capable of measuring all aspects of knowledge, the tester has to be satisfied with a sample or limited number of items pressured to represent the population or universe (totality) of all possible items that could be constructed and administered.

Almost all the commercially available diagnostic test are in arithmetic and reading, probably because it is easier to agree upon and analyse the objectives in those area than in others. In other areas of the curriculum, for example, in medical education, teacher many have to construct diagnostic test that measure their own specific objective

4. Feedback : To provide knowledge of improvement to students. Feedback is also important to the students themselves. It gives them an idea of their accomplishments and can help them make more realistic decisions. They need to know not only how well they are meeting teacher or school objectives but also how well they are doing in comparison to individuals with whom they are most likely to compete.

There is evidence that incentives can improve learning and that students who have been given specific feedback perform better than those who are given no knowledge of how well they performed. (Gilbert, 1990)

In diagnostic work criterion-referenced feedback is more important than norm-referenced feedback. That is, it is probably more important to know that a student is experiencing difficulty become proficient in a specific area of the curriculum than it is to know that the student is average in the class.

5. <u>Motivation and guidance of learning</u>: To provide information to student regarding how important the teacher considers a topic to be.

Tests can be used to motivate and guide students to learn, and because students study for the type of examination they expect to take, it is the teacher's responsibility to construct examinations that measure important course objectives.

The use of marks to motivate students has been investigated in a number of studies. Ellis Page(1958) found that on the final examination the students from both the free comment and specified comment groups did much better than those who received no comments from the teacher.

6. <u>Program and curriculum improvement</u> : To determine the effectiveness of a program throughout its duration (formative evaluations) and its overall effectiveness (summative evaluations).

Formative evaluation of a program is designed to help the teacher or administrator make effective decisions throughout the course's or project's duration. This type of evaluation provides continuous information that can be used to modify the program to improve its effectiveness and efficiency.

Formative evaluation is closely related to the feedback and diagnostic functions of testing. When students complete each unit or phase of instruction, tests can inform them of their knowledge, whether or not they are pacing themselves adequately to meet course objectives, and in what areas they need to improve. With the teacher's help, new remedial materials or methods can be used to facilitate learning.

7. Theory development : To further knowledge about human traits, characteristics or attributes. In addition to their many practical uses, tests have also furthered the development of educational and psychological theory.

3) Criterion-referenced testing and mastery decision

One of the most challenging tasks facing medical educators is that of developing examinations which measure accurately and assess appropriately the adequacy of student knowledge, skills and professional attitudes. This evaluative task has such importance because it is chiefly through examination data that teachers monitor the progress of students through medical school, identify those who are to be identified as a physicians, and thus ultimately central both the quantity and quality of physicians available to society.

No single examination can provide adequate data for all the decisions a faculty must make on medical students. Each examination,however , is most likely to serve a particular evaluative need if it is designed from an

explicit statement of the decision a faculty must make and is developed to provide the specific data required for that decision.

Tests are very often used as the basis of decisions about the degree to which a student has mastered the domain to which the test is matched. This is consistent with the Glaser (1963) concept of criterion-referenced testing. That idea of mastery has been modified to require the determination of whether the student has or has not mastered the domain of content.

The use of mastery decisions is not new. The Taxonomy of educational objectives: Handbook I, The cognitive Domain (Bloom et al.,1956) was widely accepted among professional educators. Use of the taxonomy led to the common practice of expressing educational outcomes in specific, behavioral terms. Mager's preparing Instructional objectives(1962)explained to thousands of teachers-in-training how to write instructional objectives. Mager's book also introduced the notion that the objective should contain the degree of correct performance that is necessary in order to indicate that the student has attained, or mastered, the objective.

Additionally,John Carroll (1963) promoted objectives-based curriculum reform and Benjamin Bloom (Bloom, Hastings, and Madaus, 1971) later developed many of these ideas into a theory of mastery learning. Many schools developed curricula that were based on the principles of matching instruction to objectives and monitoring student progress with tests that were matched to the objectives.

The scores on these tests were used to decide whether the students had mastered the objectives.

Method of setting standard

In order to decide whether a student has mastered an objective or domain, we need to see whether she or he has met the standard of minimal acceptable performance that would constitute mastery. There are several methods of setting standards that might be used.

a) Professional Judgment

The method that is probably used most often in school settings is that of the professional judgment of the teacher. The teacher is familiar with the content that is to be mastered, the usual patterns of performance of students on that content, and the level of performance that is needed in order to do well on later, related objectives. For example, the teacher knows whether 70 percent correct would indicate that a child is likely to have problems with additional material and should be remediated, or whether 70 percent correct is adequate enough to suggest that a child should proceed and begin work on new objectives.

Critics of this approach mention its subjectivity and the fact that when pressed for explanation, the teacher may have a very limited rationale for his or her choice of standards. When the standard is the same for all objectives, perhaps 80 percent as minimally acceptable, this may be evidence of an automatic response rather than a carefully considered decision about what is minimally acceptable performance on each of the deferent objectives.

b) Nedelsky method

Other methods of standard setting were developed for whole tests rather than for each specific objective, although these techniques could be applied to objectives. The first of these was proposed by Nedelsky (1954) for use with multiple-choice tests. In order to set an appropriate standard of minimally acceptable performance, one would do the following:

1. Assemble a panel of qualified experts in the content area.

2. Have each expert examine every item on the test and eliminate every multiple-choice response that she or he thinksa minimally competent examinee could eliminate.

3. Compute the probability of guessing the answer correctly after the above options are eliminated. This is 1 divided by the number of options that remain.

4. The sum of these probabilities across the set of items is the expected score of a minimally competent examinee as determined by that expert.

5. The average of these expected scores across all of the experts is then the standard of minimally acceptable performance.

For example, suppose that one of the experts reviewed a 20-item multiple-choice test, each item having four options. The probability of guessing correctly on an item would be 1 out of 4 or 1/4. If this expert felt that a minimally competent student could eliminate one of the distractors on item 1, then the probability of guessing correctly on item 1 is 1/3. If two distractors on item 2

could be eliminated by a minimally competent student, the probability of guessing item 2 correctly would be 1/2. If all of the options appeared adequate on item 3, its probability of being correctly guessed would remain at 1/4. The expert would rate each item in this way and determine the probability that a minimally competent student would guess correctly. This expert would then add together the probabilities of the 20 items.

Other experts would engage in the same procedures and generate their scores in a similar manner. The average of all these experts' scores is then used as the standard of minimally acceptable performance.

This and other methods for setting standards call for a panel of qualified experts. This does not necessarily mean that these are nationally recognized experts. They may be colleagues who are familiar with the content area and the characteristics and typical performance levels of the students. Experienced teachers can serve this role very well.

c) Angoff method

Angoff (1971) described a somewhat different method. The steps in this process are as follows:

1. Assemble a panel of qualified experts in the content area.

2. Have each expert examine every item on the test and estimate the percentage of those in a group of minimally competent persons who would answer the item correctly.

3. Sum the percentages across the set of items

to establish a minimally acceptable score for that expert.

4. The average of the scores across all of the experts is then the standard of minimally acceptable performance.

In summary, criterion-referenced tests and other kinds of tests are sometimes used as the basis of decisions about whether a student has mastered an objective or a domain of content. A standard of minimal acceptable performance is set and those who exceed this standard are said to have achieved mastery. Several methods have been used to set standards and each of these methods contains a great deal of subjective judgment. However, if a mastery decision is needed, it is best to use an established standard setting procedure.

4) Taxonomy of educational objectives

The optimal practice of medicine requires the complex cognitive abilities of problem-solving and interpretation of data as well as recall or recognition of isolated information. Therefore, most medical educational programs attempt to develop the students' ability to perform these complex cognitive processes in addition to providing them with a base of information. (Buckwalter, 1981)

To help teachers in precise formulation of educational objectives, systems of classification into domains (practical skills; attitudes or communication skill; intellectual skills and knowledge) and with each domain (different levels of the process) have been put forward by

various specialists in education and psychology.

One of the well-known taxonomy is Bloom's taxonomy (Bloom, 1956). He specified Six cognitive-process-levels arranged in hierarchical order of complexity:

- knowledge

- comprehension

- application

- analysis

- synthesis

- evaluation

with each process being devided into subprocesses. The hierarchical order implies that the objectives in one class require the behaviors found in the preceding levels.

In 1963, C. McGuise proposed a classification system derived from that of Bloom and designed more specifically for use in the preparation of achievement tests for students.

1. Knowledge

    1.1 Recall

    1.2 Recognition of meaning

2. Generalization

3. Solving of a routine problem

    3.1 Interpretation of data

    3.2 Application

4. Solving of an Unfamiliar problem

    4.1 Analysis of data

    4.2 Special application

5. Evaluation

6. Synthesis

In 1971, J.J.Guilbert Summarized that three levels are probably enough for the purposes of defining educational objectives and student evaluation (J.J.Guilbert, 1987)

1. The first level is that of <u>Recall</u> of facts. This involves remembering the facts, principles, processes, patterns and methods necessary for efficient performance of a professional taste.

2. The second level is that of <u>Interpretations</u> of data. This is a process of application or use of ideas, principles or methods to deal with a new phenomenon or situation

3. The third level is that of <u>Problem Solving</u> (relating to diagnosis, treatment organizationetc.) This at best should include finding solutions for a problem arising from new situations with no precedent to serve as a guide.

5) <u>Related study about feedback information</u>

There were a lot of study that support the important of feedback information for the student. Peecle, J. et al. (1985) had ninety-seven fifth graders took a multiple-choice test with factual and guess questions after reading a 900-word text. The effects of immediate informative feedback, delayed feedback, or no feedback on their performance on a delayed retention test were analyzed. Results suggested that awareness of initial errors was helpful.

Smith and Wight (1988) evaluated immediate feedback, no return test technique via student ratings. They found

that students were enthusiastic in their assessment of the technique and believed that it facilitated their learning.

Diaz Lefebuse and Rene (1988) develop a study guides to help students reduce stress toward testing and develop critical reading and thinking skill. The guides were made up of 30 multiple choice questions. The students completed the study guide using an open-book format. After completion of the test the teacher and students discussed the answer. A benefit of this method was that students received immediate feedback, were familiar with the chapters, develop confidence in participating in class discussion, had a sense of control in their own learning and were motivated to learn.

Summary

In chapter II, an over view of the CTPB curriculum, the purpose of evaluation, criterion-reference testing and mastery decision, taxonomy of educational objectives as well as the pertinent study about feedback information have been reviewed and presented.