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BLOOM'S APPROACH TO THE TAXONOMY OF THE EDUCATIONAL OBJECTIVES

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Just as in Biology the plants and animals are categorized into phylum class, order, family, genus, species and variety to ensure accuracy of communication and as a means of understanding the organization and interrelation of the various parts of the animal and the plant world, similarly, it was intended to classify the goals of educational system. In education there is no common view about the different objectives, for example, some teachers say that the students should understand knowledge, others say they should' grasp the core or essence, still others say that they should comprehend. There are different interpretations of the same objective by different people. With the help of Taxonomy of Educational Objectives teacher should be able to define and translate the objectives in the same way. This will facilitate the exchange of information, curriculum development and evaluation devices. It will also help in modifying the educational outcomes.

The idea for the classification of educational objectives was formed at an informal meeting of college examiners attending the 1948 American Psychological Association convention in Boston. At this meeting it was felt there should be theoretical framework which could be used to exchange ideas and materials among test workers to facilitate communication among examiners. It was agreed to classify the educational 'objectives under the domains -Cognitive, Affective and Psychomotor. It was the view of the group that the objective should be stated in behavior form which can be observed and described. While discussing the principles by which the taxonomy be developed it was agreed that taxonomy should have educational, logical and psychological basis.

The Educational objectives were divided into three major parts : the Cognitive, the Affective and the Psychomotor domain. Cognitive domain includes those objectives which deal with recall and recognition of knowledge and development of intellectual abilities and skills. The Affective domain includes objectives of interests, attitudes, values and development of appreciation and adjustment. Objectives under this domain are not stated very precisely and clearly. It is difficult to describe behavior under this domain because internal feelings and emotions are not as clear as overt behavior manifestations. What is more the testing procedures for this domain are still not standardized. The Psychomotor or Motor-skill domain was also recognized, though not much has been done to classify the objectives under this domain.

The Cognitive Domain

The Taxonomy of educational objectives is organized under six major classes :

1. Knowledge.
2. Comprehension.
3. Application.
4. Analysis.
5. Synthesis,
6. Evaluation

1. Knowledge: It includes the knowledge of:

i) Specific and isolated facts and information.
ii) Terminology.
iii) Dates, events, persons, sources of information.
iv) The ways of organizing, studying, judging and criticizing ideas and phenomena.
v) Trends, sequences.
vi) Classification and categories.
vii) Criteria by which facts, principles, opinions are tested and judged.
viii) Methodology.
ix) Universal and abstractions.
x) Principles, generalizations and their application.
xi) Theories structure and their interrelation.

2. Comprehension: This includes three types of behavior:

a. Translation (a) From one level of abstraction to another.
(b) From symbolic form to another form and vice-versa.
(c) From one verbal form to another.

b. Interpretation.

c. **Extrapolation,** which includes behavior like drawing conclusions, predication etc.

3. Application: In comprehension the emphasis is on the understanding of the meaning and intent of material. In application the emphasis is on remembering and bringing to bear upon the given material, the appropriate generalization and principles.

4. Analysis: Analysis emphasizes the breakdown of the material into its constituent parts and of the way they are organized. This category includes.

i) Analysis of elements.
ii) Analysis of relationships.
iii) Analysis of organizational principles.

5. Synthesis: Synthesis can be defined as the putting together of elements or parts so as to forma whole. This category includes

1. Production of unique communication.
2. Production of plan's proposed set of operations.
3. Derivation of a set of abstract relations.

6. Evaluation: Evaluation aims at making judgment about the value, ideas, works, solutions, methods, material, etc. This consists of evaluation in terms of internal evidence and in terms of external evidence.

The Affective Domain

The Affective Domain includes attitudes, interests, values and appreciation. The objectives relating to these categories are difficult to define and evaluate. However, a hierarchy like that of the cognitive domain has been developed by Krathwohli[1] and others in which each category is more abstract and complex than the previous one. The different categories of the affective domain have been briefly discussed here:

1. Receiving: This is the first and the lowest level of the affective domain and includes an individual's awareness of various sources of information on population and recognizing these sources when encountered. It is subdivided into three categories:

a) Awareness level, the individual merely has his attention attracted to the stimuli.
b) Willingness to receive, describes the state in which he has differentiated the stimuli from others and is willing to give it his attention.
c) Controlled or selected attention, them he student looks for the stimuli.

2. Responding: This is a higher level than simple awareness or attention of making some response to a stimulus. At this level, the individual is perceived as responding regularly to the affective stimuli. There are three categories of this level.

a) Acquiescence in responding. This is the lowest level of responding. The student is merely complying with expectations (e.g., at the request of his teacher, he hangs reproductions of famous paintings in his dormitory room, he is obedient to traffic rules).
b) Willingness to respond. At this level the learner responds increasingly to an inner compulsion (e.g. voluntarily looks for instances of good art where shading, perspective, colour, and design have been well used, or has an interest in social problems broader than those of the local community).
c) Satisfaction in response. The learner responds emotionally as well (e.g., works with clay, especially in making pottery for personal pleasure). Up to this point he has differentiated the affective stimuli; he has begun to seek them out and to attach emotional significance and value to them.

3. Valuing: This is the third level of the affective domain and indicates an internalization of, and commitment to certain ideals or values. The objectives under this category include development of Scientific Attitudes. For example, a preference for information acquired from controlled experiments rather than for opinions of other people;

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[1] David R. Krathwohl, Benjamia S. Bloom, and Bertram Masia. Taxonomy of Educational objectives, the classification of educational goals, hand book 11. Affective Domain. New York: Mckay, 1964

a disregard of superstition; suspended judgment until there is ample evidence to make a judgment etc. This is also subdivided into three categories.

a) Acceptance of a value e.g., continuing desire to develop the ability to write effectively and hold it more strongly.
b) Preference for a value e.g., seeks out examples of good art for enjoyment of them to the level where he behaves so as to further this impression actively and
c) Commitment i.e., faith in the power of reason and the method of experimentation.

4. Organization: As the learner successively internalizes values he encounters situations for which more than one value is relevant. This necessitates organizing the values into a system. Since a prerequisite to interrelating values is their conceptualization in a form which permits organization, this level is divided in two categories:

a) Conceptualization of a value e.g., desires to evaluate works of art which are appreciated, or to find out and crystallize the basic assumptions which underline codes of ethics and
b) Organization of a value system e.g., acceptance of the place of art in one's life as one of dominant value, or weighs alternative social policies and practices against the standards of public welfare.

5. Characterization by a value or value controlling: Finally, the internalization and the organization processes reach a point where the individual responds very consistently to value-laden situations with an interrelates set of values, a structure, a view of the world. This is the highest level of the affective domain and includes characterization of a person's behavior by certain controlling values, ideas, or beliefs and the integration of values and attitudes into a world view or total philosophy of life. It is subdivided into two categories.

a. Generalized set. The learner views all problems in terms of their aesthetic aspects, or readiness to revise judgments and to change behavior in the light of evidence and
b. Characterization. The learner develops a consistent philosophy of life.

Psycho-motor Domain—Dave's model

The Psycho-motor Domain concerns itself with levels of attainment on neuromuscular coordination. As the level of coordination goes up, the action becomes more refined, speedy and automatic. In this case five broad categories have been identified as given below:

Imitation: This is the lowest level of psycho-motor behavior. It is represented by "Covert inner rehearsal of the music system". There is very rudimentary coordination in an act.

Manipulation: This is the next higher level of psycho-motor behaviour. It involves following directions, selecting certain actions in preference to others and acting accordingly.

Precision: This is the third category in which reproduction of operations is carried out with speed and refinement, giving the learner the ability to control (increase, decrease or modify) his action in response to requirements.

Articulation: This is the fourth category. The learner is able to handle a number of actions in unison, keeping in view their sequence and rhythm.

Naturalization: This is the final stage which is the equivalent of perfect habituation ranging from automatisation to reutilization. At this level the performer does not expend any psychic energy in carrying out an operation. His actions are more or less mechanical and without any conscious thinking or planning, i.e., a mere reflex action.

The classification of objectives of the psycho-motor domain may not interest in its entirety the teachers of all subjects but in such curricular areas as writing, speech, driving, crafts, etc., it will find a very wide application.

Domain	Cognitive (BSS bloom) (1956)	Affective (Krathwohl) (1964)	Psychomotor (Horrow Janpson (1972)	Dave
Organization principle	Complexity of mental operations	Internationalization of attitudes/values	Habit formation	Naturalization
"High level" activities (learner's behavior, creative, adoptive complex, autonomous)	6. Evaluation ↑ 5. Synthesis ↑ 4. Analysis ↑	5. Characterization of value complex (or commitment) ↑ 4. Organization ↑	3. Coordination	precision articulation ↑
"Middle level" activities (learner's behavior, autonomous, active, flexible)	↑ 3.application ↑ 2.Comprehension ↑	↑ 3. Valuing ↑ 2. Responding ↑	2. Control manipulation	2. Manipulation
"Low level" activities (learner's	↑	↑	1. Impul (attending)	↑

behaviour passive, unimaginative, inflexible)	1. Knowledge	1. Receiving		1. Initiative

Figure 1 Relationship between Cognitive, Affective and Psychomotor Objective

Major Instructional Objectives

If science programme in the school is to be effective, we must know what we are trying to accomplish and then put in all our efforts to achieve it.

Any subject in the school curriculum should try to achieve the general aims of education set to make the child a good citizen who can adjust himself and participate in the democratic set up of society. Individual development in all the dimensions of child's personality and the social efficiency and the like are some other general aims of education. It is, however, out of the scope of this book to discuss all those aims. We shall limit our discussion to the main objectives of science teaching which are dealt under the following heads:

1. Knowledge.
2. Skills
3. Abilities
4. Attitudes.
5. Training in scientific method.
6. Interests and Habits.
7. Appreciation
8. To provide work for leisure.
9. Training for better living.
10. To form basis for vocation and specialization.

1. Knowledge

This is one of the major aims which has been over-emphasized so far at the cost of other aims of teaching science. However, the pupils studying science should acquire the knowledge of:

(i) Fundamental principles and concepts useful in daily life.
(ii) A body of facts to understands the scientific literature.
(iii) Inter-relationship and interdependence of different branches of science.
(iv) Knowledge of plants, animals –their interdependence.
(v) Knowledge of natural phenomenon etc.
(vi) Knowledge of the origin and evolution of plants and animals, origin of earth, moon and other plants and satellites.
(vii) Knowledge of general rules of health and human body etc.

The student should be able to apply this knowledge in his daily life.

2. Skills

The student should acquire skill in experimentation, construction, observation, drawing and problem –solving. The skill in experimentation will include:-

(a) Experimental Skill.

(i) handling of apparatus and instruments.
(ii) arranging apparatus for an experiment

(iii) preserving chemicals, specimens, apparatus etc.

(b) Constructional Skill.

(i) making hand-made apparatus.

(ii) repairing of certain instruments.

(c) Drawing skill

Drawing skill includes drawing the sketches of certain experiments, Biological specimens, instruments etc.

(d) Problem- solving skill.

(e) Observation skill.

3. Abilities

The teaching of science should also aim at developing certain abilities in the students such as:

(iv) Ability to sense a problem.

(v) Ability to organize and interpret.

(vi) Ability to analyze.

(vii) Ability to generalize.

(viii) Ability to predict from a given data.

(ix) Ability to organize science exhibitions, fairs etc.

(x) Ability to locate reliable and necessary information from appropriate source.

(xi) Ability to discuss, argue and express using scientific terminology.

(xii) Ability to improvise and manipulate instruments using his acquired knowledge.

4. Attitudes

Scientific attitudes are the most important outcomes of science teaching. Though some people view the scientific attitudes as the by-products of teaching science, yet a majority of the people consider them as equally important as the knowledge aim. Science should be taught directly and systematically because developing scientific attitude has a number of characteristic features which distinguish it from other attitudes.

A man with scientific attitude

i. Is critical in observation and thought.

ii. Is open-minded.

iii. Respects other's points of view and is ready to change his decision on presentation of new and convincing evidence.

iv. Is curious to know more about the things around him. Wants to know 'Why', 'Whats' and 'Hows' of the things he observes.

v. Is objective in his approach to problems.
vi. Does not believe in superstitions and false beliefs.
vii. Suspends judgments until suitable support is obtained.
viii. Believes in cause and effect relationship.
ix. Is truthful in his observations and draws conclusions based on accurate facts.
x. Is unbiased and impartial in his judgment.
xi. Adopts a planned procedure in solving a problem.
xii. Believes that truth never changes, but his ideas of what is true may change as he gains better understanding of that truth.
xiii. Accepts no conclusion as final or ultimate.
xiv. Seeks to adopt various techniques and procedures to solve the problem.
xv. Selects the most recent, authoritative and accurate evidence related to the problem.
xvi. Seeks the facts and avoids exaggeration.

5. Training in Scientific method or reflective thinking

The method by which the scientists approach a problem may be termed as Scientific Method. He will attack the problem in the same way even in an area in which he is quite ignorant i.e,. the training in method of attacking a problem, which he gets in the pursuit of science, is transferable to other situations in life. He will adopt a definite procedure, characteristic of a scientist in arriving at desired conclusions. First of all, he will sense a problem, define it, collect suitable evidence, organize and interpret the data, formulate the hypothesis, test its validity and accuracy and finally draws conclusions. All these steps will involve scientific attitude of mind, habits and skills which are characteristic of reflective thinking. The training in scientific method should be one of the important aims of the teaching of science.

6. Interest

The teaching of science should also aim at developing some interests in reading scientific literature, in scientific hobbies, in activities of science clubs, in vocational fields, in nature etc. The teacher should stimulate interest in the students by providing such activities and situation as may foster the above mentioned interest e.g. organization of science fairs, excursions, library reading etc. the motivational techniques, like rewards and punishments, praise and blame, rivalry may be made use of at times. The psychological principles of learning viz. readiness, exercise and Effects, should invariably be utilized by the teacher. The students must be prepared to accept the problem in hand. When the problem becomes real to the students their interest in the solution will always follow. Once the interest in the pupils is aroused the learning becomes easier.

7. Habits

Certain socially desirable habits of honesty, truth, tolerance, self-confidence, self-reliance etc., should be included through the teaching of science.

8. Appreciation

The student of science should be able to appreciate the contribution of science in the progress of civilization, the adventures of scientists, natural phenomena, contribution of scientific method etc. The appreciation must come as an outcome of science teaching and the teacher must make the students conscious of the benefits bestowed by science for the comforts of the mankind. The adventures of scientists in exploring the truth should be told by the teacher. The students should occasionally be taken for outings so as to appreciate the beauty of nature.

9. Providing work for leisure

The problem of leisure can be easily solved by teaching the students different types of hobbies and other scientific activities. For example, students should be taught to prepare articles of their daily use such as inks, soaps, cream, boot-polish etc. they should also be given knowledge and training in some useful activities like gardening, maintenance of acquarium and other livestock, preservation of animals and plants, collection of plants, animals etc. the students, after having learnt the technique and procedure involved in different hobbies and scientific activities, can engage himself in a useful and productive work in his leisure hours. He can also improvise certain instruments etc.

10. Training for better living

The students of science should know the laws of health and hygiens and should be given training in healthful living. They should be taught to take special care of the body and so improve their surroundings, and thereby improving the standard of living. He should know the ways and means of prevention with his own domestic, social and national environment and the economic and cultural conditions.

11. Forming basis for career and later specialization

In addition to being an integral part of general education, whole science programme at secondary stage should prepare the student for some vocation and specialization in the individual subjects. So, a different type of knowledge and training should be given to those students who intend to go for higher studies or want to enter some profession. This should form a basis for further pursuit in the field of science.