CHAPTER I
INTRODUCTION

1.1 Educational System in Thailand

Education in Thailand has developed from traditional education offered in the temple, the palace and the family to modernized education, and aims not only at fostering a sense of Thai nationalism, and at preparing Thai citizens for life, but also aims at providing greater equality of educational opportunity to meet the social and economic needs of the country. Thai education is provided on the basis of the National Scheme of Education and the National Educational Development Plan. At present, the development of education is under the Eighth National Education Development Plan (1997-2001) aiming at preparing the Thai people to cope with a rapidly changing world in the era of globalization.

1.1.1 The Eighth National Education Development Plan (1997-2001)

The Eighth National Education Development Plan (1997-2001) has been formulated with the objectives, policies and major programmes for educational development as follows:

1.1.1.1 Objectives

* To expand an extensive and equal provision of basic education for all people; and to extend basic education to secondary education level.
* To improve the equality of education and its relevance to the needs of individuals, communities and the nation, and to enable learners to achieve their full potential for self-development.
* To enhance Thai education in strengthening the national potential for self-reliance, and to contribute to national economic stabilization and the role of Thailand in the global economy.
1.1.1.2 Policies on Educational Development

* To accelerate an extensive and equal expansion and further extension of high-quality basic education services for all.
* To reform the teaching and learning system.
* To reform the teacher education system.
* To accelerate the production and development of middle-level skilled and higher-level skilled manpower.
* To reform educational administration and management.

1.1.1.3 Major Programmes for Educational Development

Major Programme 1: Promotion of Basic Education for All

Major Programme 2: Improvement of Educational Quality

Major Programme 3: Development of the Teacher Education System and Process, and the Development of In-Service Teacher Education.

Major Programme 4: Production and Development of Manpower in the Areas of Science and Technology and Social Sciences.

Major Programme 5: Research and Development.

Major Programme 6: Improvement of Administration and Management.

Major Programme 7: Development of Higher Education.


Major Programme 9: Development of an Educational Information System.

1.1.2 Structure of Educational System

The present educational system is structured according to the 1992 National scheme of Education which provides opportunities for individuals to develop themselves in accordance with their age. As it is designed to assure continuous and life-long learning, it covers both education in the school-related system and from the way-of-life learning process.
1.1.2.1 **Education in school-related system**: In this system education is provided by educational institutions, characterized by a class/grading system, and the use of curriculum specified for the level and type of education so as to develop learners in accordance with curriculum objectives. It is divided into 4 levels: pre-school education, primary education, secondary education and higher education.

<table>
<thead>
<tr>
<th>Level of Education</th>
<th>Pre-school Education</th>
<th>Primary Education</th>
<th>Secondary Education Lower</th>
<th>Secondary Education Upper</th>
<th>Higher Education</th>
<th>Flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class of Level</td>
<td>1 2 3 4 5 6</td>
<td>7 8 9</td>
<td>10 11 12</td>
<td>Flexibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approximate Age</td>
<td>3 → 6</td>
<td>7 → 12</td>
<td>13 → 15</td>
<td>16 → 18</td>
<td>19 →</td>
<td></td>
</tr>
</tbody>
</table>

Pre-school education encourages the harmonious physical, intellectual, emotional and development of a child prior to primary education. It can be organized in the forms of day-care centre, Kindergarten, or child development centre, depending upon local conditions and target groups.

Primary education, which is compulsory according to the Primary Education Act of 1980, aims at providing a basis for learners to form desirable character encompassing morality, ethics, basic knowledge and ability, and to retain literacy and arithmetic ability.

Secondary education is regarded as part of the process of life long education. It is divided into two parts, each covering a period of three years, the lower level allows the learner to explore his individual interests and aptitudes through a wide choice of both academic and vocational subjects. The upper level offers specialized studies that will eventually lead to future employment.
Higher education is divided into 3 levels: lower than bachelor’s degree level, bachelor’s degree level, and graduate level.

Education from way-of-life learning process is self learning from various sources of knowledge and environment related to way of life naturally existing or modified to enhance learning. It is not only to complement the formal education but also to correct the over dependence on formal education and to offer opportunities for lifelong learning.

1.1.3 Educational Administration

The educational administrative system in Thailand is parallel to all other sections of public administration characterized by the three level structure:

- The Central or National Level
- The Provincial Level
- The Local Level

The responsibility for educational management in Thailand is under the mandate of four main ministries: 1) The Office of Prime Minister 2) The Ministry of Education (MOE) 3) The Ministry of University Affairs (MUA) 4) The Ministry of Interior (MOI)

In addition, other ministries also take charge of the management of education in specialized field or for specific purposes. Their responsibilities and functions can be classified as follows:

1.1.3.1 The Central or National Level

At this level, the ministries concerned and the operational implementing organizations may set their ministries’ policies which have to be in accordance with the national policy.
1.1.3.2. The Regional and Provincial Levels

At the provincial level, the Committee of Education, Religion and Culture has been set up in each province chaired by the Governor, with the Provincial Education Superintendent as Secretary of the Committee. Other members are the representatives from various departments within the province and 5 scholars. This committee is responsible for the approval of Educational Development Plan at provincial level in line with the MOE’s plan, preparation of annual budget proposal for allocation of funds, coordination of common utilization of resources including follow up and evaluation of provincial plans/projects.

1.1.3.3 The Local Level

The local authorities responsible for the management of education in their own jurisdiction are the Bangkok Metropolitan Administration (BMA) and the municipalities including Pattaya City, with financial support from, and under the supervision of, the MOI.

The educational administration of schools providing primary and secondary education is shown in table 1.2.
<table>
<thead>
<tr>
<th>Responsible Bodies (Ministry / Department)</th>
<th>Type of Schools</th>
<th>Courses Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ministry of Education</strong></td>
<td></td>
<td>Primary</td>
</tr>
<tr>
<td>1. ONPC</td>
<td>Public</td>
<td>*</td>
</tr>
<tr>
<td>2. Dept. of General Ed.</td>
<td>Public :</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>→ General School</td>
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<tr>
<td></td>
<td>→ Special Ed. School</td>
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<tr>
<td></td>
<td>→ Welfare Ed. School</td>
<td></td>
</tr>
<tr>
<td>3. Office of Rajabhat Institute Council</td>
<td>Public :</td>
<td></td>
</tr>
<tr>
<td></td>
<td>→ Demonstration School</td>
<td></td>
</tr>
<tr>
<td>4. Office of Private Ed. Commission</td>
<td>Private :</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>→ General School</td>
<td></td>
</tr>
<tr>
<td></td>
<td>→ Special Ed. School</td>
<td></td>
</tr>
<tr>
<td></td>
<td>→ Welfare Ed. School</td>
<td></td>
</tr>
<tr>
<td>5. Dept. of Physical Ed.</td>
<td>Public :</td>
<td></td>
</tr>
<tr>
<td></td>
<td>→ Sport School</td>
<td>*</td>
</tr>
<tr>
<td>6. Dept. of Fine Arts</td>
<td>Public :</td>
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</tr>
<tr>
<td></td>
<td>Dramatic Arts College</td>
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<tr>
<td></td>
<td>Fine Arts College</td>
<td></td>
</tr>
<tr>
<td>7. Dept. of Vocational Ed.</td>
<td>Public :</td>
<td></td>
</tr>
<tr>
<td></td>
<td>→ Technical College</td>
<td></td>
</tr>
<tr>
<td></td>
<td>→ Vocational College</td>
<td></td>
</tr>
<tr>
<td></td>
<td>→ Agricultural College</td>
<td></td>
</tr>
<tr>
<td>8. Rajamangala Institute of Technology</td>
<td>Public</td>
<td></td>
</tr>
<tr>
<td></td>
<td>→ Demonstration School</td>
<td></td>
</tr>
<tr>
<td><strong>Ministry of University Affairs</strong></td>
<td>Public :</td>
<td></td>
</tr>
<tr>
<td></td>
<td>→ Demonstration School</td>
<td></td>
</tr>
<tr>
<td><strong>Ministry of Interior</strong></td>
<td></td>
<td>Primary</td>
</tr>
<tr>
<td>1. Breau of Local Ed.Ad.</td>
<td>Public (Local)</td>
<td>*</td>
</tr>
<tr>
<td>2. Bangkok Metropolitan Ad.</td>
<td>Public (Local)</td>
<td>*</td>
</tr>
<tr>
<td>3. National Police Office</td>
<td>Public : Border Patrol</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Police Primary School</td>
<td></td>
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<tr>
<td><strong>Ministry of Labour and Social Welfare</strong></td>
<td></td>
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<tr>
<td>Department of Public Welfare</td>
<td>Public</td>
<td></td>
</tr>
<tr>
<td></td>
<td>→ Hilltripe Welfare School (Temporary Seasonal)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>→ Child and Youth Welfare school</td>
<td></td>
</tr>
</tbody>
</table>
Education at primary and secondary levels is mainly organized by MOE through various departments. The Office of the National Primary Education Commission (ONPEC) is the major organization responsible for primary education. The Department of General Education (DGE) functions mainly at the secondary level. Private schools are under the supervision of the Office of the Private Education Commission (OPEC). There are demonstration schools of various universities and RIS which are outside the control of the MOE, but they follow the national standard curriculum. Primary schools under the ONPEC and MOI have offered lower secondary classes in accordance with the government policy on ‘The Expansion of Educational Opportunities’ at lower secondary education. Besides, special and welfare schools provide secondary education for the handicapped and disadvantaged. Public Vocational Education at upper secondary level is provided by the Department of Vocational Education (DVE) Department of Fine Arts (DFA), Rajamangala Institute of Technology (RIT).

1.1.4 The Expansion of Educational Opportunities at Lower Secondary Education

Since the Sixth National Education Plan (1987-1991) there is emphasis on the increase of equality in educational access and quality. Significant developments were the provision and expansion of educational opportunities at lower secondary education as an effort of the government to extend basic education from 6 → 9 years resulting in remarkable increase in transition rate from primary to secondary education. Primary schools under the Office of the National Primary Education Commission and Ministry of Interior have afforded lower secondary classes in accordance with the government policy on the expansion of educational opportunities at lower secondary education. Moreover, The Seventh and Eighth National Education Plans still lay emphasis on distribution of lower secondary education as a basic education. It shows that the government pays attention to expand opportunities and develop the quality of Thai
people, who are the key to overall development of nation. The primary schools which follow the ‘Expansion of Educational Opportunity Schools Project’, would offer the additional three years of lower-secondary classes with the exemption of school fees by using the same national standard curriculum.

1.1.5. Curriculum and Learning Process of Lower Secondary Education

The structure of standard national curriculum of lower secondary education includes 4 components:

1.1.5.1 Core Subjects: These are basic subjects that correspond to life and society in general and must be taken by all students. All of these subjects are prepared by the Department of Curriculum and Instruction Development, Ministry of Education.

1.1.5.2 Prescribed Elective Subjects: These are basic subjects which are different according to local conditions and needs. The local authorities are given an opportunity to choose the subjects offered according to a number of credits, or the local authorities can prepare the subjects offered by themselves in addition to those prescribed by the Department of Curriculum and Instruction Development.

1.1.5.3 Free Elective Subjects: These are the subjects that are open for learners to choose according to their interests, aptitudes and needs. Students can choose either the subjects prepared by the Department of Curriculum and Instruction Development or those created by the Local Authorities.

1.1.5.4 Activities: All schools are required to organize three types of activities for learners: those organized in accordance with the regulations of the Ministry of Education; guidance, remedial teaching or academic development activities; and independent activities of learners.

The secondary level curriculum applied the credit or unit system. Every coursework could be given credit and accomplished in one semester. Such a credit
system was intended to give more flexibility and efficiency to learning. It could promote more freedom of choice, and did away with an annual repetition of the grade. Every school could evaluate its own students, and in order to promote standard of testing, schools were clustered into groups, for close collaboration on testing.

1.2 Evaluation of Education

1.2.1 Significance of Evaluation

Evaluation occupies a key position in education. There are many reasons suggested for keeping clear records of learner’s progress, for example: to help the learner realize what he/she has learned, to help the teacher plan for future learning or remediation. Every theory of learning assumes the presence of feedback. Evaluation is a prerequisite to this feedback. Without good evaluation, we cannot know whether effective learning has occurred. The following are some of the commonly advocated reasons for evaluating learners:

- increasing the motivation of learners
- prediction of an individual’s potential
- diagnosis of learning
- diagnosis of teaching
- certification, classification and comparison with other learners.

1.2.2 The Meaning of Evaluation

From an educational view point, evaluation may be defined as a systematic process of determining the extent to which educational objectives are achieved by pupils. Evaluation assumes much more comprehensive and inclusive term of definition. It includes both qualitative and quantitative descriptions of pupil behaviour plus value judgments concerning the desirability of that behaviour.
Evaluation = Quantitative description of pupils (measurement) + value judgments
Evaluation = Qualitative description of pupils (non-measurement) + value judgments.

As noted in above, evaluation may or may not be based on measurement, and when it is, it goes beyond the simple quantitative description (Gronlund 1971).

1.2.3 Evaluation and Programmed Instruction

There is no place in education where testing has played a more central role than it has in programmed instruction. Essentially, programmed instruction consists of a continuous series of learning sequences, each containing the following elements: 1) the presentation of a limited amount of instructional material (called step of frame); 2) a test item, question, or problem, requiring a response to the instructional material; 3) immediate knowledge of results, or feedback, concerning the correctness of the response made in step two. This basic learning sequence is repeated over and over again in a programme. The instructional materials, on which the learning sequences are based, are carefully ordered to guide the learner toward a specific set of instructional objectives (Gronlund 1971).

Programmed instruction has been presented in many different forms. In some cases teaching machines have been used. In other cases, the programmed materials have been put into workbook or textbook form. More recently, computer-assisted instruction has come into being, at least on an experimental basis.

In the present investigation the learners were given the written programmed instruction in the form of a programmed text.

1.2.4 Other Uses of Evaluation Results

The main purpose of evaluation is to improve learning and instruction. All other uses are secondary or supplementary to this major purpose.
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Reporting pupil progress to parents. The systematic use of evaluation procedures in the classroom provides the teacher with an objective and comprehensive picture of each pupil’s progress. The comprehensive nature of evaluation process also equips the teachers to report on the total development of the pupil rather than on a limited area of it. This kind of overall objective information about pupils provides the foundation for the most effective cooperation between parents and teachers.

Use in guidance and counseling. The results of evaluation procedures are especially useful for guidance and counseling. Assisting a pupil with educational and vocational decisions guiding him in the selection of curricular and extracurricular activities, and helping him solve personal and social adjustment problems, all require an objective knowledge of the pupil’s abilities, interests, attitudes, and other personal characteristics. The more comprehensive is the picture of the pupil’s strengths and limitations in various areas, the greater is the likelihood of effective guidance and counseling.

Use in school administration. Evaluation also provides the information on which to base administrative decisions concerning the placement, grouping and promotion of pupils. In the public relations area, an evaluation programme is indispensable for gathering the objective data to be used in interpreting to the community, the goals and accomplishments of the school.

1.2.5 Types of Evaluation Procedure

Evaluation in terms of aspects of behaviour evaluated may be subdivided into two general categories. In the first are those which are used to determine a person’s abilities. Procedures of this type are concerned with how well an individual performs when he is motivated to put forth his best effort. In short, the evaluation results indicate what an individual can do. Aptitude and Achievement tests are included in this category. The second subdivision in this classification of procedures includes those
designed to reflect a person’s typical behaviour. How does the individual usually behave in normal or routine situations? Results in this area, then, tend to indicate what an individual will do rather than what he can do. Evaluations of typical behaviour fall in the general area of personality appraisal. Methods designed to evaluate interests, attitudes, and various aspects of personal-social adjustment are included in this category.

1.2.6 Evaluation of Academic Achievement

The main emphasis in evaluation is on the extent to which educational goals are achieved. Achievement, especially academic achievement is universally praised as a goal of education. Programmes are designed to enhance achievement. Pupils are honoured for high achievement; many tests covering school subject matter contain the word achievement in their titles. One definition of academic achievement in Dictionary of Education by Good (1978) is as ‘knowledge gained or skills developed in the school subjects, usually designated by test scores or by marks assigned by teacher or by both’

To evaluate learner achievement, teacher must select things which will able to see that indicated presence of that achievement. A description of what student will be asked to do is called an instructional objective. Instructional objectives can be categorized by underlying capabilities or learning outcomes. It is useful to associate each objective with one of these categories to help assure that the correct learning outcome is being measured, because instructional objectives only describe a student’s visible performance to be the result of a capability not other than the one being assured. Two approaches often used to categorise learning outcomes were associated with Bloom, 1956 and Gagne, 1985(Oosterhof 1994). Bloom’s taxonomy consisted of 3 domains: (i) cognitive domain includes six capabilities : knowledge, comprehension, application, analysis, synthesis and evaluation (ii) affective domain, and (iii) psychomotor domain. Gagne’s approach includes five capabilities : (i) verbal
information, (ii) intellectual skills, (iii) cognitive strategies, (iv) motor skills, and (v) attitudes.

1.2.7 Evaluation of Academic Achievement of Secondary Level Students in Thailand

The secondary schools in Thailand have used the same standard curriculum and the same rules of evaluation. Every secondary school has to evaluate its own students and give grading. The methodology of evaluation rules can be summarized as follow:

- Evaluation of students' academic achievement should cover three domains — cognitive, affective, psychomotor.
- In order to promote standard of evaluation, schools were clustered into groups for close collaboration on testing as: setting behaviour objective, developing tests, setting proportion of middle term scales and final term scales, etc.
- Instructor of each subject should have pre-evaluation for realizing learners' foundation, formative evaluation for improving instruction procedure and final evaluation for determining students progress toward Stated Educational Objectives.
- Using grading system: every course work could be given credits to be accomplished in one semester, then assigning grade as 4 3 2 1 0 : 4: pass, exceptional, 3: pass, superior, 2 : pass, satisfactory, 1: pass, 0: fail

1.3 Bloom's Taxonomic Categories

A number of attempts have been made to formulate systematic organization of objectives' taxonomy and the best known of these is associated with the name of Bloom. The major purpose in constructing taxonomy of educational objectives by Bloom is to facilitate communication. It is a method of improving the exchange of ideas and materials among test workers as well as other persons concerned with
educational research and curriculum development. Bloom (1956) divided educational objectives into 3 domains: (i) Cognitive (ii) Affective and (iii) Psychomotor.

Bloom concentrated on the study of cognitive domain. He assumed that in thinking about a problem or topic a hierarchy of cognitive process is involved. He defined six main classes in the hierarchy, each higher step encompassing those below. These were in an ascending order of difficulty. Table 1.1 indicates the taxonomic categorization of educational objectives in the cognitive domain given by Bloom (1956).
Table 1.3
Taxonomy of Educational Objectives in the Cognitive Domain
(Bloom’s taxonomy)

<table>
<thead>
<tr>
<th>Objective</th>
<th>Mental Process or Abilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledge</td>
<td>1. Recall</td>
</tr>
<tr>
<td></td>
<td>2. Recognize</td>
</tr>
<tr>
<td>2. Comprehension</td>
<td>1. See relationship</td>
</tr>
<tr>
<td></td>
<td>2. Cite example</td>
</tr>
<tr>
<td></td>
<td>3. Discriminate</td>
</tr>
<tr>
<td></td>
<td>4. Classify</td>
</tr>
<tr>
<td></td>
<td>5. Interest</td>
</tr>
<tr>
<td></td>
<td>6. Verify</td>
</tr>
<tr>
<td></td>
<td>7. Generalize</td>
</tr>
<tr>
<td>3. Application</td>
<td>1. Reason</td>
</tr>
<tr>
<td></td>
<td>2. Formulate</td>
</tr>
<tr>
<td></td>
<td>3. Establish</td>
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<tr>
<td></td>
<td>4. Infer</td>
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<td></td>
<td>5. Predict</td>
</tr>
<tr>
<td>4. Analysis</td>
<td>Analyze</td>
</tr>
<tr>
<td>5. Synthesis</td>
<td>Synthesize</td>
</tr>
<tr>
<td>6. Evaluation</td>
<td>Evaluate</td>
</tr>
</tbody>
</table>
1.3.1 Knowledge

1.3.1.1 Knowledge involves the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting. For measurement purposes, the recall situation involves a little more than bringing to mind the appropriate material. Although some alteration of the material may be required, this is a relatively minor part of the task. The knowledge objectives emphasize most the psychological process of remembering. The process of relating is also involved in that a knowledge test situation requires the organization and recognition of the problem such that it will furnish the appropriate signals and cues for the information and knowledge the individual possesses. To use an analogy, if one thinks of the mind as a file, the problem in a knowledge test situation is that of finding in the problem or task the appropriate signals, cues, and clues which will most effectively bring out whatever knowledge is filed or stored.

i) Knowledge of specifics

The recall of specific and isolable bits of information. The emphasis is on symbols with concrete referents. This material, which is at a very low level of abstraction, may be thought of as the elements from which more complex and abstract forms of knowledge are built.

ii) Knowledge of terminology

Knowledge of the referents for specific symbols (verbal and non-verbal). This may include knowledge of the most generally accepted symbol referent, knowledge of the variety of symbols which may be used for a single referent, or knowledge of the referent most appropriate to a given use of a symbol.

* To define technical terms by giving their attributes, properties, or relations.
** Familiarity with a large number of words in their common range of meanings.
iii) Knowledge of Specific Facts

Knowledge of dates, events, persons, places, etc. This may include very precise
and specific information such as the specific date or exact magnitude of a
phenomenon. It may also include approximate or relative information such as
an approximate time period or the general order of magnitude of a
phenomenon.

* The recall of major facts about particular cultures.
* The possession of a minimum knowledge about the organisms studied in
  the laboratory.

1.3.1.2 Knowledge of Ways and Means of Dealing with Specifics

Knowledge of the ways of organizing, studying, judging and criticizing. This
includes the methods of inquiry, the chronological sequences, and the standard of
judgment within a field as well as the patterns of organization through which the areas
of the fields themselves are determined and internally organized. This knowledge is at
an intermediate level of abstraction between specific knowledge on the one hand and
knowledge of universals on the other. It does not demand the activity of the student in
using the materials as it does a more passive awareness of their nature.

i) Knowledge of Conventions

Knowledge of characteristic ways of treating and presenting ideas and
phenomenon. For purposes of communication and consistency, workers in a
field employ usage, styles, practices, and form which best suit their purposes
and/or which appear to suit best the phenomena with which they deal. It should
be recognized that although these forms and conventions are likely to be set up
on arbitrary, accidental, or authoritative bases, they are retained because of the
general agreement or concurrence of individuals concerned with the subject,
phenomena, or problem.
* Familiarity with the form and conventions of the major types of works, 
e.g., verse, plays scientific papers, etc.

* To make pupils conscious of correct form and usage in speech and writing.

ii) Knowledge of Trends and Sequences

Knowledge of the processes, directions and movements of phenomena with 
respect to time.

* Understanding of the continuity and development of American culture as 
exemplified in American life.

* Knowledge of the basic trends underlying the development of public 
assistance programs.

iii) Knowledge of classification and categories

Knowledge of the classes, sets, divisions, and arrangements which are regarded 
as fundamental for a given subject field, purpose, argument, or problem.

* To recognize the area encompassed by various kinds of problems or 
materials.

* Becoming familiar with a range of types of literature.

iv) Knowledge of criteria

Knowledge of the criteria by which facts, principles, opinions, and conduct are 
tested or judged.

* Familiarity with criteria for judgement appropriate to the type of work and 
the purpose for which it is read.

* Knowledge of criteria for the evaluation of recreational activities.

v) Knowledge of methodology

Knowledge of the methods of inquiry, techniques, and procedures employed in 
a particular subject field as well as those employed in investigating particular 
problems and phenomena. The emphasis here is on the individual’s knowledge 
of the method rather than his ability to use the method.
* Knowledge of scientific methods for evaluating health concepts.
* The student shall know the methods of attack relevant to the kinds of problem of concern to the social sciences.

1.3.1.3 Knowledge of the Universals and Abstractions in a Field

Knowledge of the major schemes and patterns by which phenomena and ideas are organized. These are the large structures, theories, and generalizations which dominate a subject field and which are quite generally used in studying phenomena or solving problems. These are at the highest levels of abstraction and complexity.

i) Knowledge of Principles and Generalizations

Knowledge of particular abstractions which summarize observations of phenomena. These are the abstractions, which are of value in explaining, describing, predicting, or determining the most appropriate and relevant action or direction to be taken.

* Knowledge of the important principles by which our experiences with biological phenomena are summarized.

* The recall of major generalizations about particular cultures.

ii) Knowledge of theory and structures

Knowledge of the body of principles and generalizations together with their interrelations which present a clear, rounded and systematic view of a complex phenomenon, problem or field. These are the most abstract formulations, and they can be used to show the interrelation and organization of a great range of specifics.

* The recall of major theories about particular cultures.

* Knowledge of a relatively complete formulation of the theory of evaluation.
1.3.2 Comprehension

This represents the lowest level of understanding. It refers to a type of understanding or apprehension such that the individual knows what is being communicated and can make use of the material or idea being communicated without necessarily relating it to other material or seeing its fullest implications.

1.3.2.1 Translation

Comprehension as evidenced by the care and accuracy with which the communication is paraphrased or rendered from one language or form of communication to another. Translation is judged on the basis of faithfulness and accuracy, that is on the extent to which the material in the original communication is preserved although the form of the communication has been altered.

* The ability to understand non-literal statements (metaphor, symbolism, irony, exaggeration).
* Skill in translating mathematical verbal material into symbolic statements and vice versa.

1.3.2.2 Interpretation

The explanation or summarization of a communication. Whereas translation involves an objective part-for-part rendering of a communication, interpretation involves a reordering, rearrangement, or a new view of the material.

* The ability to grasp the thought of the work as a whole at any desired level of generality.
* The ability to interpret various types of social data.
1.3.2.3 Extrapolation

The extension of trends or tendencies beyond the given data to determine implications, consequences, corollaries, effects, etc., which are in accordance with the conditions described in the original communication.

* The ability to deal with the conclusion of a work in terms of the immediate inference made from the explicit statements.

* Skill in predicting continuation of trends.

1.3.3. Application

The use of abstractions in particular and concrete situations. The abstractions may be in the form of general ideas, rule of procedures, or generalized methods. The abstractions may also be technical principles, ideas, and theories, which must be remembered and applied.

* Application to the phenomena discussed in one paper of the scientific terms or concepts used in other papers.

* The ability to predict the probable effect of a change in a factor on a biological situation previously at equilibrium.

1.3.4. Analysis

The breakdown of a communication into its constituent elements or parts such that relative hierarchy of ideas is made clear and/or the relations between the ideas expressed are made explicit. Such analyses are intended to clarify the communication, to indicate how the communication is organized, and the way in which it manages to convey its effects, as well as its basis and arrangement.

* The ability to recognize unstated assumptions.

* Skill in distinguishing facts from hypotheses.

1.3.4.1 Analysis of relationship

The connections and interactions between elements and parts of a communication.
* Ability to check the consistency of hypotheses with given information and assumptions.

* Skill in comprehending the interrelationships among the ideas in a passage.

### 1.3.4.2 Analysis of Organizational Principles

The organization, systematic arrangement, and structure which hold the communication together. This includes the ‘explicit’ as well as ‘implicit’ structure. It includes the bases, necessary arrangement, and the mechanics which make the communication a unit.

* The ability to recognize form and pattern in literary or artistic works as a means of understanding their meaning.

* Ability to recognize the general techniques used in persuasive materials, such as advertising, propaganda, etc.

### 1.3.5 Synthesis

The putting together of elements and parts so as to form a whole. This involves the process of working with pieces, parts, elements, etc., and arranging and combining them in such a way as to constitute a pattern or structure not clearly there before.

#### 1.3.5.1 Production of a Unique Communication

The development of a communication in which the writer or speaker attempts to convey ideas, feelings, and /or experiences to others.

* Skill in writing. Using an excellent organization of ideas and statements.

* Ability to tell personal experiences effectively.

#### 1.3.5.2 Production of a Plan or Proposed Set of Operations

The development of a plan of work or the proposal of a plan of operations. The plan should satisfy requirements of the task which may be given to the student or which he may develop for himself.

* Ability to propose ways of testing hypotheses.
* Ability to plan a unit of instruction for a particular teaching situation.

1.3.5.3 Derivation of a Set of Abstract Relations

The development of a set of abstract relations either to classify or explain particular data or phenomena, or the deduction of propositions and relations from a set of basic propositions or symbolic representations.

* Ability to formulate appropriate hypotheses based upon an analysis of factors involved, and to modify such hypotheses in the light of new factors and considerations.

* Ability to make mathematical discoveries and generalizations.

1.3.6. Evaluation

Judgments about the value of material and methods for given purposes. Quantitative and qualitative judgments about the extent to which material and methods satisfy criteria. Use of a standard of appraisal. The criteria may be those determined by the student or those, which are given to him.

1.3.6.1 Judgments in Terms of Internal Evidence

Evaluation of the accuracy of a communication from such evidence as logical accuracy, consistency, and other internal criteria.

* Judging by internal standards, the ability to assess general probability of accuracy in reporting facts from the care given to exactness of statement, documentation, proof, etc.

* The ability to indicate logical fallacies in arguments.

1.3.6.2 Judgments in Terms of External Criteria

Evaluation of material with reference to selected or remembered criteria.

* The comparison of major theories, generalizations, and facts about particular cultures.

* Judging by external standards, the ability to compare a work with the highest known standards in its field especially with other works of
After the taxonomy was developed it engendered a lot of interest among the curriculum developers and evaluators to use it. As quoted by Dave (1970) Gagne observed ‘Bloom’s technique for defining objectives and it has been tried out in a number of universities with respect to achievement testing and evaluation programmes. Stedman (1973) developed instructional programme based on behaviour objectives. Attempts have been made to assess the achievement of students learning through different instructional styles. In this study, an attempt has been made to study academic achievement of students in Bloom’s taxonomy through linear and adjunct instructional programmes.

1.4 Instructional Design

In the teaching-learning process, a variety of activities are called into play, which determine the interrelationships of teacher and learner. The advanced countries have made considerable improvement in their instructional system by using the new concepts of educational technology. Educational technology includes the mechanism of instructional process in the classroom situation levels of teaching, theories of teaching, principle teaching operations and establishing relations between theories and teaching operations. The concept of ‘chalk-board’ is changing to ‘sky-board’. The concept of classroom too has undergone many changes. We have to accept these changing concepts. We have to accept teaching machines, programmed tests, language laboratories, TV, etc. According to Leith (1966) ‘Educational technology is the application of scientific knowledge about learning and the conditions of learning to improve the effectiveness and efficiency of teaching and training. Researches of the past have pointed out to the fact that individuals have varying personality traits, consequently they differ in their learning styles and they need to be taught by different instructional designs to get maximum out of them. Programmed instruction is that part...
of educational technology that lays stress on a teaching-learning strategy based on self-instructional tests or auto-tutors. Instructional programmed designs are essentially a management approach that influences management decision making in education. It has brought to educational management a scientific quantitative approach for solving educational administrative problems.

1.4.1 Programmed Instruction: Overview

Programmed instruction implies self-instructional and self-controlled, carefully specified and skillfully arranged learning experiences. It is an application of principles of behavioural sciences and technology in the field of education. Programmed instruction is also known as ‘programmed learning’. The English writers prefer to use the term programmed learning, since it is learner-oriented so as to be auto-instructional. The American writers call it programmed instruction and they define it as a process of arranging material to be learned in a series of small steps designed to lead a learner through self-instruction from what he/she knows to the unknown of new and more complex knowledge and principles. The aim of programmed learning is to enable the learner to progress through a pre-arranged sequence of experiences to the acquisition of some kind of information or skill. Because the sequence is programmed, ‘we say it is programmed learning’. Naturally, the experiences are ordered in a manner that is thought to maximize the efficiency of learning.

There are three important elements in this controlled learning process:

(a) The learner is presented with a stimulus, which gives him information; demands on him response, or does both.

(b) There is a continual necessity for the learner to utilize his information in making some response.

(c) After responding, he is presented with information (feedback), which enables him to ascertain the appropriateness of response.
The programme lies in writing it in such a way that every student will eventually be able to complete it without a mistake. The key to the programme is to ensure that the student tries the correct answer. The material presented to the student may be in the form of a book or simple machine or a complicated computer. In every case, the student gives his response and then checks the correctness of the response.

Technology or automation is the only solution to the challenge posed by ‘knowledge explosion’ and ‘population explosion’. The present era, therefore, is passing through a period of a silent revolution in the field of education. Programmed instruction is an innovative step in this direction towards automation and individualization of instruction.

1.4.1.1 Main Characteristics of Programmed Learning

- Programmed instruction is a process of constructing sequences of instructional material in a way that the rate and depth of learning are maximized, understanding is fostered and the motivation of the student is enhanced.

- Assumptions about learner are clearly stated and put in definite terms in a programmed learning type of situation. This assumption may relate to the particular level of reading competence of the learner, his command of vocabulary and his background in the subject matter.

- The objectives underlying the programme are defined in explicit and operational terms. This makes the terminal behaviour desired to be built up through the programme measurable and observable.

- The subject matter of the programme is presented by breaking it into small steps in a logical sequence. The small steps stress the gradual nature of the increase in complexity and the smoothness of the transition from one item to the next. Information grows in depth. Changes occur in quality and quantity.
Programmed learner emphasises the interaction between learner and the programme.

The learner is made to respond actively by asking to fill in the blank, count the number of coins in a row or complete a series of numbers. For doing it correctly the student receives enforcement and establishes a pattern of stimulus-response interaction.

A programmed instructional sequence takes into consideration the initial behaviour of the learner with which it starts and the terminal subject matter competence, which the learner is to achieve.

A programmed test provides for immediate feedback information. This is based on the theory of reinforcement which emphasises that the learner learns from the sequence of responding and not from the making of response itself.

In a programmed learning situation, the learner progresses at his own pace.

Programmed instruction takes care of the fact that there are even differences in the rate at which an individual learner learns various kinds of subject matter.

Programmed learning enhances the capacity of the learner to discriminate or to generalize by frequent application and thus offers the learner an interesting challenging project.

Programmed learning provides for constant evaluation through the record of learner's responses. The quality of the programme can be improved through checking the number of errors at each step and the learner's progress can be evaluated by looking into various types of responses produced by the learner.
Programmed learning is based strictly on the behaviouristic principles of psychology. A fair amount of stress is given on the examination and development of understanding through the handling of various cues in the learning process.

In programmed learning a learner moves in every specific way as opposed to traditional procedures of teaching where the learner moves in very general way.

Fig.1.1 Procedure of teaching by Programmed Learning and Tradition

1.4.1.2 Theory of Programmed Learning

The origin of modern programmed instruction or programmed learning arises from the psychology of learning which is responsible for the modification of behaviour of students according to certain prescribed objectives. Although Sidney Pressey had actually designed several self-testing devices in the 1920’s, it was Professor Skinner, who in his famous article, ‘Science of Learning and Art of Teaching’ published in 1945 pleaded for application of the knowledge derived from behavioural psychology to classroom procedures and suggested automated teaching devices as a means of doing so. Wrote Professor Skinner (1958), ‘In spite of discouraging evidence to the
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contrary, it is still supposed that if you tell the student something, he then knows it’. He emphasized that to acquire or learn behaviour a student must engage in behaviour. It is not enough to attract students’ attention but, more important, the attention of students should actually be directed to what the teacher wants them to learn. Reinforcement, i.e., the knowledge of the correctness of the learning behaviour, must be immediate and frequent; the knowledge that student is right is sufficient reinforcement to encourage him to learn more. Professor Skinner also pointed out that ‘holding students together for instructional purposes in a class is probably the greatest source of inefficiency in education’. In his view, if a certain behaviour is expected of a student after the learning experience, he must be encouraged to perform in that manner during the learning session itself. A student learns better and is motivated to learn more if the step taken by him is confirmed to be correct, that is to say if the learnt behaviour has been reinforced. It is easier to learn one step at a time. If the behaviour to be learnt were analyzed into parts, which are properly spaced and arranged in logical sequence, it would be easier to learn the whole desired behaviour by learning one step at a time. There should be few errors in the learning process so that the student practises correct responses and these responses are reinforced immediately by the knowledge of results so that he makes closer approximation to the responses which are the desired outcomes.

1.4.2 Principles of Programmed Learning

> **Principle of Small Steps.** The subject matter to be taught or learnt is broken into small steps. These steps are called frames, and the learner learns only one step at a time, then probably all the learners will be able to learn one small step at a time and sequentially learn all the steps. It is a difficult task to learn the whole material but one step is very easy to learn. This is known as the “principle of small steps.”
Principle of Active Responding. One of psychological principles is that the learners learn better and faster when they are actively participating in the teaching-learning process. For learning to occur the learner is made to interact with every bit of information in the form of responses. The principle of active responding is used for the programmes. A good programme requires a thorough understanding of the previous frames before moving on to the next frame.

Principle of Reinforcement. Every response, even approximately correct, must be reinforced immediately. Delayed reinforcement fails to work. Skinner (1954) devised a mechanism of controlling the behaviour of the learner in his teaching method, popularly known as the linear model. The learner goes through each step of the instructional sequence, gives a response and then for each correct response he gets confirmation and for every wrong response he receives correction.

Principle of Self-Pacing. Programmed instruction makes provision for the learner to proceed at his/her own speed. He/she is not made to bother about the learning rate and speed of others. By making this provision, the programmer recognizes the individual differences in the teaching-learning process.

Principle of Empirical Testing. Programmed instruction is based on continuous evaluation. The teacher can assess the performance of his students. A student can also evaluate his performance on the programme. In the programme the detailed record which the student leaves in the form of responses provides the basic material for revising the programme.

1.4.3 Types or Styles of Programmed Instruction

Programmed instruction is making headway at a tremendous speed. Various styles of programming have emerged from the 1950s until the present time. It is very difficult to have a broad classification of the programming styles. If we look into the available programmes developed in U.S.A.; U.K. and some other countries, we find a
very wide flexibility shown in the choice of styles or in the selection of a programme paradigm. Programmers have experimented with these styles and have tried to assess the learning potentiality of each one of them. Some of the popular styles of programming are mentioned as follows:

- Linear or extrinsic programming developed by Skinner (1954)
- Branching or intrinsic programming developed by Crowder (1954)
- Mathetics programming developed by Gilbert (1962)
- Adjunct Auto Instruction developed by Pressey (1963)

1.4.3.1 Linear or Extrinsic Programming

B.F. Skinner who is the proponent of linear style or the straight-line programme holds that a creature, bird or human can be led to a desired behaviour by means of carefully constructed programme consisting of small steps leading logically through the subject-matter from topic to topic, provided each step is reinforced by some kind of favourable experience or reward. The increments in information which the student is expected to absorb are small. The favourable experience or response increases the probability of the same response to occur again in future. The process of rewarding the correct response to a stimulus increases the general tendency to give a response. It may be graphically illustrated as below:

![Fig. 1.2 Arrangement of Frames in Linear Programming](image-url)
As shown in the figure 1.2, the sequence of frames and path of learning in the programmed learning is systematic and linear. That is why, this type of programming is referred to as linear programming. Hence all the learners have to proceed through the same frames and in the same order.

In the linear programme, learner’s responses are controlled externally by the programmer sitting at distant place. Hence linear programming is also termed as extrinsic programming. In branching programming, learner response is controlled by learner himself internally. It is, therefore, also called intrinsic programming.

i) Chief Features of a Linear Programme

- A linear programme is a straight-line programme.
- In a linear programme every learner follows the same path.
- A linear programme is composed of small steps.
- A student in a linear programme is given a small amount of information.
- The linear programme breaks the content into small units of one word to as many as 40 or 50 words in length.
- In a linear programme the programmer controls the response of the learner.
- In a linear programme the learner learns by avoiding the errors.
- The emphasis in linear programme is on response.

ii) Advantages of a Linear Programme

- The smallness of the frames brings the sub-goals within the reach of the learner thereby facilitating secondary reinforcement.
- The repetitive and easy nature of the programme ensures ‘success experience’ to the learner.
- Immediate knowledge of results releases tension and anxiety, thus acting as drive reducer and motivator.
- Repetition ensures learning and strengthens the responses.
1.4.3.2 Branching or Intrinsic Programming

Crowder (1954) the originator of the branching or intrinsic method of branching, defines it as a programme which is adapted to the needs of the students without the medium of an extrinsic device such as a computer. It is best on the traditional tutoring method and assumes that the units of information may be decided to be rather large, perhaps two or three paragraphs. The student responds by indicating his choice on a multiple choice question and if he makes error, he is given remedial help; thus different students get different sequences of information. In branching or intrinsic style of programming, the learner has a choice of adopting his learning sequence. It is also known as intrinsic or adaptive programming. When it is presented in the book form, it is called a ‘Scrambled’ book. Since the learner has the freedom to choose his own sequence of learning, it allows for greater differences in student abilities and makes the job challenging and interesting for the students. The following diagram explains the module followed in this style of programming:

![Diagram of Branching Programming](image)

Fig. 1.3 Arrangement of Frames in Branching Programming

At the end of the frame there are multiple choice questions to test whether the learner has understood the information given in the frame or not. On the basis of this response, he is directed to proceed to the other frames of the programme. The frames in this style of programming are of two types; one is referred to as Home Page (HP)
which leads the student to extra information or knowledge of facts on the subject and, second, Wrong Answer Page (WAP) where the student gets elucidation and further explanation on the material he has learnt and on the nature of his errors. In the diagram, above frames 1C, 2C and 3C are Home Pages while frames 1a, 1b, 2a, 2b are Wrong Answer Pages.

i) Characteristics of a Branching Programme

- Each frame is of relatively bigger size (compared to the linear style.) This frame may contain two or three ideas or related sequence.
- A single question, usually of multiple-choice type, is asked at the end of a frame.
- In order to answer the question, the learner has to arrive at an answer by setting the relationship between one idea and the other and by filling up the gaps not fully expressed in the frame. Then only he can select the correct alternative from the multiple choice.
- Branching programme does not try to minimize errors. Errors are anticipated and made the best possible use by diagnosing them and by providing remedial instruction.
- According to the alternatives selected, the learner will be directed to go to a particular page. If his response is correct, he goes to the next concept. If his response wrong, he goes to a remedial page wherein his mistake in partially or fully explained.

Thus in a branching programme, all learners do not follow the frame route. Rather, the route depends on the responses made by the learner. Thus, the learner branches according to his responses.
ii) Types of Branching Programme

There are two types of branching programming. One is called micro-branching model and the other macro-branching model. The micro-branching model consists mainly of a branching within the individual frame without changing the total frame sequence. The following diagram explains the structures of micro-branching model:

Fig 1.4 The Structures of Micro-Branching Model

The second type of branching sequence is known as Macro-branching model. Here a special post checking frame or didule is introduced into the sequence. The following diagram illustrates this model:

Fig 1.5 The Structures of Macro-Branching Model
If the student solves the test part of the frame well, he simply goes on to new study material; but if he fails to complete it satisfactorily, he gets instead larger or smaller repetition task.

iii) Advantages of a Branching Programme

➢ The bigness of the size of a frame as well as the branching minimizes unnecessary repetitions and responding, thus reducing the amount of learning time and fatigue.

➢ The pitfalls and consequences of erroneous logic are usually explained in the remedial frames so that the learner not only gets the correct response but also understands why some other response is not correct.

iv) Limitations of the Branching Programme

➢ Branching programming may not develop understanding. The learner may find the correct answer by guessing.

➢ No branching method can provide infinite branching to take care of all possible needs of every individual student.

➢ The cost of branching programme is very high when compared with traditional teaching approaches.

➢ The branching programme is not suitable for small children, as they are unable to express the symbolism.

➢ The programme needs revision after every two years.

➢ It is difficult to cover the entire subject matter.

➢ The diagnostic questions framed by the programmer may or may not suit the needs of the individual learner.

➢ The programme cannot shape the behaviour of the learner.
1.4.3.3 Mathetics Programming

Gilbert (1962) is the originator of the concept of mathetics who described the systematic procedures of mathetics in 1962 in his article ‘Mathetics: The Terminology of education’, in the Journal of Mathetics, Vol.1 No.1. He defines mathetics as ‘the systematic application of reinforcement theory to the analysis and reconstruction of those complex behaviour repertoires usually known as subject-matter mastery, knowledge and skills Mathetics, if applied diligently, produces teaching materials that exceed the efficiency of lessons produced by any known method’.

i) Basic Steps in Writing Mathetical Programme

(1) Data collecting and task analysis
(2) Prescription for mastery
(3) Characterization and Lesson Plan
(4) Exercise Writing
(5) Editing

In mathetics style, an ‘exercise’ is the technical unit of learning instead of a frame as in the linear type. As a technique of teaching, mathetics can be applied to a wide range of subject matter but it is specially suited to teaching of skills. The system includes guidelines for analysis of skills, knowledge to be learned and specific strategies to overcome the deficiencies. The size of the exercise is determined not by breaking the material into meaningful small steps but by determining how big a step a student can take at the moment.

In a task completion, motivation is the most important factor. Mathetics utilizes this principle to a great extent. Naturally, the last task or the completion of the task brings motivation. Hence, mathetical programme that utilizes this principle starts from the last task or frame in the series and retrogresses. Having completed the last task first, the learner goes to the next one before it in next frame and thus to the introductory part. So the tasks of frames have to be properly connected from the last to
the first. Otherwise, the frames will lose relevance, sequence and logic. This procedure is called 'chaining'. In a chain there is a fixed sequence of responses to be emitted, e.g., steps in division, order of words in a sentence, opening or closing a bottle or tying or untying a shoe lace. Frames that follow indicate the chaining process. In chains responses must occur in a fairly regular order. Each response produces some change in the stimulus situation that sets the occasion for the next responses to occur. The retrogressive chaining technique is based on the assumption that closer the student to the reinforcement when he is being taught, the more effective is the reinforcement. In this case the reinforcement is the completion of the task. Each time the student performs, he completes the task.

There are three steps in designing a mathetic programe. They are (1) demonstration (2) prompt and (3) release. In the demonstration the entire procedure is demonstrated. The mastery behaviour is shown in the beginning itself. In the second step prompt, the learner is demonstrated last two submastery steps and the mastery step is prompted or hinted. At the third stage, release, the programmer demonstrates some of the sub-mastery steps and prompts some other sub-mastery steps while the last sub-mastery step and the mastery steps are released. The following diagram explains the use of three-stage process:
D = Demonstrated;  P = Prompted; Prompts are successively reduced for the student’s behaviour to be released;  R = Released; instruction, direction, guidance

Fig. 1.6  Retrogressive Chaining Process

The style is still not without limitations as there are behaviours which are not amenable to retrogressive chaining sequence. It is a highly complicated process and discourages the practical minded people to try it.

ii) Advantages of Mathetics Over conventional Styles of Programming

➢ Results can be linked to concrete goals, which we intend to achieve through a mathetical programme.

➢ It is a task and job-oriented programme.
It is relevant, significant, meaningful and valid in the eyes of both the student and the programmer.

Its stress on student success at 90/90-criterion level of mastery motivates the students.

It utilizes the principle of backward chaining.

It can be applied to a wide range of subject matter but it specifically suits the teaching of skills where the main purpose is transfer of training of skills from one situation to other situations of life.

Mathetical programmes have been developed in the areas of psychomotor skills such as barbering, electrical appliances, repair radio-television, etc.

iii) Limitations of Mathetics

Mathetics cannot be used in all school subjects.

Mathetics cannot be used in the whole content of a subject.

It does not provide freedom to the learners, as usually construct responses are required.

Mathetics does not consider the individual needs of the learners, as every learner has to follow the same path of learning.

The learners encounter difficulty in constructing the last response or mastery response in the beginning.

Mathetics cannot be used for factual content. They can be effectively used for teaching concepts.

Mathetics cannot be used for higher cognitive and effective learning objectives. It can be used for realizing the lower cognitive objectives.

Mathetics does not provide any remedial help for the weaknesses and difficulties of learners.

It is very difficult to identify the mastery step in developing a retrogressive chaining sequence.
It is not based on any sound learning theory.

It is a very difficult job to prepare a good mathematical programme. Everyone cannot develop this programme.

1.4.3.4 Adjunct Programming

According to the Concise Oxford Dictionary (1964) the word ‘Adjunct’ means ‘something added to another’. In other words two types of materials combined together will result into adjunct material.

Adjunct auto instruction is known as Pressey’s programme. Pressey (1963) argues, ‘in a well organized text book, written at a level suitable for its users, elucidative auto instruction might be most effective and integrative if placed at the end of each chapter or there might be clusters of auto-instructional items at whatever places in the chapter they seem to be needed. Adjunct programming is said to fix the programmed material in a textbook. In Pressey’s (1963) opinion, conventional material should form the main part of instruction but difficult and confusing materials should be given in the form of programmed materials. By combining teaching styles adjunct programming provides, a way for the teacher to shift from stimulus oriented to response oriented method of instruction. Basically, the Pressey programming follows the format of multiple choice questions. The student is presented with a question and four options, only one of which is correct. He chooses an option and the machine provides some immediate feedback. If the student chooses correct answer, then the machine presents the next question. If an incorrect option is chosen, the student must continue responding until he selects the correct option. Pressey’s machine could teach as well as test. After teaching the subject matter, this self-testing machine could be conveniently used for a diagnostic test. The test material may be used for programmed learning and also for review and reference. Adjunct programmes have a distinct advantage over programmed materials, which are self-contained. These materials are generally unsatisfactory for obtaining an overall view of the content. Adjunct programmed materials, however do allow an overall view
of the content for review and serve as a ready source of specific information. An adjunct programme is relatively easy to prepare and modify. The student has all the advantages of the textbook including the table of contents and an index. He can go back into the text for review and to locate specific information at any time. The rapid and experienced learner is not held back by the necessity to read and respond to a large number of small items as found in linear programmes.

In the present investigation ‘Adjunct programming’ was decided to combine linear programme with text book format to form adjunct programmed text. It serves as one level of instructional design along with linear programmed text, which forms the other level.

1.4.4 Teacher and Programmed Instruction

The teacher has to formulate objectives of teaching a particular subject, undertake content analysis of the subject matter in length of objectives, frames a chain of questions which will lead the pupils in the direction of the objectives and present the questions to his pupils who are expected to try their hand at answering the questions independently. The programmed learning can be used mainly in the cognitive field and possibly in the psychomotor field to develop certain abilities and skills of the student as an individual. The affective domain is almost reserved for teacher care.

At present the teacher is not able to devote his energy and time to this important task as most of his time and energy is consumed by his routine job as an information giver. Programmed learning, teaching machines and other gadgets will set teacher free from routine work. Anyway innovation in the school practices must remain in the hands of teachers to make it more effective.

The programme can be presented in two ways: through a programmed book or through a machine. Pressey (1950) is considered as the first user of teaching machines in the classroom. Skinner (1958) developed a different teaching device, which removed the limitations of the Pressey machines. After Skinner’s machine computers
entered into the field of educational technology. The computers are acquired for at least five general applications in schools, colleges and universities. These are (1) a problem solving tool for students; (2) a tutorial teaching device; (3) an automated library or information retrieval system; (4) a classroom information system for instructors; and (5) a data management for staff and administration in instructional planning. The use of computers for tutoring is very new. And in view of its cost, many schools cannot afford them for teaching device. Moreover, computers which are exclusively built for educational purpose are rarely available in the market.

As a result of the above contention linear programming and adjunct programming through textbook styles are preferred because these appeared economical and quite a few errors on the part of the learner could be expected to be committed during the process of learning.

1.5 Achievement Motivation

The term motivation is derived from the Latin word ‘Movex’ or the ‘Motum’, which means to move, motor and motion. It is the move towards set goals; therefore, motivation is a force, which energizes the behaviour of learners. Motivation has come to be regarded as one of the major domains of psychology and education.

Motivation drives and directs behaviour; achievement motivation governs behaviour relevant to achievement and learning. An understanding of achievement motivation has implications for many aspects of human life, including how individuals develop new skills, and how or whether they make use of existing skills.

Achievement motivation is relatively a new concept in the world of motivation. It is essentially a type of motivation that is personal in nature. The basis of achievement motivation is achievement motive i.e. a motive to achieve. Those who engage themselves in a task on account of an achievement motive are said to work under the spirit of achievement motivation. The desire of the learner to improve his
achievement at school or to get a good grade or to become an engineer and so on is known as achievement motive.

Mc Clelland (1953) and his associate Atkinson (1964) investigated human motivation through the intensive study of a single motive known as the achievement motive. They assumed that motives arise from changes in emotional states. As such, the term motive was defined, as ‘the readjustment by a cue of a change in an affective situation’. Atkinson (1964) stated that achievement motive applies when an individual realizes that his performance will be evaluated, according to some criteria, his own or others’, and that the resulting evaluation will be favourable (success) or unfavourable (failure).

The level of achievement motivation can be increased in an organization where (1) goal-setting behaviour is encouraged. (2) personal responsibility for task accomplishment is demanded (3) performance feedback is given to the worker, (4) workers are allowed to take moderate risks and (5) rewards are given according to their performance (Stinger 1966).

Achievement motivation is the desire to do better, to achieve unique accomplishment, to compete with standards of excellence and to involve oneself with long-term achievement goals. Achievement motivation is defined by Murray (1938) as ‘a special motive to master, manipulate or organize physical objects, human beings or ideas to do this as rapidly and independently as possible, to overcome obstacles and attain a high standard, to rival and surpass others and to increase self-regard by successful exercise of talent’. It was Murray (1938) who first of all used the term ‘n-Ach’ to refer to achievement need.

Achievement motivation has been referred to as the need for achievement (and abbreviated as n-Ach), a wish to do well. It refers to the behaviour of an individual who strives to accomplish. Something, to do his best, to excel others in performance. This involves competition with a particular standard of the excellence of performance.
Achievement motivation is thus a learned motive to compete and to strive for success. Success becomes a goal, which must be achieved in one way or the other.

1.6 Need Of the Study

Thailand, as member of the world society, is now confronting the most drastic social changes from within and from its interconnectedness with the complex and rapid changing world. Education seemed to be the most important areas of social reform since it is believed that education is a very important process to enhance individual development which will contribute to social and economic development of the country. It will enable Thailand to move through the current crisis.

Thailand has been successful in expansion of basic education. Still, more efforts are required to be made on the importance of education through various programmes in order to promote the role of education in enhancing the quality of the Thai people. One of the major projects to develop education is the reform of teaching and learning system by using educational innovations and technology centre. (ONEC, 1997)

The world of instruction has changed day by day due to the results of technological advancements which have captured the environment. Educators have employed research in instructional innovations for facilitating learning. Programmed instruction is the some of those things.

In school, instruction and achievement are both valuable goals. For each individual student, attainment of these goals depends on the complex interrelationships among a number of variables, including student background characteristics, prior learning classroom environment, instructional guilty, motivation etc. Since programmed instruction is considered to be based upon the application of psychological principles in teaching situation, it is likely to be more effective than the traditional lecture method. Sennett (1973), Long (1974), Wallace (1979) Vick (1979),
Suprenant (1979) concluded the superiority of programmed instruction over lecture method. Sodhi (1976) Bhushan (1973) have evaluated programmed learning through taxonomy of educational objectives and found significant differences in different levels of taxonomy objectives. Many researches have been conducted to see the effectiveness of teaching through different mode of instructional programmes in relation to some independents variables. Jyoti (1992), Kaur(1985), Sween(1984) have conducted studies to see the effectiveness of teaching through linear programme and other styles of instructional programmes in relation to achievement motivation and other variables. They found that academic achievement through instructional programmes was contingent upon achievement motivation. According to Skinner (1954) “Motivation in school learning involves arousing, persisting, sustaining and directing desirable behaviour”. Hsiangyeng’s (1991) study indicated that achievement motivation interacted with study habits when predicting academic achievement, Tripathi (1986) found that achievement motivation of boys and girls was highly correlated with achievement. But Velma (1996) could not find significant differences in the relationships between the achievement motivation scores and the grade point average of Mexican American learners. Smith (1964) and Sarason (1960) found a negative relationship between achievement Motivation and scholastic achievement. Thus, review of literature and the various studies which have been conducted in this field do not lead to a clear cut trend. And no study has been conducted to evaluate academic achievement in Bloom’s taxonomic categories in relation to the two modes of Instructional Designs: Linear and Adjunct programme, Achievement Motivation and Sex especially in Bangkok (Thailand). Hence, the present study.

The present study is intended to evaluate Academic Achievement of secondary school students through programmed instruction in different styles (Linear Programme and Adjunct Programme), to find out effectiveness of Instructional design, Achievement Motivation and Sex in terms of learner achievement by using grade 9th
students of Expansion Opportunity Schools in Bangkok as population of research. Sex as a classification variable has been taken into consideration for analysing the data in terms of the performance of male and female students conjointly as well as separately.

1.7 Statement of the Problem

The present study is precisely stated as under: Evaluation of Academic Achievement in Bloom's Taxonomic Categories in Relation to Instructional Design and Achievement Motivation.

1.8 Objectives of the Study

The study was conducted to achieve the following objectives:

1.8.1. To work out the effect of Instructional Design on the Academic Achievement of the students in Taxonomic categories of Knowledge, Comprehension and Application.

1.8.2. To find out the effect of Achievement Motivation on students' achievement in Knowledge, Comprehension and Application areas.

1.8.3. To study the effect of Sex differences on the Academic Achievement of students in three Taxonomic areas.

1.8.4. To study the interaction effects of Instructional Design, Achievement Motivation and Sex on the Academic Achievement of the students in three Taxonomic Categories.

1.8.5. To study the intercorrelations among the variables of Instructional Design, Achievement Motivation, Sex and Academic Achievement.
1.9 Hypotheses

The hypotheses formulated for the present study are as follows:-

H1. Academic Achievement of students through the Linear Programmed Instruction will be better than that of students learning through the Adjunct Programme

H2. Academic Achievement of High Achievement Motivation group will be significantly better than that of Low Achievement Motivation group.

H3. The Academic Achievement of the students will be significantly different for Male and Female students in various taxonomic areas.

H4. The interaction effect of Instructional Design, Achievement Motivation and Sex will be significant on the Academic Achievement in various Taxonomic Categories.

H5. The intercorrelations among the variables of Instructional Design, Achievement Motivation, Sex and Academic Achievement will be positive and significant.

1.10 Delimitation of the Study

The study was delimited with respect to the place of study and variables of the study.

The study is delimited to the Expansion Opportunity Schools under Bangkok Metropolitan Administration in Thailand. The sample for the present study consisted of 709 students, which was drawn from 9th grade students of the Expansion Opportunity Schools under Bangkok Metropolitan Administration in Thailand.

The investigation was conducted in respect of two levels of Achievement Motivation (High and Low) and two Instructional Programme Designs (Linear Programme and Adjunct Programme).

Students of both the sexes were selected for the purpose of this study.
1.11 Operational Definitions of the Concepts

For the clarification of the problem “Evaluation of Academic Achievement in Bloom’s Taxonomic Categories in Relation to Instructional Design and Achievement Motivation.” the explanation and operational definitions of concepts involved in the present investigation have been given below:

- Academic Achievement refers to the level of success in learning micro-organisms in biology through instructional programmed design.

- Instructional Design refers to the Linear Programme and the Adjunct Programme in micro-organism on biology.

- Taxonomy of educational objectives includes Bloom's (1956) taxonomy in the Cognitive Domain divided into three levels, namely Knowledge, Comprehension and Application.

- Achievement Motivation refers to the level of need in individual person. The desire to improve academic achievement.

- The Expansion Opportunity Schools refer to Primary Schools with sufficient resources and wherein facilities have been offered for the additional three years of lower-secondary education classes for access to basic education with the exemption of school fees.