CHAPTER 5
CRITERIA OF A DISCIPLINE

5.1.0 Introduction

Academic disciplines are that fields of human knowledge which students study at universities and colleges. The range of disciplines is very wide. Each of them has its methods, objectives, and subjects matter. Academic disciplines represent a logical source of differentiation in organizational structure because each discipline possesses some common cognitive or social rationale that defines its boundaries (Becher & Trowler, 20011; Del Favero, 20032). From the cognitive perspective, the way in which institutions form their substructures or departments is based upon the differing ways in which knowledge is developed and taught across the various disciplines. From the social perspective, disciplinary structures vary based on the social culture that grows around the strength of identity and inclination to collaborate with a group (Becher & Trowler, 20013). Both the cognitive and the social structures of disciplines illustrate their manifestation as dynamic organizational components of the higher education system. As such, the similarities and differences in the manner that disciplines approach teaching, research, and administration are significant to the historical and future structural organization and function of higher education institutions. Instead of possessing some common cognitive or social rationale that defines its boundaries, the term 'discipline' is used by academicians to refer to certain subjects such as history, mathematics and physics, and not to others such as home economics, journalism and poultry farming etc. In fact, there is a whole list of criteria and characteristics, which indicate whether a subject is indeed a distinct discipline. This chapter will try to answer, “What criteria or standards are assumed or applied when we distinguish the disciplines from a non-discipline”.

5.2.0 Criteria of a discipline given by different scholars

Every discipline has some specific characteristics to distinguish it from a non-discipline. These characteristics are considered to give a respectable academic status of a ‘discipline’ to a 'field of study'. From time to time different scholars have given
different criteria to recognize a discipline but there is no specific consensus in this concern. Some of these criteria look similar while some are entirely different from others. In fact, due to different nature of disciplines it is not easy to come up with a suitable criterion, which would, applicable for all disciplines to the same degree. However, in general, scholars focus on possession of a well-defined subject matter, suitable methods for research, definite objectives and scope of inquiry as essential characteristics to recognize a discipline. In the coming part of this chapter, criteria of characterizing a discipline given by different scholars will be reviewed and analyzed in order to come up with suitable criteria to characterize a discipline.

5.2.1 Criteria given during sixties

Sherwin S. Shermis, 1962\(^4\) characterized an intellectual discipline by having:

1. a rather impressive body of time-tested works.
2. a technique suitable for dealing with their concepts.
3. a defensible claim to being an intimate link with basic human activities and aspirations.
4. a tradition that links the present with the past and provides inspiration and sustenance for the future.
5. a considerable achievement in both eminent men and significant ideas.

According to him, the five criteria seem descriptive of liberal art and sciences, but they are also potentially descriptive of many other fields-areas not usually thought of as capable of being intellectual disciplines. It is, further, his belief that a study is an intellectual discipline if it acts like one. An intellectual discipline is not self-contained and static entity; it is a process one in which the creative activities of thinking persons produce that which is capable of affecting human lives in a positive and fruitful manner. If we follow Shermis, many 'fields of studies' considered as non-disciplines but having tremendous social and professional value may attain the status of a discipline.

John B. Carroll, 1963\(^5\) proposed following criteria for identifying a discipline:
1. A specified scope of inquiry
2. The possession of structured subject matter.
3. A recognized set of procedures for gaining new knowledge (including criteria for stating the validity of new knowledge), and a set of procedures for ordering new knowledge.
4. Accepted techniques and tools for applying knowledge in specific cases to specified practical ends.

Every field of knowledge whether called a discipline or non-discipline has a specific field of inquiry for e.g., as biology deals with life of plants and psychology studies human behaviour. In the same way cooking deals with techniques of making food. As biology uses experimental and observation methods, likewise cooking also uses definite set of techniques and tools for preparing different food items. It is important to note here that Carroll does not emphasize possession of own subject matter or methods. Instead, he uses terms like structured subject matter and accepted techniques. It means it does not matter that content or methods of a discipline is borrowed from other but it should be well adapted and organized according to the nature and needs of a discipline.

Almost similar but detailed criteria presented by Devore (1964) in his monograph entitled “Technology: An intellectual discipline”. According to him, an intellectual discipline:

1. has a recognizable and significant tradition, an identifiable history.
2. has an organized body of knowledge which has structure with unity among the parts.

The knowledge has:
a) been objectively determined by verifiable and agreed upon methods.
b) stood the test of the time thereby evidencing durability.
c) been found to be cumulative in nature, and
d) deals in concepts and ideas from a theoretical base.
3. is related to man's activities and aspiration and becomes essential to man by addressing itself to the solution of problems of paramount significance to man and his society.

4. identifies as a part of its tradition and history a considerable achievement in both eminent men and their ideas, and

5. relates to future man by providing the stimulation and inspiration for man to further his ideas and to reach his goals.

The criteria proposed by, Devore for viewing technology as a discipline based on the five criteria put forth by Shermis (1962). The criteria not only give importance to an organized body of knowledge, theoretical foundation and verifiable knowledge generation mechanism but also to the ability of a 'field of study' to solve men's problems.

**Marc Belth (1965)** in his book ‘Education as a discipline’ describes the criteria for a discipline. According to him, disciplines are distinct from one another in one or more of the following:

1. **In the level of abstraction of the concept with which they are concerned**
   The level of abstraction of familiar disciplines of physics, psychology, mathematics, and sociology are identified by their concern with the specifics of human experiences. However, the level of abstraction of education is identified by the methods by which ideas are produced, tested, and recreated.

2. **In the modes of thinking by which they are characterized**
   Belth describes three types of thinking – mathematical, scientific and philosophical but he considers educational thinking different from these because it has a quality of its own.

3. **In the objectives they seek**
   For example, the objective of science is the development of laws and theories. The objective of philosophy is to draw out and set forth clearly and understandably, in order to discover the range of their meanings, the presuppositions on which we undertake all of our pursuits- physical, logical, and valuational. The objective of
the study of education, then, would be to improve the methods of inquiry and creativity by which science and philosophy perform their functions and pursue their objectives.

4. **In the types and manifestations of the moral rules by which they are limited and evaluated**

Every discipline is guided by a basic set of rules, which enable it to perform its proper functions, in the direction toward which it is turned, and in the character by which it is to accomplish its goals. These rules not only direct action and choices, but also serve as evaluative-corrective criteria. For example, where science is concerned with writing laws and theories by which explanations of material nature can be made and tested, it is an act of immorality to expect laws to be held as true even though all evidence denies the accuracy of those laws. In education, however, the moral dimension that has been pronounced has invariably been derived not from the educative rules, but from some social-psychological rule system.

If we minutely analyze Belth’s criteria, we find that like many scholars he does not emphasize autonomy of disciplines in terms of content, research methods or terminology. He sees distinctness in each discipline in terms of abstract thinking, reasoning, objectives they seek and moral rules which direct the functions of a discipline. That is why he successfully proves distinctness of education as a discipline while comparing it with other disciplines like philosophy and psychology. Any discipline if analyzed on this criterion can prove its distinctness because any field of knowledge, whether considered as a discipline or not, has a distinct mode of thinking, own values and own objectives despite it borrows content, terminology or research methods from other. In spite of borrowing, a discipline deals in its own distinct way with the content, research methods or terminology as directed by its mode of thinking and reasoning, values and objectives.

**5.2.2 Criteria given during seventies**

*Kuhn (1970)* in his landmark work ‘The structure of scientific revolutions’ theorized that disciplines employ different cognitive frameworks, select different problems for
study, use different methods for studying the problems, make different types of
generalization, and use different examples to illustrate their conclusion. However, it is
not easy to distinguish a discipline with a non-discipline on the basis of these criteria.
The criterion that disciplines select different problems for study is true for various
non-disciplines also. Each branch of knowledge deals with a particular area of study.
For example- Psychology is concerned with people's behaviour, medical science deals
with art of healing, and education is related to the study of teaching and learning
process. Same is true for other less recognized areas of study like animal husbandry,
home economics, poultry farming and flower arranging. While dealing with these
problems, each discipline applies its own mode of thinking, reasoning and abstraction
i.e., cognitive framework. According to the need of the study and its own nature, each
discipline uses different methods for study.

According to **P.H. Hirst (1975)**\(^\text{10}\) ‘the developed form of knowledge’ (the term used
by him for discipline) possesses some distinguishing features:

a) They each involve certain central concepts that are peculiar in character to the
form. For example, those of gravity, acceleration, hydrogen and photosynthesis
characteristic of the science and number, integral and matrix in mathematics.

b) In a given form of knowledge these and other concepts that denote, if perhaps in a
very complex network of possible relationships in which experience can be
understood. As a result, the form has a distinctive logical structure. For example,
the terms and statements of mechanics can be meaningfully related in certain
strictly limited ways only, and the same is true for historical explanation.

c) The form, by virtue of its particular terms and logic, has expressions or statements-
that in some way or other, however indirect, it may be, are testable against
experience. Each form has distinctive expressions that are testable against
experience in accordance with particular criteria that are peculiar to the form.

d) The forms have developed particular techniques and skills for exploring
experience and testing their distinctive expression, for instance the techniques of
sciences and those of the various literary arts. The result has been accumulation of
all the symbolically expressed knowledge that we now have in the arts and the sciences.

Based on these criteria Hirst originally catalogued the forms of knowledge, or disciplines, as follows: Mathematics, physical sciences, human sciences, history, religion, literature and the fine arts, philosophy and moral knowledge.

Additional to the forms there are what Hirst calls 'fields of knowledge', which arise when knowledge that is rooted in more than one form is built up round specific phenomenon. Unlike the forms of knowledge, the fields are not concerned with developing a particular structuring of experience. They are held together simply by their subject matter, drawing on all forms of knowledge that can contribute to them. Geography, as the study of man in relation to his environment, is an example of a theoretical study of this kind, engineering an example of practical nature.

In this way, Hirst classified some subjects as 'fields of knowledge' who do not fulfill the criteria given for 'Forms of knowledge and draw content from other developed forms of knowledge. However, he did not use the terms discipline or non-discipline for any of the categories. If we consider these fields of knowledge as 'non disciplines,' as they borrow knowledge from the other developed forms of knowledge and analyze one of such non-disciplines like cooking which as a subject hardly seems to have characteristics of an intellectual discipline. We find that it can also fulfill almost all the criteria given by Hirst for a developed form of knowledge. It also involves certain central concepts that are peculiar in character, for example frying, boiling, baking, roasting etc. It has developed particular techniques and skills for exploring new recipe and testing their distinctness. So, although comprehensive and impressive, the criteria cannot be said fully able to distinguish disciplines from non-disciplines. However, it adequately classifies different subjects as 'forms of knowledge' or 'fields of knowledge'.

5.2.3 Criteria given during eighties

Some characteristics of a discipline were identified by M.S. Yadav, S.B. Menon and P. Arun Kumar (1982)\textsuperscript{11} in their article 'Educational Research as an interdisciplinary
endeavour'. In their words: A discipline is characterized by a definite jurisdiction of experiences, and a methodology of treating them. These two characteristics put together represent a perspective, which the specialists involved in the discipline, are supposed to share. Conversely, a discipline is also characterized by a group of specialists sharing a common perspective of organizing the experience within its jurisdiction. The members of the group constantly communicate among themselves using a terminology understood almost only amongst them. In addition, they share a common paradigm of concepts, principles and theories.

Another criteria proposed by Sparks (1983),12 According to him, in order to become acceptable as a discipline, a specific ‘body of knowledge’ must grow in degree of relevance to deal important problems; grow in theoretical and conceptual depth; and develops its own conceptual structure.

Rumble (1988)13 while characterizing a discipline divides his argument into two:

**Intrinsic Criteria (focusing on the essential nature of the discipline)**

1. A discipline is an area of academic endeavor marked by autonomy, internal cohesion, specialization by subject, and independence from other area of academic endeavor;
2. A discipline must have theoretical and conceptual depth and its own conceptual structure (paradigms); and
3. A discipline is an area of academic endeavor with its own recognizable ‘culture.’

**Extrinsic Criteria (those which are extraneous to disciplines)**

1. A discipline is the basic unit to bring subject experts together;
2. A discipline is taught and researched at the higher education level;
3. A discipline has relevance to deal with an immediate problem; and
4. A discipline is one, which is recognized as such by academics.
5.2.4 Criteria given during nineties

Liles et al (1995)\cite{Liles1995} after a review of literature on what constitutes a discipline identified six basic characteristics: (1) A focus of study, (2) a world view or paradigm, (3) a set of reference disciplines used to establish the discipline, (4) principles and practices associated with the discipline, (5) an active research agenda, and (6) education and professionalism. Liles’s criteria to a great extent equally applicable to all the branches of knowledge. Almost, all the branches of knowledge, whether called a discipline or not, possess these characteristics.

5.2.5 Criteria given during two thousand

Lokesh Koul (2004)\cite{Lokesh2004} identifies following specific characteristics of a discipline:

1. A discipline has its own well-defined course content (subject matter) specifically defined for different levels.
2. Subject matter of a discipline is related to some professional and social activity. For example, agriculture helps farmers in farming and education helps teachers in the art of teaching.
3. Every discipline has its own method of study. In Chemistry, laboratory or experimental method is used.
4. A discipline has its own field of investigation with a unique system of values. For example, Botany is concerned with plants and Psychology with human behaviour.

IAE-Pedia\cite{IAE2011} 2011 (Information Age Education - an online publication) characterizes a discipline by a combination of general things such as:

1. The types of problems, tasks, and activities it addresses.
2. Its accumulated accomplishments such as results, achievements, products, performances, scope, power, uses, impact on the societies of the world, and so on, and its methods of preserving and passing on this accumulation to current and future generations.
3. Its history, culture, and language, including notation and special vocabulary.
4. Its methods of teaching, learning, assessment; its lower-order and higher-order knowledge and skills; and its critical thinking and understanding. What it does to preserve and sustain its work and pass it on to future generations.

5. Its tools, methodologies, and types of evidence and arguments used in solving problems, accomplishing tasks, and recording and sharing accumulated results.

6. The knowledge and skills that separate and distinguish among: a) a novice; b) a person who has a personally useful level of competence; c) a reasonably competent person, employable in the discipline; d) an expert; and e) a world-class expert.

5.3.0 Review and Analysis of different criteria

With a synoptic view of criteria discussed above, broadly, following characteristics may be identified as recognizable features of a discipline:

1. Distinct and well-structured subject matter
2. Suitable methods of generating knowledge
3. Possession of own theories, principles and concepts
4. Distinct terminology
5. Own field of investigation and object of research
6. Relation to some social and professional activity
7. Presence of community of scholars

Let us critically analyze some important one of them in order to prove their validity and utility for characterizing a discipline.

5.3.1 Criterion 1: Distinct and well-structured subject matter

It is said that disciplines deal with unique and organized bodies of knowledge while non-disciplines borrow subject matter from other disciplines. It may be true for well-established disciplines. For example, Physics deals uniquely with the structure and relationship of physical matter. However, it would be difficult to deny a similar uniqueness to such subjects considered as non-disciplines. As Jonas F. Solitis\textsuperscript{17} states “One might argue, that physics is pure while home economics uses the facts, laws and theories of the social and natural sciences, and therefore, is not unique in some pure
sense. But, Mathematics is used in both Chemistry and Physics, while basting is unique to cooking. History on the other hand freely uses the concepts and theories of economics, sociology and political science, in a way not so different from the use of biological, physiological and chemical concepts in books on animal husbandry.” Therefore, it is clear that disciplines whether pure or applied borrow, share and overlap content with each other. In this concern, Solitis considers the subject of cooking more independent than physics or chemistry.

James L. Kuethe (1963)\textsuperscript{18} puts the similar remarks. According to him, ‘It is not the possession of a unique corpus of facts that characterizes a discipline. If this were true, the disciplines of political science and economics might be hard put to demonstrate how they are more than a particular combination of psychology, sociology, statistics and Law.’ Similarly, biology may be reduced to physics and chemistry. Actually, no discipline can be said to have complete autonomy in this concern. John Walton supports the mutual dependence of disciplines (1971)\textsuperscript{19} by asking the question, “How many of the subjects now taught in colleges and universities would qualify as discipline if they were required to have a unique organization and method of extensions, logic, perhaps, but then logic is dependent to some extent on Language, Mathematics, considered as one of the purest disciplines, borrows from logic, and all the sciences borrows from mathematics.” By exposing inter-dependence of disciplines, Walton proves that borrowing is not a crime but necessary for the enrichment of the content of a discipline. Each discipline in order to solve the problems it deals has to share knowledge with other disciplines.

Similarly, Paul H. Hirst (1962)\textsuperscript{20} recognized the value of inter-disciplinary study of various set of phenomena by saying that most of the disciplines overlap; for example, the postulates and concepts of chemistry and physics are applicable to the phenomenon of biology. Therefore, the criterion of having unique subject matter seems unable to draw a precise line between the disciplines and non-disciplines.
5.3.2 Criterion 2: Suitable methods of generating Knowledge

Disciplines possess a unique method of acquiring and verifying the knowledge relevant to each subject. In each discipline, course content is not only preserved and transmitted but also enriched through continuous research work. For e.g. In Chemistry, laboratory and experimental methods are used while case study is the dominant method of Psychology.

Historically, when the disciplines were limited in number, focus of each discipline was limited around a particular area of investigation. However, due to knowledge explosion disciplines had to widen their field of investigation and due to further specialization of knowledge within a discipline new disciplines have emerged. This knowledge explosion and specialization enhanced the interdependence of disciplines on each other and now one subject cannot be completely isolated from the other. These newly emerged disciplines broke the traditional disciplinary boundaries, as they have to peep in other areas of study in order to fulfill their responsibilities given by society to them. They have to deal with problems that are more complex. Yadav, Menon and Kumar21 give example of emergence of biochemistry and biophysics in this concern. They state that ‘in the course of its evolution, a stage came when biology as a discipline could not have progressed far with its traditional preoccupations of taxonomy, anatomical descriptions, etc., and had to proceed to establishing causal relationships between biological phenomena and the more fundamental natural laws which formed part of more established disciplines like chemistry and physics. This paved the way for the establishment of the hybrid disciplines like biochemistry and biophysics. A biophysicist or biochemist shares his premises, constructs and methodology with the biologist and the physicist or chemist as the case may be, But, the preoccupation of finding chemical or physical explanations to biological phenomena is uniquely his own, and that is what makes his a discipline.’ Therefore, it is clear that the knowledge-making process in modern society is a collaborative effort to which many parties contribute. Knowledge is not a product of individual thinking but of collective work and many people contribute to its creation. As the fields of investigation overlap, the methods of investigation and verifying knowledge also overlap. For example, In order to study voting behaviour, each discipline whether it is
sociology, psychology, and political science would use survey as the dominant method of study. Both biology and oceanography study the marine life using observation method and so on.

James L. Kuethe\textsuperscript{22} also argues, “Disciplines cannot be identified by possession of unique method. The methods of Physics and Chemistry are similar as are the methods of Psychology and Sociology.” Scientific method, which is thought to be unique property of ‘Sciences’, generally applies to fields such as chemistry, physics and Biology. Actually, the term refers simply to a special approach for acquiring knowledge - an approach involving the use of several key values or standards. Robert A. Baron\textsuperscript{23} in his book 'Psychology' describes following values and standards that are essential components of scientific method:

\textbf{Accuracy}- A commitment of gathering and evaluating information about the world in a careful, precise, and error - free manner as possible.

\textbf{Objectivity}- A commitment to obtaining and evaluating such information in a manner as free from bias as possibly.

\textbf{Skepticism}- A commitment to accepting findings as accurate only after they have been verified over and over again, preferably by many different scientist.

\textbf{Open Mindedness}- A commitment to changing one’s views – even views that are strongly held – in the face of evidence that these views are inaccurate.

Viewed in this light, the phrase scientific method refers simply to using these methods and adopting these values in efforts to study any problem or any aspect of human life around us.

In the similar respect a seemingly strange but wonderful e.g. given by John. F. Solitis\textsuperscript{24} while testing the idea of employing special method by each discipline for attacking problems and confirming results. He compared the process of producing synthetic rubber in the laboratory by a chemist with the process of preparing a baked dish of meat in the kitchen by a cook. Both the chemist and the cook hypothesize that
a certain set of chemicals/ingredients in a certain proportion put through a certain process of combination with proper heat and pressure will yield the required product. So, both of them undergo similar process of planning and implementing in a systematic manner. He argues, “It would seem that a scientific approach, in its most general form, is shared by many subjects as a proper method for obtaining desired results. Yet if one were to claim uniqueness of method for each discipline, a similar claim for water skiing or cooking seems defensible.”

Therefore, it can be interpreted that any discipline if follows the guidelines, as above described, while generating and verifying knowledge, qualifies for membership in the family of disciplines who use scientific method. It also seems that the criterion of possessing unique research method lacks discriminatory power between a discipline (chemistry) and a non-discipline (cooking).

However, Lovell and Lawson question the applicability of scientific method equally to all disciplines. They state that scientific method has been very valuable in establishing new knowledge in natural sciences, and it also helped social scientist, to gain insight into their problems. But, it cannot answer question involving moral or value judgments. Indeed, man has no one method for acquiring the knowledge necessary to answer all his questions. They quote Thompson (1961), “The scientific method is not a royal road leading to discovery in research...but rather a collection of pieces of advice...which may help to guide the explorer in his passage through the jungle of arbitrary facts”.

Therefore, it can be said that due to difference in the nature of different sciences viz. Natural Sciences and Social Sciences 'Scientific method' cannot be equally applied to each discipline. Each discipline modifies this general method to suit its nature. It is also interpreted that scientific method cannot be used to solve the problems related to values, culture, morality and other aspects of human behaviour. It can also be interpreted that the claim of sciences, being the most respectable disciplines in the academic world due to the possession of scientific method, is not justified because having different nature and diversified field of investigation social sciences cannot apply the scientific method in the same way as applied by sciences.
To make the above interpretation more clear it is necessary to discuss the nature of natural and social science. Social Sciences are not exact science like physical sciences, as they, unlike the latter, deal with human beings. Human nature and man's environment are so complex that it is more difficult to comprehend and predict human behaviour than the physical phenomena. No two persons are alike in feelings, drives or emotions. No one person is consistent from one moment to another. The behaviour of human beings is influenced by biological, psychological, socio-cultural, temporal and environmental factors. It is difficult to see the underlying uniformities in the diversity of complex human behaviour. Therefore, it is said that explanation, control and prediction will never reach the high levels as attained in the natural sciences.

Now, it is clear from above discussion that scientific methods are not the only possession of disciplines of science but it is used in other disciplines also, but the approach of its applicability varies from discipline to discipline as the nature of disciplines differ. Therefore, on the basis of above discussion, it can be said that in terms of research methods we cannot distinguish disciplines of sciences with disciplines of Non-sciences. Even we cannot draw any line between disciplines and non – disciplines, as Solitis made it clear by comparing the research in chemistry and cooking.

In the social sciences also we cannot distinguish different disciplines on the basis of research methods because different disciplines in the social sciences however treated as separate branches of knowledge for the purpose of study, but they are interdependent studies of the different aspects of the same object i.e. man. Social Sciences include various disciplines dealing with human life, human behaviour, social groups and social institutions. They consist of Anthropology, Behaviour Science, Commerce, Demography, Economics, Education, Geography, History, Law, Linguistics, Management, Political Science, Psychology, Public Administration, Sociology, and Social Work. Social Science research calls for inter-disciplinary approach, as human life cannot be compartmentalized into psychological, social, economic or political aspects. “Man lives in a socio-economic and political world and thrives on its varied relationships. It is inconceivable that study of bare and isolated events on anyone aspect of man's life would yield any meaningful results”. 26
discipline-specific study of a social problem from an angle of, say, economics or sociology or political science only cannot give a correct and total view of the problem. For example, the problem of poverty cannot be just studied as a mere economic problem or a social problem or a political issue. The approaches and theories of all these disciplines must be blended to provide a meaningful and valid approach to the problem. This interdisciplinary approach facilitates better understanding of the complex level of social-psychological-economic-political forces, intricately interwoven in modern life.

From the above discussion following points can be deduced in order to justify that having own method of generating knowledge is not a satisfactorily discriminating criterion between a discipline and a non-discipline because almost all disciplines adopt, share and overlap in this concern. Therefore it can be interpreted that,

- In some or other way, each discipline deals with certain aspects of human life. No one method can answer all the questions of human interest and finding solution is more important than sticking to a particular method whether or not this method is able to generate the new knowledge and verify the old.

- Disciplines whose fields of enquiry is limited and who deals with simple and almost similar type of problems can stick to a particular method but those who deal with complex and diversified problems or more important problems cannot fulfill their aims with one particular method.

- The field of investigation of the disciplines earlier established is less diversified and limited but the disciplines emerged from these disciplines have broader and diversified fields of investigation. These newly emerged disciplines have more load of societal expectations and in order to fulfill continuously changing needs of the society they have to share and exchange knowledge generation mechanism from each other.

Let us take few examples to make the above points more clear. First, take the case of Philosophy, a well-established discipline, and Education, having philosophy as one of its foundational disciplines. Philosophical problems, in general, are subject of critical
thinking and reasoning, continuous discussion and analysis. Philosophical method is the dominant method of the discipline. On the other hand, education has to deal with diversified and complex type of problems. For e.g., A study of the personality characteristics of a student is simultaneously subject to physical, biological, social and psychological analysis. Therefore, the dominant methods of these disciplines would help a teacher for collecting and analyzing data related to the physical, biological, emotional and social aspect of the student.

Another example is from the field of medical sciences. While investigating on a new medicine an investigator has to use a variety of methods like historical, experimental, case study, field survey and correlational studies etc. Here he does not bother from borrowing the methods from other disciplines but concentrates only on producing an effective medicine, because the autonomy, in terms of research methods, is not important than the societal expectations from the medical sciences. Therefore, it can be concluded that,

- However, the methods overlap in different disciplines but each discipline makes adaptation in the method to suit its own needs, that is the application of different methods for constructing and verifying the knowledge is uniquely its own, and that is what makes it a discipline. Experimental method, a dominant method of science, is a good example of such adaptation. However, same steps of the method are followed in each discipline but nobody can say that the method is similarly used in Psychology and Education as it is used in Physics, Chemistry or Biology. Due to the subjective nature of the social sciences adaptations in the method is done in experimental design, control, number of variables and nature of tools etc.
- Even, different types of research are, also, not sharply distinguishable from one another. There may be overlapping between one type/method and another. For example, pure research may involve experimentation or case study or analytical study; Evaluation studies may apply experimental or survey methods; Experimental Research is necessarily an analytical study; Survey Research may involve quasi-experimental approach or analytical approach; and so on.
In conclusion it can be said that the possession of own method of generating knowledge is not a satisfactory criterion to distinguish a discipline from a non-discipline. Knowledge and methods of generating knowledge in some or other way are interrelated. All disciplines focus on making the human life better. As put forth by J. Walton\textsuperscript{27}, “there are no copy rights on the methods of inquiry. All the methods of knowing like observation, conceptualization, classification, analysis, theorizing, and experimentation are public domains.”

5.3.3 Criterion 3: Own Theoretical Foundation

Another criterion for distinguishing a discipline from a non-discipline is possession of own theoretical foundation. The issue that has been hotly debated in the literature is whether a discipline needs a distinct theoretical base of its own in order to progress as a scientific discipline.\textsuperscript{28} This is based on Kuhn’s (1970)\textsuperscript{29} concept of scientific progress, which is characterized by the development of “paradigms” and subsequent testing of them. Weber (1987\textsuperscript{30}, 1997\textsuperscript{31}) argues that the lack of a unifying theory or paradigm is the major barrier to the progress of a field of knowledge. While commenting on the disciplinary status of ‘Information System’ he says that IS needs to develop a paradigm of its own to transcend the boundaries of an applied discipline and to enter the realm of a pure discipline. This, he says, is necessary to avoid the fragility of applied disciplines such as medicine, engineering, and architecture, which have their paradigmatic and theoretical bases located elsewhere. Before discussing this issue further let us discuss what a theory is and how it is generated.

5.3.3.1 Theory

A theory is a set of concepts related through statements of relationship, which together constitute an integrated framework that can be used to explain or predict phenomena. The statements of relationship explain who, what, when, where, why, how and with what consequences an event occurs. Traditionally theory is often set against something called 'practice'. Practice in this sense can be approached as the act of doing something. 'Theory', crudely, can portray as abstract ideas about some thing or phenomenon. Thus, for many workers and informal educators, theory is what you learn in college and then apply to the situations you find in your work. The result is
practice. From theory can be derived general principles (or rules). These in turn can be applied to the problems of practice. Theory is 'real' knowledge while practice is the application of that knowledge to solve problems.

5.3.3.2 Generation of theories

Thomas Kuhn in his much-cited 1962 book *The Structure of Scientific Revolutions* proposed the theory of knowledge generation. Although, as the book’s title suggests, Kuhn has written about sciences, Kuhn’s theory has now been accepted as relevant and useful not only by academic disciplines outside of natural sciences. According to Kuhn, the change in human knowledge about any subject takes place in the following steps. At first, an academic discipline or any other intellectual community works within the confines of an accepted theory or theories. The members of the community use it systematically and methodically. Kuhn calls this theory or theories the accepted paradigm, or standard of the discipline. Once the majority of an intellectual community accepts a new paradigm, the community’s members work on expanding this paradigm, but not on changing it. While working within an established paradigm, all members of an intellectual community have the same assumptions about what they study and discuss, use the same research methods and approaches, and use the same methods to present and compare the results of their investigation. Such uniformity allows them to share their work with one another easily. More importantly, though, staying within an accepted paradigm allows researchers to create a certain version of reality that is based on the paradigm that is being used and accepted by all members of the community. For example, if a group of scientists studies something using a common theory and common research methods, the results that such investigation yields are accepted by this group as a kind of truth or fact that had been experimentally verified.

Changes in scientific paradigms happen, according to Kuhn, when scientists begin to observe unusual phenomena or unexpected results in their research. Kuhn calls such phenomena anomalies. When anomalies happen, the current paradigm or system of research and thinking that a community employs fails to explain them. Eventually, these anomalies become so great that they are impossible to ignore. Then, a shift in
paradigm becomes necessary. Gradually, then, existing paradigms are re-examined and revised, and new ones are established. When this happens, old knowledge gets discarded and substituted by new knowledge. In other words, an older version of reality is replaced by a newer version.

To illustrate his theory, Kuhn uses the paradigm shift started by the astronomer Copernicus and his theory that the Earth revolves around the Sun. This example shows that even scientific truths that seem constant and unshakable are subject to revision and change. To an untrained eye, it may seem that all scientists and other researchers explain and describe reality, which is unchangeable and stable. However, when an intellectual community is working within the confines of the current paradigm, such as a scientific theory or a set of research methods, their interpretations of this reality are limited by the capabilities and limitations of that paradigm. In other words, the results of their research are only as good as the system they use to obtain those results. Once the paradigm use for researching and discussing the subjects of investigation changes, the results of that investigation may change, too. This, in turn, will result in a different interpretation of reality.

What later becomes an accepted theory in an academic discipline begins as someone’s opinion. Enough people have to be persuaded by a theory in order for it to approach the status of accepted knowledge. All theories are subject to revision and change, and who is to say some time down the road, a better research paradigm will not be invented that would overturn what we now consider a solid fact. Thus, ‘research and the making of knowledge are not only social processes but also rhetorical ones. Change in human understanding of difficult problems and issues takes place over time. By researching those problems and issues and by discussing what they find with others, writers advance their community’s understanding and knowledge.’

5.3.3.3 Relevance of possession of theories for a body of knowledge to be recognized as a discipline

Disciplines are generally considered theoretical and more remote from the everyday business of living. Certainly, the natural sciences are heavily laden with theory and abstract ideas, and we might well say the same for the social sciences, while even the
study of history and literature produces special theories and concepts. Some examples of theories popular in different disciplines are given below:

- **Astronomy**: Big Bang Theory
- **Biology**: Cell theory, Theory of Evolution, Germ theory
- **Chemistry**: Atomic theory, Kinetic theory of gases
- **Mathematics**: Approximation theory, Combinatorial game theory, Deformation theory, Dimension theory, Field theory, Matrix theory
- **Philosophy**: Proof theory, Speculative reason, Theory of truth, Type theory, Value theory, Virtue theory
- **Physics**: Theory of relativity, Quantum field theory, Scattering theory, String theory

From the above list, it is clear that most of the theories in the list are associated with established and pure disciplines while emerging disciplines have no theories or fewer theories. Applied disciplines often lack any distinct theoretical base of their own. Instead, they use theory from other disciplines (reference disciplines) and apply this to solve practical problems. For example, medicine uses theory from chemistry and biology and applies it to the problem of preventing and curing disease; engineering uses theory from physics and mathematics and applies it to build roads, buildings, and bridges.

However, merely not possessing own theories does not disqualify a discipline to attain a respectable academic status. Actually, the possession of theories depends on the nature of disciplines. In many ways, this is a legacy of Aristotle and his threefold classification of disciplines as theoretical, productive or practical. Aristotle divides the disciplines into three classes: (i) Theoretical: the aim of the theoretical is to know or to understand. (ii) Practical: The aim of practical is to do, and (iii) Productive: the aim of the productive is to make or create. Each requires special kinds of subject matter and special competence. For example, theoretical disciplines, such as mathematics and the natural sciences require investigators who are able to reason logically, to deal with abstractions, to build comprehensive theories; and the objects of study must possess at least relative permanence and uniformity. In contrast to the theoretical
discipline, the practical disciplines are concerned with subject matter capable of change or alternation. Such subject matters, for example, as human behaviour and social institutions have the capacity to change. The chief practical disciplines for Aristotle were ethics, politics, and education. The practitioner obviously needs certain skills and abilities that differ from, or go beyond those needed by one undertaking theoretical investigations. The productive disciplines, such as engineering, the fine arts, and the applied arts, require material that is even more malleable and skills that are more specialized and distinctive. Therefore, it is not necessary for all disciplines to have own theories because of nature of some disciplines is practical or productive.

Beyond a few traditional academic disciplines, the majority of disciplines in contemporary institutions of higher learning are applied, dynamic, and relatively young- such as management, information technology, interior design, or dental hygiene. Practical and applied disciplines always face the blame that they have weak theoretical foundation or they are dependent for theories on other disciplines. However, it is not so, applied disciplines usually have both a strong theory component and a strong practice component. In this concern, Solitis put the example of animal husbandry and home economics. He says, “These subjects are not devoid of theoretical considerations or abstract concepts. The concept of a atomic weight in physics is no more abstract than the concept of budget in home economics. (In fact, the latter is probably more difficult to calculate than the former!)”.

In an applied discipline, practical credibility is at least as important as, if not more important than academic respectability. The nature of applied disciplines is different. They are expected to play a different role than the theoretical disciplines. If we look at the typical school curriculum from the standpoint of Aristotelian framework, we note overwhelming emphasis on the theoretical disciplines and neglect of the practical ones. This negligence of practical and productive disciplines forces them to work out their own theories instead of pursuing their actual duties. An applied discipline has two primary objectives, one theoretical and one practical (Phillips 1998):

- To increase knowledge (theoretical): to understand why things happen in a particular area of interest.
• To improve practices (practical): there is an expectation that research will ultimately result in some useful social outcome.

Therefore, it can be argued that applied disciplines should stay firmly rooted as applied disciplines. There seems no sound reason why these discipline should not use theory from other disciplines and apply it to solve practical problems in the same way that medicine uses theory from chemistry and biology in curing the people. Surely, this is just as legitimate as pursuing knowledge for knowledge’s sake. In fact, Kuhn explicitly excludes applied disciplines from his discussions about the need for a paradigm for a discipline to progress. Therefore, it seems that the characteristics of abstraction and possession of own theories are not firm enough to separate the disciplines from the non-disciplines.

5.3.4 Criterion 4: Distinct Terminology

Within all academic disciplines, there are a range of terms and words that are the language of that academic community. Every discipline has its own idiom provided with vocabulary, grammatical structures, and other linguistic conventions. This language has evolved and developed within disciplines to communicate particular ways of seeing and thinking specific to that subject. Without the appropriate terminologies, students cannot be properly educated nor can scientists work with precision. Groups of specialists would not have the communicative means to express themselves in technical languages or to disseminate technical information and access it through information networks.

In a standard published by the International Organization for Standardization (ISO), “terminology” is defined as “A set of designations belonging to one special language.” and as “Terminology science- Science studying the structure, formation, development, usage and management of terminologies in various subject fields.” In knowledge generation, communication and management the experts use and create their own terminology, i.e., their own specialized language. It is a language for the special purpose of scientific or business communication.
P. Jennifer (1998) refers Sager (1990) to explain the meaning of terminology:

1. The set of practices and methods used for the collection, description and presentation of terms.
2. A theory; i.e. the set of premises, arguments and conclusions required for explaining the relationships between concepts and terms which are fundamental for a coherent activity.
3. A vocabulary of a special subject field.

Each discipline has its own unique language conventions, format, and structure. It is the vocabulary of a special subject field and the collection of words that one would normally associate with a particular discipline. These may be nouns, verbs, adjectives or adverbs which are considered to have a clearly defined meaning when used in the context for which they have been defined. In other words, the style, organization, and format that are acceptable in one discipline may not be at all acceptable in another. Each discipline has its specific terminology and it is important to become familiar with and competent in it. In knowledge generation, communication and management the experts use and create their own terminology, i.e. their own specialized language. It is a language for the special purpose of scientific or business communication.

Each discipline, whether pure or applied, has its own terminology. Disciplines also share terminology with each other. Generally, emerging disciplines initially use terminology of their foundational disciplines but gradually develop terminology of their own. For e.g. education has its own terminology different from its foundational disciplines. For e.g. class, curriculum, timetable formal, informal, non-formal system of education, and multicultural classroom etc. In addition, it also uses various terms and concepts, originally belong to any other discipline. For e.g. achievement, motivation, learning, reward, and punishment etc. However, these all terms are used in specific educational context. Even in the subject of cooking, which hardly seems to have the pureness and sublimity associated with an academic subject or “intellectual discipline,” terms and concepts like recipe, basting, frying, and baking etc. are used, which are uniquely its own.
Almost all the languages of world share terms from each other. Terminology is just the means of communication of knowledge and there should not be any copyright of any discipline on them. No discipline can be said purely autonomous in this sense; even logic and mathematics have to borrow from language to express them. Discipline specific terminology may be one of the identification mark of a discipline but each discipline should have its own unique terminology does not seem a justified criterion for distinguishing a discipline from a non-discipline.

5.3.5 Criterion 5: Own field of investigation and object of research

Another criterion for characterizing a discipline is possession of own field of investigation and object of research. For e.g., Botany deals with plants, Zoology with animals, Psychology with human behaviour and Physics with the study of matter. Emerging or less recognized disciplines also deal with particular type of problems. For e.g., poultry farming deals with techniques of raising fowls and home management deals with art of managing home and related family affairs.

Disciplines also overlap in this concern. As Walton\textsuperscript{42} remarked, ‘there is considerable overlapping among these various disciplines. Both biology and oceanography include the study of marine life; both philosophy and political science include political theory; both Latin and history include Roman civilization; and sociology, psychology, and political science all concern themselves with voting behaviour. It would be most unusual if many of the phenomena included in a discipline were not also included in other disciplines.’ However, instead of overlapping, the approach of dealing with the same problem is different in different disciplines. For e.g. learning in rats, pigeons, chimpanzees, and men will continue to be a part of the discipline of psychology, but learning under the special conditions of boy, book, and teacher should be the special concern of education.

Another example may be ‘the question of renewable energy’, which might be a research topic within different disciplines. The following list shows the types of questions that would accommodate the different disciplines:\textsuperscript{43}
• Business (economics): Which renewable resources offer economically feasible solutions to energy issues?
• Humanities (history): At what point did humans switch from the use of renewable resources to nonrenewable resources?
• Natural and applied sciences (engineering): How can algae be developed at a pace and in the quantities needed to be a viable main renewable resource?
• Social sciences (geography): Which US states are best suited to being key providers of renewable natural resources?

Disciplines share their field of investigation. However, their focus of interest for a particular field or object of research is different as clear in the above example. If we concentrate on focus of interest, this criterion can draw a line between different disciplines. Otherwise, this criterion also hardly offers any help to distinguish disciplines from non-disciplines.

5.4.0 Conclusion

From the above discussion, it can be interpreted that either we should try to change the existing criteria to distinguish a discipline from a non-discipline or there should not be any criteria for classifying any field of knowledge as discipline or non-discipline because no criterion described above is completely able to distinguish a discipline from a non-discipline. No Discipline is purely autonomous in terms of content, research methods, terminology, theory etc. Each discipline share with or overlap other discipline in some or other way. Discipline themselves could profit by contact with problems of other disciplines. Nature of different disciplines is different. Therefore, it is not justified to analyze them on the same criteria, which were originally made for pure disciplines. Now new disciplines have emerged. Majority of them are inter-disciplinary and multidisciplinary in nature and do not fulfill these criteria. In this concern, M.S. Sodha (2010) remarks “What you do is more important than what is your address.” Therefore, instead of evaluating disciplines on the same rigorous criteria, we should try to judge their utility in order to give them academic respectability. If we do so, many emerging disciplines like education, management, medicine, poultry farming, and home management etc. can achieve the
respectable academic identity due to their huge importance in daily life affairs. These
disciplines believe in sharing of knowledge, in crossing the boundaries, in rubbing the
lines and in breaking the walls just for making them better and better servant of
society.

Each discipline has distinct nature. Education is not mathematics, nor is physics
literature, so we should not seek to find criteria for identifying common elements in
elements and they are different from each other on the basis of some other elements.
While distinguishing a discipline from the other, we should consider the total set of
elements characterizing a particular discipline. This total set of elements would
definitely be unique for each discipline.” For e.g., Education shares/borrows subject
matter from different foundational disciplines but when we see subject matter of
education in totality, it is unique and distinct in itself and cannot be replaced by any of
the foundational disciplines. Therefore, we should not try to judge different
disciplines on the same standard. Solitis rightly remarked (when could not find the
adequate answer for the question of identifying the discerning features of an academic
discipline) ‘we can continue our discussion of subjects and subject matter without
definite answers to these questions. For we can speak neutrally of a subject as the
name given to any body of knowledge, whether that body be large or small, highly
organized or not, traditional or new, etc., and this neutrality will allow us to apply our
ideas to any and every conceivable subject, past, present, and future.’ Keeping in view
the shortcomings of existing criteria, an effort is done in the next section, to deduce
suitable criteria from the different criteria discussed above.

5.5.0 Deducing suitable criteria from the criteria discussed

Analysis of different criteria reveals that there are some misconceptions regarding the
nature of disciplines. Therefore, before selecting suitable criteria to analyze education
as a discipline it is necessary to review these criteria and interpret them adequately.
Before deducing suitable criteria it is necessary to clear the misconceptions associated
with the nature of a discipline:
1. The terms ‘borders’, ‘boundaries’, ‘territories’, ‘kingdoms’, ‘empire’, and so on are frequently used while defining a discipline. In some of these definitions, knowledge is almost treated like a geographic territory over which one can fight and which can be controlled by ‘disciplinary factions’. There are lots of overlapping jurisdictions and constantly shifting and expanding knowledge formations. Disciplinary boundary lines would be nowadays much harder to draw and this has already led to the creation of genuinely studies, which combines a large no. of subjects. Therefore, majority of disciplines are not purely autonomous or independent in terms of content, research methods, terminology, theory etc. Each discipline share with or overlap other discipline in some or other way.

2. Rigour or rigidity in a discipline does not give it more respectable academic status. In fact, such rigidity becomes barrier to free thinking. Knowledge of a discipline should be taught considering it a coherent body of total available knowledge. Coherence makes it easier for students to learn and understand a discipline. Contradictory knowledge claims or fragmented knowledge is simply far more difficult to digest and far less compelling. Coherence has therefore a major effect on the attitudes of students towards learning and their educational success.

3. Nature of different disciplines is different but they have their own value and scope. No discipline can be regarded as more or less important as other disciplines. So, any discipline whether pure, applied or practical are equally important.

4. New disciplines evolve due to explosion and specialization in a particular branch of knowledge or when two branches of knowledge merge with each other to generate a new hybrid discipline. Therefore, it is natural to share content, method and theories with parent discipline. It can be compared with cell division in living beings. During the mitotic division of the cell new cells produced by division of the nucleoplasm and cytoplasm of the parent cell, these daughter cells retain the characteristics or genetic composition of the parent cell. While in the meiotic cell division new combination of characters developed in the offspring. Similarly, A parent discipline or two or more disciplines give birth to a new discipline when,
due to specialization of knowledge, the old ones are not able to deal with particular area of knowledge. For e.g. biochemistry evolved from biology and chemistry retains the characteristics of its parent discipline but is different in scope and object of research.

It can be concluded from the above points that in spite of sharing and overlapping, each discipline maintains its unique identity because disciplines are different from each other in their nature, objectives, object of research, and specific attributes. No discipline can take the place of another. For e.g., Biology cannot be considered similar to physics or chemistry. Similarly philosophy, sociology, psychology cannot be taught as an alternative to education in teacher education colleges. It was also found that while discussing the criteria of characterizing a discipline majority of scholars do not use the terms like own method, own unique content and own theories. Instead, they use the terms like structured subject matter or organized body of knowledge, mode of thinking, a suitable/ accepted/ recognized set of procedures/ techniques and tools etc. These terms clearly show that having own content or method does not mean that content or method must be totally independent or autonomous or there should not be any overlapping or sharing. Instead, the content should be wisely adapted and well organized. Similarly, a discipline should select and modify the methods based on nature of the problem under study. Therefore, borrowing or sharing is not a crime but necessary for the growth of a discipline.

In the light of the different criteria discussed and analysed, a general list of characteristics of a discipline would include:

1. A discipline has a recognizable and significant tradition or an identifiable history.
2. It should have a unique mode of thinking or different cognitive framework.
3. Disciplines have a body of accumulated, structured and well organized, specialist knowledge referring to their object of research, which is specific to them and not generally shared with another discipline.
4. Disciplines have theories and concepts that can organize the accumulated specialist knowledge effectively.
5. Disciplines have a specified scope of inquiry and a particular object of research (e.g. law, society, politics), though the object of research maybe shared with another discipline.

6. Disciplines have developed specific research methods or recognized/accepted/suitable set of techniques/tools/procedures for generating new knowledge and validating existing knowledge according to their specific research requirements.

7. Disciplines use specific terminologies or a specific technical language adjusted to their research object.

8. Disciplines have an intimate link with basic human activities and aspirations.

9. Disciplines must have some institutional manifestation in the form of subjects taught at universities or colleges, respective academic departments, community of scholars or professional associations connected to it.

All the above characteristics are generally possessed by all the bodies of knowledge whether old or new, established or emerging, and pure or applied. However, while evaluating a body of knowledge as a discipline, it should not be a precondition to fulfill all of these criteria to the same extent by all the disciplines. Regarding the different nature and different development stages of disciplines, some of them may be more developed or more autonomous in terms of content, theory or methods. While others in spite of having different objectives, field of investigation and social/professional significance may be less developed or dependent on more established ones.

The body of knowledge or subject matter may be borrowed or shared with other disciplines but when it takes its place in new discipline, it acquires a new shape and new meaning, which is unique for that discipline. The knowledge is structured with unity among the parts. This subject matter becomes very own, distinct, specialized intellectual property of that discipline. The knowledge deals in concepts and ideas from a theoretical base. Body of knowledge of a particular discipline involves certain central concepts, principles and theories. For e.g. number, integral and matrix in mathematics and gravity, acceleration and density in physics. A newly evolved discipline initially uses theories and principles of its parent discipline but later modifies existing theories or generates new.
There are many methods available for generating and validating knowledge in various disciplines. Some disciplines may take the honour as originator of a particular method. However, no discipline can generate or validate its knowledge by using one particular method. For e.g. experimental method originated in science but other methods like survey and case study are also used in science. Therefore, disciplines use a particular method or combinations of methods according to their mode of thinking, nature of the problem and objective of the study. A particular method in a discipline is not used in the same way as in another. For e.g., although basic steps of experimental method are common in all the disciplines but control and manipulation of variables and prediction are not possible in Social Sciences as in Sciences. Similarly in psychology ‘case study’ generally refers to ‘clinical case study’ used for abnormal or deviated behavior but in education case study may be used for any child, group or institution. Therefore, disciplines may use common methods but adaptation and implementation of a particular method is governed by the nature of a particular discipline. In this sense, each discipline is unique and said to have its own style of using a particular method for generation of new knowledge and generation of existing knowledge. As the field of investigation overlaps, the methods of investigation also overlap (Yadav, Menon, Kumar 1982) for e.g., psychology studies human behavior in general while education studies behavior of children in specific settings of school, i.e., either in classroom or in playground. Here nature and objective of study may be different but field of investigation is same, so similar methods of study like observation would be used. Similarly, the object of study of different disciplines of social sciences like anthropology, psychology, demography, geography, history, law, political science, sociology etc. is ‘man’. These disciplines deal with human life, human behavior, social groups and social institutions. Therefore, these disciplines use common method of research and incline towards interdisciplinary approach of research.

In this chapter, criteria of a discipline given by different scholars were discussed and analyzed critically. The criteria equally applicable to all the bodies of knowledge were also deduced considering the shortcomings of the existing criteria. In the next chapter,
disciplinary characteristics of education will be analyzed on the basis of the criteria deduced above.
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