Chapter I

INTRODUCTION

This chapter brings out the relevance of validation of Bloom's Taxonomy of Educational Objectives in the cognitive domain as applied to a professional Physical Education course. As contextual background of the study, the traditional role and objectives of education, the nature and importance of cognitive development and the need for classification of cognitive objectives have been duly described.

In this context, Bloom's Taxonomy has been presented as a potentially useful scheme for classification of cognitive objectives in education as well as in the professional preparation of physical education personnel. The assumptions underlying the Taxonomy and their implications have been described, highlighting the need for validation of the Taxonomy before its potential could be realised.

The problem, delimitation, limitations, hypotheses, meaning of important terms, and significant contributions that the study is likely to make have also been stated and described.

The Background

Purposeful activity has been a significant factor in the evolution of mankind from the primitive stages of hunter-cum-food-gatherer to the present status of scientific and technological excellence.²

Much of the advancement made by man is attributable to his capacity to learn and consequently to the process of education; the word 'education' being used here in the entirety of its literal meaning as the drawing out of latent potentials of individuals.³


³The International Webster New Encyclopedic Dictionary s.v. "Educate" and "Education".
Education as a social institution has traditionally been charged with the responsibility of guiding students in the attainment of societal goals. These goals are customarily summarized as the all round development of the individual so that he may become a worthy and productive member of society.\textsuperscript{4}

The comprehensive aim of all round development is subdivided to form the objectives of education which include mental, physical, emotional, and social development of the individual.\textsuperscript{5} Development of the mental or intellectual faculties of man is an important and often pursued objective. It represents the cognitive domain of human behaviour which includes competence in knowledge, intellectual skills, and the capability for judgement and action which are essential to the continuous restructuring and strengthening of the social institutions and


building of creative vitality into the culture.\textsuperscript{6,7}

The cognitive development objective, when broken down into simpler, more tangible objectives, results in a large number of statements of such diverse nature that it becomes imperative to use some form of classification for these statements of intended behavioural changes in the students.\textsuperscript{8}

Such a classification is likely to aid in the selection of appropriate content and methodology of teaching, the planning of instructional units in a meaningful manner, effective monitoring of learning, and communication among educators.\textsuperscript{9,10}


\textsuperscript{9} Ibid.

\textsuperscript{10} Bloom, Taxonomy of Educational Objectives, p.1.
Recognizing the problems posed by the large number and varied statements of cognitive objectives, Bloom\textsuperscript{11} developed a taxonomical classification scheme for the objectives.

The Taxonomy of Educational Objectives

In the Taxonomy, desired student behaviors are represented by six major categories of Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation.\textsuperscript{12} The criteria for classification of cognitive objectives into these categories are distinctions traditionally made by teachers in student behaviours, logic, internal consistency within the Taxonomy, and psychological tenability. According to Bloom, the categories are ordered in a hierarchically cumulative manner.\textsuperscript{13}

Knowledge as an objective is common to all curricula. It comprises of the processes of recognition and recall of information. In the Taxonomy,

\textsuperscript{11}Ibid.

\textsuperscript{12}Ibid. p, 18.

\textsuperscript{13}Ibid., pp. 17-19.
behaviours or objectives that may be included in this category have been arranged in such a way that specific and concrete behaviors come before complex and abstract ones. This category includes three sub-categories, viz., Knowledge of Specifics, Knowledge of Ways and Means of Dealing with Specifics and Knowledge of Universals and Abstractions in a given subject field.

Knowledge of Specifics deals with the terminology and specific facts of dates, events, persons, places, sources of information, etc. The ways and means of dealing with specifics include conventional forms of creating and presenting ideas and phenomena; trends and sequences of events; classifications and categories; criteria by which facts, principles, opinions, and conduct are tested or judged; and the methodology of inquiry and investigation.

Universals and abstractions in a subject

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14 Ibid., pp. 63-67.

15 Ibid., pp. 68-74.
field include principles and generalizations which summarize observations of phenomena; and theories and structures which comprise the body of principles and generalizations along with their interrelations to present a clear, rounded, and systematic view of a complex phenomenon, problem, or field.\textsuperscript{16}

It may be noted here that knowledge of ways and means of dealing with specifics, and knowledge of universals and abstractions refer to mere recall or recognition of these processes and do not include behaviours whereby the processes are actually used.

Comprehension, the second major category in the Taxonomy, refers to those objectives or behaviours which represent an understanding of the literal message in a communication.\textsuperscript{17} This category includes three sub-categories, viz., Translation, Interpretation, and Extrapolation.

Translation refers to the change of a communication from one level of abstraction to another,

\textsuperscript{16}\textit{Ibid.}, pp. 75-77

\textsuperscript{17}\textit{Ibid.}, p. 89.
from one symbolic form to another; or from one verbal form to another.\textsuperscript{18}

Interpretation implies the identification and understanding of the major ideas in a communication through translation, as well as an understanding of the interrelations among these ideas.\textsuperscript{19}

Extrapolation refers to simple extensions of ideas, trends, or tendencies given in a communication so as to make it meaningful not only in the situation specified but also in other, similar situations. To be able to extrapolate accurately, the student must be able to translate and interpret the communication. Then, the extension of ideas, trends, or tendencies beyond that which is given would reveal implications, consequences, corollaries, effects, etc., which are in accordance with the conditions as literally described in the communication.\textsuperscript{20}

\textsuperscript{18}Ibid., pp. 92-93.
\textsuperscript{19}Ibid., pp. 93-94.
\textsuperscript{20}Ibid., p. 95.
Application, the third major category, refers to the use of abstractions such as general ideas, rules of procedures, technical principles, theories, etc., in particular and concrete situations. In as much as the taxonomical categories are arranged in a hierarchically cumulative manner, students, in order to be able to apply an abstraction, must be able to remember and comprehend the same. Ability in application is demonstrated when a student, upon being confronted with a problem new to him, applies the appropriate abstraction to solve it.\(^{21}\)

The next level in the hierarchy of educational objectives in the cognitive domain is that of Analysis. It emphasizes the breakdown of a given communication into its constituent parts; identification of the relationships among them; and understanding of the way the parts are organized.

Quite often, many of the elements in a communication are not explicitly stated. Statements of facts, of value, of intent, etc., would have

\(^{21}\)Ibid., p. 120.
to be identified and classified as such to determine the nature and meaning of the communication. Thus, analysis of elements forms the first sub-category of this major category.²²

The second sub-category deals with analysis of relationships among the elements as well as among the various parts of a communication. It is somewhat more difficult than analysis of elements. The relationships may be of hypotheses to evidence, or of the conclusions to the evidence and the hypotheses. To a considerable extent, analysis of relationships deals with the consistency of element to element or part to part, or the relevance of elements or parts to the central idea in a communication.²³

Analysis of organizational principles refers to the identification and understanding of the author's purpose in producing the communication; his point of view, attitude, or general conception of the field dealt with. The production of

²²Ibid., pp. 145-46.
²³Ibid., pp. 146-47.
a communication generally involves the use of some form, pattern, or structure around which arguments, evidence, or other elements are organized. Rarely is the nature of the former explicitly stated. Analysis of the form, pattern, or structure makes possible a deeper comprehension and a better evaluation of the communication.  

Higher in the Taxonomy, and more complex than Analysis, is Synthesis which is defined as the putting together of elements and parts in such a way that a form, a pattern, or a structure which was not clearly there before emerges. Uniqueness and originality of the form, pattern, or structure is an essential element in synthesis. Objectives representing synthesis are classified into three sub-categories on the basis of the final product which may be a unique communication, a plan or proposed set of operations, or a set of abstract relations.  

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24 Ibid., pp. 147-48

25 Ibid., p. 162-68.
Production of a unique communication includes those behaviors or objectives which primarily emphasize communication of ideas, feelings, and experiences so as to bring about a specific change or response in a particular group of individuals.\textsuperscript{26}

Production of a plan or proposed set of operations refers to the setting up of a unique and empirically sound procedure or methodology for the attainment of a specific goal. The empirical requirements of the plan of operations may be laid down in the form of specifications or data to be taken into consideration, or they may have to be worked out by the student. In either case these specifications provide a fairly well defined criterion against which the product may be evaluated.\textsuperscript{27}

The third subcategory in Synthesis is Derivation of a Set of Abstract Relations. The relations may be derived from an analysis of certain observed phenomena or from analysis of relations among

\textsuperscript{26} Ibid., pp. 168-69.

\textsuperscript{27} Ibid., p. 170.
propositions or other symbolic representations. 28

In the former, the student is expected to study the phenomena, or facts based upon them, and then come up with a logically consistent scheme for classifying or organizing them. In the latter, the student begins with abstract symbols, propositions, etc., rather than with concrete data. He is expected to move from these symbolic representations to deductions that can reasonably be made. 29

Evaluation is the highest category in the cognitive Taxonomy. It involves some combination of the preceding five categories and an element unique to it. Evaluation refers to the making of judgements about the value, for some purpose, of particular ideas, works, solutions, methods, materials, etc.; the judgement being made against criteria as well as standards of accuracy, effectiveness, economy, or satisfaction. The Evaluation category is divided into two subcategories on the basis

28 Ibid., p. 164.

29 Ibid., pp. 171-72.
of the source of criteria being internal or external. 30

Judgements in terms of internal evidence are concerned with tests of the accuracy of the work exhibited through consistency, logical accuracy, and absence of internal flaws. 31

Judgements in terms of external criteria include a consideration of the ends to be served and the appropriateness of specific means for achieving these ends. Efficiency, economy or utility of specific means for particular ends are the primary consideration for evaluation of ideas, works, solutions, etc. 32

The Taxonomy Applied to Professional Preparation in Physical Education

An important and useful quality of the Taxonomy is its neutrality with regard to the

30 Ibid., pp. 185-87.
31 Ibid., p. 188.
32 Ibid., pp. 190-91.
subject matter. \(^{33}\) This makes it potentially useful for classification of cognitive objectives in any field of educational endeavour including professional physical education.

Professional preparation in Physical Education refers to the specialized preparation of students to become teachers and administrators in Physical Education at various levels. It comprises two broad areas, viz., classroom instruction in theoretical subjects and teaching of games and sports. Implicit in the aim of theory teaching is the intended application of theoretical knowledge in practical field work.

General cognitive objectives of professional preparation in Physical Education include learning about the theoretical foundations of the profession, methods of teaching, organizational patterns for physical education programmes, forms and techniques of administration, methods of inquiry and research, \(^{33}\)Ibid., pp. 14-15.
evaluation and grading, etc.\textsuperscript{34}

These general objectives can be broken down into specific and more tangible objectives which, then, can be classified according to the guidelines provided in the Taxonomy of educational objectives. The Taxonomy may also be used for identification of new, and as yet unexplored objectives.\textsuperscript{35}

Knowledge is justifiably an important cognitive objective of professional preparation in physical education. With the acquisition of knowledge, students are likely to become better acquainted with what is known in the profession by convention or definition. Knowledge of specific facts such as the terminology, dates of important events, names of professional leaders, sources of information, etc., would enable the student to get initiated into the profession.


\textsuperscript{35} Ibid., pp. 1-2.
Knowledge of conventional ways of presenting ideas and facts would aid in communication among professional personnel. Elements also worthy of learning are significant professional movements, professional trends, classifications and categories such as physique types, criteria for selecting players, tests and other measurement tools, methods of teaching, techniques of performing skills, etc.

Comprehension of subject matter taught would involve the ability to translate an idea or a concept into one's own words, read graphs accurately, interpret the meaning of classroom instruction and textbook material, distinguish among warranted and unwarranted conclusions drawn from a body of data, extrapolate on the basis of given facts or trends, etc.

Being a field oriented profession in which practical work is of utmost importance, Physical Education has a vast scope for cognitive objectives in the Application category. Of obvious importance in the professional preparation of physical education personnel is the ability to apply motor learning theories, mechanical principles, rules of games, etc.
Also, with the current growth in literature in professional and allied areas, Analysis objectives are becoming increasingly relevant. These objectives would include the ability to recognize unstated assumptions, to distinguish facts from hypotheses, to identify motives for participation in physical education activities; to distinguish relevant from irrelevant arguments; to distinguish cause-and-effect relationships from other sequential relationships; to infer the author's purpose and point of view in dealing with historical accounts of professional events, etc.

Physical Education, in order to be accepted as an integral part of the overall educational process, has to continually come forward with new ideas and meanings presented in a cogent manner. Therefore, to have synthesis objectives in professional preparation courses is apparently vital for Physical Education.

Such objectives would include skill in writing using appropriate organization of ideas and statements, ability to present arguments coherently, ability to propose sound experimental procedures
for testing hypotheses, ability to plan a unit of instruction for a given situation; ability to formulate a theory of motor learning applicable to teaching games and sports, etc.

The importance of Evaluation Objectives in Physical Education cannot be overemphasized. The Taxonomy defines evaluation as the making of judgments about the value of ideas, words, solutions, methods, materials, etc. Evaluation Objectives in Physical Education would include the ability to evaluate reported findings on the basis of exactness of statements, proper documentation, proof, etc.; ability to identify logical errors in arguments; ability to evaluate and compare existing theories of learning; ability to evaluate beliefs pertaining to fitness, nutrition, weight management, etc.; skill in identifying and weighing values involved in alternative courses of action, etc.

Thus, it is readily evident that the Taxonomy of Educational Objectives proposed by Bloom is potentially useful in determining and classifying the cognitive objectives of professional preparation in physical education. The Taxonomy can also be
of help in selecting effective teaching methodologies and aids, and in the monitoring of student learning.

Need for Validation of the Taxonomy

The usefulness potential of the Taxonomy can be realized only if the validity of the assumptions underlying its structure is ensured. These assumptions relate to the hierarchy of categories and the cumulativeness of the hierarchy. 36

Hierarchy refers to the arrangement of categories in an ascending order of complexity, that is, the knowledge category is at the lowest level of complexity and the Evaluation category at the highest, with the comprehension, Application, Analysis, and Synthesis categories occupying intermediate positions. If this assumption holds good, the level of difficulty of objecties will increase with each successive category. In other words, average category and subcategory scores in a test developed according to the Taxonomy would exhibit

a downward trend.  

Cumulative nature of the hierarchical arrangement of categories in the taxonomy implies that any given category above knowledge consists of the processes stipulated by all lower level categories and, in addition, a process which is unique to it. If knowledge is regarded as a measure of process A, Comprehension as a measure of process B, which includes A and a unique element, etc., through Evaluation regarded as a measure of process F which includes processes A, B, C, D, E, and a unique element, then apparently the adjacent categories will have the greatest proportion of shared elements.  

The assumption of cumulative nature of hierarchy is based on the premise that a particular simple behaviour may become integrated with other equally simple, or slightly more complex behaviors to form a final behavior more complex than any of its cons-

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\[37\] Ibid., p. 74

\[38\] Ibid.
tituents.  

It may be noted here that the above two assumptions apply to the subcategories in the taxonomy as well.

Empirical tests of the validity of these assumptions would reveal the actual usefulness of the Taxonomy and may provide suggestions for improving the Taxonomy.  

Hence the present study was undertaken by the scholar.

Statement of the Problem

The purpose of this study was to assess the validity of Bloom's Taxonomy of Educational Objectives in the cognitive domain as applied to a professional physical education course.

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40 Ibid., p. 24.

41 Kropp, Stoker, and Bashaw, "Validation of the Taxonomy of Educational Objectives," p. 69.
Delimitation

The study was conducted on First Semester, Master's degree students of the Lakshmibai National College of Physical Education, Gwalior. The subject content for the validation of the Taxonomy was the prescribed college syllabus for the subject Research (Process).

Limitations

Previous acquaintance with a question may enable the student to answer the question by using recall rather than the desired intellectual process. While all the questions used in collecting data were prepared specifically for this study, chance familiarity of the subjects with similar questions could not be entirely ruled out and therefore was recognized as a possible limitation.

Also, unequal content knowledge may lead to differences in scores among the subjects even when all of them use the same intellectual process. The scholar, who taught the course in Research (Process) himself, made every possible effort to equalize content learning. However, some differences
in content knowledge among the subjects were unavoidable due to varying academic aptitudes and study habits. The existence of these differences was recognized as a possible limitation in the present study.

**Hypotheses**

**Hierarchical Syndrome Analysis**

In the Hierarchical Syndrome Analysis, the first and all subsequent pairs and groups will be formed between adjacent categories and subcategories of the Taxonomy.

**Analysis of Variance**

**Overall Analysis of Variance**

The null hypothesis stated that the analysis of variance of scores in the Taxonomical categories and subcategories will not be significant at .05 level.

The research hypothesis stated that the analysis of variance of scores in the Taxonomical categories and subcategories will be significant at .05 level.
Analytical Comparisons

The null hypothesis stated that there will be no significant difference at .05 level between scores of paired adjacent categories and subcategories.

The research hypothesis stated that there will be a significant difference at .05 level between scores of paired adjacent categories and subcategories in favour of the lower level category or subcategory.

Definition and Explanation of Terms

Taxonomy

A Taxonomy is a set of classifications which are ordered and arranged on the basis of a single principle or a consistent set of principles. It should be in conformity with sound theoretical views available in the field. Also, a taxonomy should be of value in pointing to phenomena yet to be discovered.\(^{42}\)

A taxonomy has certain structural rules. It must be so constructed that the order of the terms must correspond to some real order among the phenomena represented by the terms.43

Cognitive Domain

The cognitive domain includes those objectives which deal with the recall or recognition of knowledge in intellectual abilities and skills such as comprehension, application, analysis, synthesis, and evaluation.44

Educational Objectives

As the present study involves measurement of student attainment of objectives, the term is considered in this study at a level where it is amenable to measurement. Thus, educational objectives and behavioral objectives will be considered synonymous.


44 Ibid., p. 7.
Mehrens and Lehmann\textsuperscript{45} define a behavioral objective as a statement that specifies what observable performance the learner will be engaged in when we evaluate whether or not he has achieved the objective.

Bloom\textsuperscript{46} describes educational objectives as the changes produced in individuals as a result of educational experiences. Such changes may be represented by the global statements of the objectives of an educational unit, or they may be represented by the actual description of the student behaviors which are regarded as appropriate or relevant to the objectives. Behavioral objectives may also be inferred from the tasks, problems, and observations used to test or evaluate the presence of these behaviors.

In professional physical education courses in India, educational objectives are more often

\textsuperscript{45}Mehrens and Lehmann, Measurement and Evaluation in Education and Psychology, p. 19.

\textsuperscript{46}Bloom, Taxonomy of Educational Objectives, p. 12.
implicit in the teaching - testing process than explicitly stated. Therefore, the description of educational objectives by Bloom is considered more relevant for the present study.

**Significance of the Study**

Statement of objectives in the cognitive domain is an important prerequisite for effective instruction and evaluation. Also necessary is a valid classification system for the objectives. Hence it is believed that the present study will be of values in the professional preparation of physical education students in India in the following ways:

1. Validation of the Taxonomy will facilitate comprehensive coverage of the entire cognitive domain while designing courses and planning lessons.

2. Selection and statement of objectives will become easier and more effective.

3. Development of teaching methodologies and aids will become more efficient through the use of the Taxonomy.
4. Development of Measurement tools and provision of basis for weighting of scores in different categories of the Taxonomy according to the relevance of the category for physical education will be facilitated. This will make the grading process more meaningful.