

Knowledge and pedagogy:

An essential proposition in response to teacher preparation

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Abstract: In this paper, the researcher will examine various points of view of the different epistemological schools of thoughts in the first section of the paper. This will be followed by the analysis of the knowledge base and pedagogical reasoning in the second section. The third section of the paper will be devoted to examine the modern pedagogical practices which will be followed by the interpretation of the integration process of the content and pedagogy in the fourth section of the paper. The fifth section will reflect the implication of the finding of the study for preparing the successful teacher by making the balance of the knowledge base of teacher and the pedagogical knowledge. The whole paper has a great relevance with regard to preparing teachers for a changing context, because it has dealt with core components of knowledge and pedagogy.

Key words: epistemology; pedagogy; hermeneutics

1. Rationale of the study

Knowledge and Pedagogy both the concepts are philosophical in its origin. These concepts have its roots in the epistemological branch of philosophy. The present century demand an integrated teacher who can shape the inner potentialities of a learner through an integrated approach of knowledge of the content area (Subject) and of the science of teaching. The Jacques Delors Commission (1996) believes that a rethinking of teacher education is necessary, in order to bring out in future teachers precisely, and those human and intellectual qualities will facilitate a fresh approach to teaching. To fulfill the global needs of such kind of teacher, the context for the preparation for teacher today is to be changed. The professional requirement is to be put in the teacher preparation for which the knowledge of the subject specially, the knowledge base of teachers should be very sound that is considered as epistemological clarity — what are the sources of knowledge, formation of knowledge, priority of knowledge which can be put as content in the curriculum. Because, the explosion of knowledge is very fast and quantum of knowledge is so wide and vast. The next step for an equipped teacher is to have the knowledge of the science and art of teaching — that is the pedagogical knowledge. R.N. Tagore refer in this context that — what is to be taught is important but to whom it is to be taught is more important and how a teacher can win over the heart of the child is very important, this is the pedagogical knowledge and skill. Pedagogy is to be intertwined with/interwoven with the knowledge base or content. Lot of works have been carried out on teacher education but very few studies has been conducted on knowledge base and pedagogy to answer the following research questions

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— (1) Do the teachers know the various theories of knowledge developed by the philosophers of the west and the east? (2) How far these theories of knowledge help to prepare the teacher in the present changing context? (3) How epistemology and pedagogy can be integrated for the preparation of the teachers? Hence, the present research study entitled, “Knowledge and Pedagogy: An essential proposition in Response to Teacher preparation” has been designed with a view to find out the significance and application of an integrated knowledge and pedagogy to make a balance between the two for the purpose of the preparation of teachers for a changing context.

The following are the main objectives of the study — (1) To study the Epistemological Theories developed by the Philosopher of the West and the East, (2) To examine the implication of the theories of knowledge in Pedagogy, (3) To examine the approach for integrating knowledge and pedagogy, (4) To find out the relevance of knowledge and pedagogy in teacher preparation. The study has been carried out by adopting the approach of documentary analysis. The study has a great significance in the modern context of teacher preparation, because the most of the teacher education are concerned with pedagogical aspects hardly they have given importance to the learning experience or the content or the knowledge aspect of the subject, especially, the theories of knowledge are hardly taken into consideration along with the rate and pace of development of the learner.

2. Epistemological schools of thought: Western and eastern

Epistemology is a philosophical discipline, which attempts to supply answers to questions concerning the nature of human knowledge and its validity. Epistemology as a term has its origin in Greek word “Episteme” and logos. Episteme means discussion about knowledge. It studies the nature, conditions and values of knowledge, without deciding before what the consequences of its study would be. It also means a preliminary study of knowledge undertaken, at the very beginning of work of scientific systematization. In broader sense of the term, it means a Science of Sciences. Knowledge played an important role in the field of pedagogy. The pedagogical sciences require the content for teaching. Content is formulated on the basis of knowledge base, i.e., which knowledge is to be imparted and practiced to the learner. Thus, a teacher must have the idea of the basis of knowledge formulation, knowledge identification, knowledge source and the priority of knowledge which are to be transmitted and uncalculated to the learners. Thus, the teacher has to make oneself clear about the epistemological bases of education and then he is to go for the science of teaching. There are various theories and ideas about the origin, source and formulation of knowledge, but it is clear to us that the age of reasoning is the beginning of scientific evolution of knowledge.

The scientific movement in Europe had a strong impact on every corner of European civilization, which was destined in a short few hundred years to transformation completely. But it began slowly, and though in the early seventeenth century it was not yet wide-spread, it was felt by sensitive and intuitive men almost immediately. One of them was Descartes. It is surprising to remember now that his dates were almost the same as Galileo’s (Feibleman, 1990). It appears that Rene Descartes tried to get along with reasoning alone, without appealing to the evidence of the senses or the evidence of practice. His version of experience was derived from human thinking and confined to it. Although, the age of reasoning is considered as the beginning of systematic epistemological basis of the theory building in knowledge, it starts long before the expression of Socrates and Plato who are the rationalist philosopher. According to Rationalism, the self is essentially active and rational. And sensations are

accidents to it. Knowledge, according to rationalists, is actively produced by the self out of its own inner ideas with the help of reason, which is the self's true essence. Socrates and Plato were the earliest rationalistic philosophers. According to them, true knowledge, and the so-called knowledge which sensation and feelings are supposed to give us is variable and never necessary. Rationalism formulated by Socrates and Plato became increasingly articulate in the philosophies of Descartes, Spinoza and Leibniz. The rationalists differ amongst themselves regarding the proper function of sense experience. But all consider knowledge derived through the exercise of reason unaided by observation, as absolutely certain and perfect. Some rationalists reject sense-experience as wholly misleading, and others attach some value to it as giving us imperfect and confused knowledge of things and qualities. The report of our senses is relative to the particular points of view of the individual observer, and as such there cannot be any universal agreement in them. Knowledge derived from sense-experience is different in different minds and varies with the change of time and place. But, true knowledge must be universal and necessary. We possess absolutely valid knowledge whose opposite is inconceivable. The mathematical truths are of this type. No one can question the validity of proportion like "part is less than the whole", A cannot be both B and not- B at the same time etc. Descartes divides ideas into three kinds — adventitious ideas, factitious ideas, and innate ideas. The ideas imposed on the mind from outside or sensations are adventitious. They are not clear and distinct. The ideas created by the mind by the conjunction of ideas are factitious. These are the ideas created by imagination. They are also not clear and distinct. But the innate ideas, which are neither adventitious nor factitious, are clear and distinct. These innate ideas are implanted in the mind by God at the time of our birth. They are self-evident. The idea of causality, infinity, eternity, perfect Being or God and the like are innate ideas. They are clear and distinct. Clearness and distinctness of ideas are the rest of their truth. The development of true knowledge consists in the logical deduction of other truths from these self-evident innate ideas. Descartes, thus, applies mathematical method to philosophy. Paulsen has characterized Descartes' philosophy as mathematical rationalism. Descartes held that some of our ideas are innate, and Spinoza agreed with him. Leibniz maintained that all of our ideas are innate. Every mind is a self-contained world in miniature. Ideas, according to Leibniz, are at first implicitly contained in the mind, and later on brought out and made explicit by mental activity. Leibniz maintains that truths are derived from reason. They are universal and self-evident. Locke, the empiricist, said, "There is nothing in the intellect which was not previously in the sense." Leibniz amends Locke's dictum thus: "There is nothing in the intellect which was not previously in the sense - except the intellect itself."

The thinkers who stress that reasoning or thought is the central factor in knowledge are known as rationalists. The fundamental position of rationalists is that reason is that most trustworthy source of knowledge. They believe that mind has the capacity to discover truth by itself or that knowledge is attained through comparing ideas with ideas. They stress that our sense experience cannot give us coherent and universally valid judgments. Rationalists are of the view that empiricists fail to justify the knowledge about the truths of logic and mathematics. For them, the highest kind of knowledge consists in universally valid and necessary judgments or in other words a priori knowledge which is found in concepts, principles and laws, not just in physical sensations. Plato was the father of this school of thought in philosophy. Reason, in accordance with it is the source of knowledge and sense organs provide raw material and reason gives shape to that raw material. The raw data of sensation must be organized by mind into meaningful pattern before anything worthy of the name knowledge appears.

A sense experience is the major source of knowledge which comes through sense. Modern science is

empirical in methods. Concepts are formed as a result of sense experience. Knowledge comes if sense organs work in favourable environments. This school of thought ignores the creativity of mind. It does not recognize heredity, intelligence and cultural pattern. In the eighteenth century, John Locke argued that human mind is tabularasa at birth. It means it is blank table. A man registers impressions in mind, which comes from the outside world through sense reception. These impressions are ideas. The man, however, is able to grasp and organize and then reorganize these simple ideas into complex ideas. One can thus know directly his own ideas. Human infant unfortunately is born without major sense reception of sight and sound are slow informing any sizeable fond of meanings beliefs at all. The matter of complex ideas is the more interesting part of Locke's view, i.e., complication, abstract ideas and general ideas. According to Empiricists, the source of knowledge is sense-experience. Knowledge is obtained by forming ideas in according with observed facts. Empiricism maintains that we know what we have found out from our senses. One form of empiricism is sensationalism which stresses that knowledge is essentially sensation and that there is no other knowledge. Pragmatism, as a form of "radical empiricism" views that mind is always selective in moulding its experience in accordance with the interests, needs and purposes of organism. It also emphasize in the changing world of experience.

Empiricism is a reaction against rationalism. According to empiricism, all our knowledge is derived from sense-experience. The empirical account of knowledge makes knowledge wholly a product of experience. Sense-experience is the only source of knowledge. Locke revolted against Cartesian rationalism and propounded the doctrine of empiricism in his well-known treatise "Easy concerning Human Undertaking." Descartes established the theory of innate ideas. He thought that a human child is born with such innate ideas which are self-evident truths. Descartes thinks that a correct knowledge of the world is obtained by mathematical deduction of truths from these self-evident principles. Locke severely criticizes Descartes' doctrine of innate ideas. After refuting the doctrine of innate ideas, Locke establishes empiricism. He maintains that mind at birth is a *tabula rasa* upon which experience writes. Mind is like a clean state in the beginning. It has no innate ideas. Mind receives ideas from experience. Experience is two-fold — sensation and reflection. Sensation is the outer perception. Sensation is the source of our knowledge of the external objects. Reflection is the internal perception. Reflection is the source of our knowledge of the internal states of the mind. Sensation is the beginning of all knowledge, and all our ideas are ultimately reducible to sensory experience. The child gets his first ideas from sensation. Then he reflects upon them. Descartes maintains that mind always thinks even before it is furnished with sensations. Mind can think independently of sensations. But Locke maintains that the mind cannot think before it has sensations. The mind is passive in receiving these sensations. After passively receiving the sensations, the mind actively compares them either one another, combines them into complex ideas, and forms general ideas out of particular ideas. The famous dictum of Locke is, "There is nothing in the intellect which was not previously in the sense." Knowledge is posterior after experience. The empirical account of knowledge advocated by Locke has come to be known as the a posteriori theory of knowledge. Locke defines knowledge as the perception of agreement and disagreement of our ideas. If knowledge is defined in this way, it is evident that the mind cannot know things immediately. Mind can only have an indirect knowledge of things through the ideas it has of things. Our knowledge therefore, is real only so far as there is conformity between our ideas and the reality of things. Hume developed Locke's empiricism to its logical extreme. Hume is an empiricist in the truest sense of the term. Hume denies the existence of matter, mind or soul and God as substances, because these are not given in our sense-experience. According to Hume, all knowledge comes from impressions and ideas. Impressions are lively

perceptions. Ideas are faint and indistinct copies of impressions. Hume says, "All the perceptions of human mind resolve themselves into two distinct kinds, impressions and ideas. The difference between these consists in the degrees of force and liveliness with which they strike upon the mind. Those perceptions which centered with most force and violence, we may name impressions; and under this name I comprehend all our sensations, passions and emotions, as they make their first appearance in the soul. By ideas I mean the faint images of these in thinking and reasoning." Hume advocates thorough-going empiricism. Our knowledge does not owe anything of intellect. Discrete impressions and ideas are automatically which are contiguity, similarity and causality. These laws of association are purely subjective. Discrete impressions and ideas do not require any a priori forms of reason to connect them with one another.

Both rationalism and empiricism are one-sided and extreme theories. None of them give us a satisfactory theory of the origin of knowledge. Rationalism is partly right when it emphasizes the necessary character; and universality of knowledge as found in science and mathematics. Universal knowledge cannot be derived from sense-experience. But rationalism was wrong in accepting innate ideas. If knowledge is nothing but analytical deduction from innate principles, then there cannot be any progress in knowledge. So the empiricists are right in emphasizing the part played by sense experience in the acquisition of knowledge. True knowledge must be universally valid knowledge and at the same time it must contain an element of novelty. Immanuel Kant seeks to reconcile the opposite theories of rationalism and empiricism. Kant propounded the doctrine of criticism which is a synthesis of rationalism and empiricism. In the first phase of his life Kant, like most German philosophers of the time, was a rationalist and Hume's scepticism awoke Kant from his "dogmatic slumbers". Kant makes a serious enquiry into the sources of human knowledge, and developed a synthesis of rationalism and empiricism which he named the "critical philosophy" or the "critical theory of knowledge".

Bergson, the eminent French philosopher, is of the opinion that knowledge, empirical or rational, is knowledge of appearances. True knowledge of reality, which lies behind the appearances, can be obtained only through intuition, a unique faculty of the mind. The intuitionist holds that reason is not the only faculty of mind. There is another mental faculty by which we can have a direct knowledge of truth in its entirety. This faculty is intuition.

Bergson maintains that empiricism cannot establish general truths, because empiricism is limited within the confines of space and time. Empirical truths are not beyond suspicion. Rationalism also is not a true theory of knowledge. Reason is discursive and analytical. Reason breaks the reality into isolated parts, into subject and predicate, and cannot therefore give us the true nature of reality. Reason or intellect falsifies reality. Intellect hovers round the facts of reality and has no access into the throbbing heart of the reality. Reason can only give us a part-view of reality. Bergson, therefore, maintains that intuition is the only organ of grasping reality which is dynamic. Bergson defines intuition as the kind of intellectual sympathy by which one places oneself within an object in order to coincide with what is unique in it and consequently inexpressible.

Rationalist philosophers maintain that reason is the only source of true knowledge. Knowledge is given by the clear vision of the intellect or reason only. They do not think that experience contributes anything to our knowledge. Rationalists think that men are born with certain innate ideas, which are self-evident principles. These self-evident innate ideas have their source in the very nature of man's rational constitution and are not derived from experience. Knowledge consists in deducing conclusions or truths from these a priori principles. Reports of our senses are relative to the particular points of view of the individual observer. A posteriori knowledge is different in different minds and varies with the change of time and place. But the contention of the rationalists is

one-sided. If knowledge consisted in deducing conclusions from innate ideas, there would be no progress of knowledge. Moreover, the doctrine of innate ideas has been severely criticized by all empirical thinkers. Empiricists contend that mind at birth is a *tabula rasa* or a clean slate upon which experience writes. Sense-experience is the only source of knowledge. Mind has been compared to a dark chamber with two windows —sensation and reflection which are the only means of communication with reality. Experience gives us only sensations. Empiricists cannot give a satisfactory account of how these discrete sensations are related to one another to form an organized whole of led it to its natural and logical conclusion which is scepticism. Thus rationalism and empiricism both are dogmatic and one-sided theories.

Bergson condemns intellect and regards intuition as the organ of true knowledge. Intellect gives us distorted view of things. Intellectual knowledge is analytical. According to Bergson, reality is a vital or vital surge which is in perpetual flow and flux. Intellect, which gives us a static view of reality, cannot catch the life-pulse of this reality. It is through intuition that we feel at one with this dynamic reality. Intuition is participation in the surge of life. By intuition Bergson means a kind of intellectual sympathy by which one places oneself within an object in order to concede with what is unique in it and consequently inexpressible. But Bergson intuitionism is unsatisfactory. Intuitionism is a kind of feeling which is subjective. It, therefore, cannot yield any universal truth which must be objective. Moreover, truth is first obtained in a flash in intuition, but it requires to be justified by rational arguments. Intuitionism therefore is not a complete knowledge. Kant's critical theory seems to be more satisfactory than the other theories. Kant's main thesis that knowledge is both receptive and interpretative is true and is accepted by most thinkers even now. Reason and experience both are necessary factors in the scheme of knowledge. Reason without experience is form without matter and is therefore, abstract. Experience without reason is matter without form and is, therefore, disorganized. But Kant's theory has also its defects. Kant has formulated a theory which lands him in an epistemological dualism. Kant has not been able to satisfactorily explain how sensation and reason — two opposite things — come to co-operate to give rise to knowledge.

Knowledge seems to be a forced amalgam of sense and reason. Kant has also created a dualism between mind and the world of things-in-themselves. It is Hegel who has emphasized the necessary and organic relation of sense and reason. He establishes the point that sense is not antagonistic and foreign to reason, but homogeneous with it. Both sensation and reason are the expressions of the Absolute, which is the ultimate reality. Therefore, Kantianism as modified by Hegel seems to be the satisfactory theory of knowledge.

Knowledge can be acquired by revelation authority, intuition, the sense or through experience. As different philosophies lay emphasis on different types or knowledge, and so on the basis of it the methods of teaching are adopted. A priori belief will talk of universal knowledge by way of formal training of mind and will thus advocate formal training in the class. Those who believe in a posteriori knowledge will advocate scientific methods, i.e., learning by doing and problems solving situation.

Knowledge explosion is one of the fundamental problems of the day. The expansion of knowledge and its accelerated speed of expansion, put the education to a frightful phenomenon. It is thus natural that either length of schoolings should be increased or some old materials may be deleted to give place to the new one. Any combination or choice between the two can never be a stop-gap arrangement.

There is no sharp break between commonsense and science or between the various sciences, so when a student gains insight into some of the most fundamental structure that cut across many disciplines a base would be

established for the refinement of common sense which may be served as key to truly liberating education. Even when the subjects of study or disciplines are to be taught, in terms of the fundamentals, there is a need to understand the pedagogical considerations some of which lie within the domain of philosophy of education.

3. Organization of knowledge

Science is, in fact, the best established knowledge. Firstly, there can be no limits to what science may study as it is an activity which would be sustained to arrive at such knowledge. It needs to be understood that why in place of one science is so complex and far-reaching that less compartmentalized application is inevitable. Secondly, the range of objects and relations studies by the various sciences are so widely divergent that it is difficult to accept that there would be any principles and methodologies applicable to the entire range. All these seem to be rather paradoxical. If the characteristic of science is an attempt to systematize knowledge in terms of a decreasing number of underlying general principles, then the unity of science is an obvious fact. On the other hand, if no system or through can be both consistent and compatible then the only science is an unobtainable goal. Still many philosophers have tried to arrange various sciences, disciplines inform of knowledge and organizational charts.

Theoretical discipline i.e., mathematical and natural sciences require investigators who are able to reason logically, to deal with obstructions and to build comprehensive theories. The objects of study must be posse at least relative permanence and uniformity. On the other hand, theoretical disciplines are concerned with subject matter capable of change or attention. Subject matter dealing with human character and social institutions has necessary characteristics. Aristotle puts ethics, politics and education in it. The persons dealing with it need certain skills and abilities that differ from theoretical investigation. (1) Formal Science-logic and mathematics; (2) The Organic Science-Physics and Inorganic Chemistry; (3) The Biological Sciences — Zoology and Botany; (4) The Homeneological Sciences — Psychology and Sociology — Professor Elizabeth Steines. Maccia used these terms as social has the difficulty of ruling out the psychological with emphasis upon individual and psychological has difficulty of including social; (5) The ideological Sciences — History and Ethics.

The one obvious link is the teaching act. Teaching is a productive and practical discipline – an art and applied science, having structure of its own. One needs to understand the fundamental principles, conceptions and procedures. Preparation for teaching consists of matter, under the guidance of subject specialist, of the subject or subjects to be taught, plus mastery under the guidance of specialists in psychology of learning, of the principles and techniques of programming. But such preparation would be needed only by an elite group: The ordinary class room is to be managed by the trained mechanic, who would use the programmer prepared by the elite. However, one thing needs to be properly understood that the structure of teaching in discipline are at least as complicated as the structure of any of the discipline to be complicated as the structure of any of the disciplines to be taught. One cannot assume that there are some short cuts to their mastery and the group of its fundamental is not important. One must understand that theory of learning is inadequate substitute for their teaching and that an adequate theory of teaching can be formulated only in the light of comprehensive theory of education. A proper preparation for teaching thus include a cognitive-emotional group of education as the process of personal development as a

socio-political institution and as the science and art of teaching as well as the physical mastery of the individual instructional technology.

For Charvaka school perception is the only testimony. Originally they equated visibility with perceptibility but afterwards they widened its scope and maintained five types of perception based on our five senses.

Perception is further divided into two categories — external and internal. External perception comes through the contact of external sense with objects. Internal perception depends upon external perception. Inner actions of the mind are based upon the material received through external perception. But all perceptions are not authoritative and authentic. Some perceptions are but illusions.

Like other philosophical schools, the Jainas have also critically examined the valid sources of knowledge. But Nyaya is a distinctive feature of the Jaina system. According to Jaina philosophers' knowledge is of two kinds, viz., Pramana and Nyaya. Pramana refers to the knowledge of a thing as it is. Nyaya is the knowledge of a thing in a particular context or relationship of the knower. Nyaya, in other words, is that particular standpoint from which we deliver our judgment about a particular thing. Nyaya also differ with differing standpoints. Thus every Nyaya gives us relative knowledge. According to the Jainas, every thing possesses an infinite number of qualities (dharma). When we affirm a thing by one of these manifold qualities, we apprehend Nyaya. But when we know a thing in different qualities, this knowledge comes through Pramana. Thus both Pramana and Nyaya are essential for the full and true knowledge of a thing.

Though Buddha was himself absolutely rational and tried to prove everything by reasoning, yet he kept silent regarding some philosophical questions and refused to discuss some other problems. It is on these issues and problems that the later Buddhist philosophers very much differed from one another and presented widely different opinions. One finds the seeds of positivism, phenomenalism and empiricism only in the philosophy of Buddha. His views can be called positivist, because according to them one must try for the progress of this life in this very world. It can be called phenomenalism since according to Buddha we can have definite knowledge of only those objects which are subject to empirical experience. Thus some have called Buddhist philosophy empiricism, because according to it experience is the only proof of knowledge. Regarding the ultimate reality some philosophers interpreted Buddha's approach as agnostic while others explained it a mystic and even transcendentalist. Those who interpreted Buddhist philosophy empirically called him agnostic, because according to empirical principle the knowledge of imperceptible things is impossible. Buddha sometimes referred to such knowledge which cannot be known by rational argumentation due to being worldly. Buddha has accepted prajna as the ultimate knowledge. Prajana is beyond the senses. Hence some philosophers interpreted Buddha's philosophy as transcendentalism. Buddha has referred to such knowledge which cannot be proved by experience or logic, which is not subject to worldly thoughts, nor can be described by words. On this basis some philosophers have interpreted Buddha's philosophy as mystic.

A significant contribution of this system has been the theory of knowledge. According to this system, only three independent sources of knowledge (valid) are admitted. These are: (1) Perception, (2) Inference, (3) Scriptural testimony (Sabda).

3.1 Role of sabda or testimony

Testimony means authoritative statement gives us the knowledge of objects which cannot be known by perception and inference. It is of two kinds: (1) Laukika, (2) Vaidika.

Laukika is testimony of ordinary trustworthy persons. It is not reliable. The Vedas gives us true knowledge

about supersensuous realities which cannot be known through perception and inference. The Vedas are infallible and possess self evident validity. The Vedas are not of personal origin but not eternal. As such the Vedas are impersonal. Yet they are not eternal since they arise out of the spiritual experiences of seers and saints, and the conceived by a continuous time of instruction from generation to generation.

Knowledge is dependent upon three things – pramata, prameya and pramana. There are three pramanas — (1) perception, (2) inference, (3) testimony or sabda. Perception is of two kinds — (1) nirvikalpa, (2) savikalpa. Inference has two distinctions — (1) vit, (a) purvavat, (b) samanyatodrasta, (2) avita. Testimony has two distinctions — (1) Laukika or of this world, (2) Vedic.

Among the systems of Indian philosophy, Nyaya has specialized in the field of logic and epistemology. In Nyaya epistemology knowledge has been explained as the manifestation of objects. Knowledge enlightens its objects as does a lamp. Knowledge has two distinctions — valid (prama) and invalid (aprama). According to Nyaya, valid knowledge is defined of real knowledge and it consists in knowing the object, as i. for example to know the snake as a snake and the bowl as the bowl. Valid knowledge has four distinctive sources viz., perception, inference, comparison and testimony. Knowledge arising from sources other than these is called invalid or aprama knowledge.

Epistemology — Knowledge is the manifestation of objects. There are two distinctions of knowledge — Valid and invalid. There are four forms of valid knowledge — (1) Perception, (2) Inference, (3) Comparison, (4) Words.

Perception — Perception is knowledge that arises out of the proximity of object and sense organ. Perception has two forms — (1) Ordinary, (2) Extraordinary. Ordinary perception has two forms — (1) External, of five kinds, (2) Mental, or (1) Determinate, (2) Indeterminate and (3) Recognition. Extraordinary perception has three distinctions — (1) Perception of classes, (2) Perception by complication, (3) Intuitive perception.

Inference — Inference is the means to ‘anuma’ knowledge. There are two forms of inference — (1) For self, and (2) For others. Inference for self has three steps or propositions — (1) Paksha, (2) Sadhya and (3) Hetu. In inference for others there are five propositions — (1) Pratijna, (2) Hetu, (3) Drastanta, (4) Upanaya, (5) Nigamana. Inference has three kinds according to the method by which the kind of vyapti is established — (1) Kevalanvayi, (2) Kevalavyatireki, and (3) Anvaya vyatireki.

Comparison — Knowledge arising out of the relation between a name and the object so named is called comparison.

Words — Sabda or words constitute a reliable statement. It is divided into two on the basis of meaning — (1) Drastarth (2) Adarstartha. It has two distinctions according to the origin of the word — (1) Vedic, (2) Laukika (ordinary).

3.2 Sources of knowledge

In Nyaya, perception, inference, comparison, and testimony have been accepted as the four sources of valid knowledge. Vaisesikas accept only two, perception and inference, as the sources of knowledge. Both comparison and testimony are included in inference.

Perception — According to Nyaya there are five kinds of perception concurring with the five kinds of sense organs – visual, tactual, auditory, olfactory and gustatory. But Vaisesika accept only visual perception.

Samavaya — According to Nyaya philosophy, the knowledge of samavaya can be had through perception. But according to the Vaisesika view samavaya is known by inference.

Hetvabhasa — According to the Nyaya there are five kinds of fallacies. On the other hand, Vaisesika accept only three fallacies.

When we receive the knowledge of an object through any source, then the question with which we are confronted is that is this knowledge in itself valid or is their need of any other proof if its validity? Does every source independently provide knowledge and is that knowledge in itself valid, or is it that one source generates knowledge while another gives evidence of its validity? Pramanyavada is aimed at a consideration of this very question. Nyaya philosophers support the extrinsic validity (paratahpramanyavada) while in the Mimamsa the theory of intrinsic validity (svatahpramanyavada) is given greater credence. Two main principles are involved in the theory of intrinsic validity or svatah pramanyavada — (1) The validity of knowledge is present in the material that creates the object. (2) The awareness of the validity of knowledge arises simultaneously with knowledge itself. *Epistemology* — Prama, caused by pramana, is the knowledge that provides experience of an unknown element. *Distinctions of Valid knowledge* — (a) Direct, (b) Indirect — (1) inference, (2) comparison, (3) testimony, (4) postulation, (5) non-preception.

Theory of intrinsic validity — This philosophy accepts the notion of intrinsic validity. According to Prabhakar, validity of knowledge is proved by its being self enlightening. According to Kumarila Bhatta, validity is imparted by knowability, while according to Murari Misra, validity is determined by anuvyavasaya. The Mimamsa philosophers criticize the Nyaya concept of external validity.

In the Advaita philosophy, epistemological considerations are secondary importance. Prama means the

knowledge which is uncontradicted. Such knowledge is valid. There are three pramanas — (1) Perception, (2) Reasoning or tarka, (3) Sruti or scripture. It agrees with Nyaya on the subject of comparison, testimony, postulation and non-perception. The identity of the subject and object consciousness by chitta concomitance adopting the form of the external object is perception. Tarka or reasoning and inference is the knowledge that arises on the basis of vyapti, the result of past experience. Scriptures are independent evidence.

3.3 Means of knowledge

On the basis of Nyaya Shastra, Swami Dayananda, lists the following:

(1) The Veda and nature of God, (2) Laws of nature, (3) The practice and teaching of Aptas, i.e, the pious and the learned men, (4) The purity and conviction of one's soul. What is good for you is good for the world. What is painful to you is painful to others. Therefore, this should be the guidance principle of one's conduct towards others, (5) There are eight kinds of evidence, i.e., ① Direct Cognizance, ② Inference, ③ Analogy, ④ Testimony, ⑤ History, ⑥ Deduction, ⑦ Possibility, ⑧ Non-existence or negation.

The whole emphasis of Indian Philosophy i.e., Hindu, Buddhist, Jain, Islam or Christianity, is on the attainment of Parmartha (Supreme value) namely the realization of God, Allah, Atman, and Brahman or Atmjnana (self knowledge) or the attainment of Nirvana of the Buddhists. The Indian Philosophy aims at the development of the individual discovery, training and utilization of his special talents. Thus, all true development is self development. The Hindu Philosophy lays special stress on Dharma, Artha, Kama and Moksha. Dharma is eternal and it should not be abandoned. India is having a cultural unity. Sacred shastras define it as one region. Not only that but the entire world is one family. An important contribution of Nyaya philosophy is concerned with the conditions of correct thinking and the means of acquiring true knowledge of the Reality. Another aim is to develop logical thinking and to inculcate rigorous criticism in its students. But the outstanding goal remains the liberation of an individual. Nyaya, also seeks the conditions and the methods of true knowledge. This system also elaborates sixteen philosophical topics.

The Agnostic philosophy, i.e., Jain, Buddhist, Sankhya, did contribute towards sacred and secular system of education. They were able to build up a scientific theory of education. If Vedic system centred around the sacrifice then the Buddhist was in the hands of the monks. Jain philosophy is on the basis of common sense, realism and pluralism. Avoidance of injury to all life is the fundamental principle. Great sanctity is attached to all life and this leads to great respect for the opinion of others too. This philosophy dislikes the dogmatic claim of each thinker that he alone is right like the Neo Realists in America, who had protested against philosophical speculations. Sankhya, is the most significant system of Philosophy that India has produced. This thought pervades all the literature of ancient India including Sruties, Samahties and Puranas. This aims at a right knowledge of Reality by the enumeration of the ultimate objects of knowledge. This system recognized only two kinds of ultimate realities, namely spirit and matter or Purusa and Prakriti. If, we examine the epistemological theories of Indian Philosophers (orthodox and heterodox) we find some commonalities. Rabindranath Tagore is the one who has integrated the past with the present, the Buddhistic ideals with the Sankhya and Upanishadic views. He has made a synthetic approach between the east and the west so far theory of knowledge is concerned. He made an integrated approach for the human kind. Rabindaranath Tagore, has been called, 'the supreme reconciler, harmonizer and peacemaker in the domain of modern thought, because the principle of harmony was so clearly

pivotal to his philosophical outlook. The principle of harmony and 'rasa', the aesthetic sense, pervaded all his life experiences. Tagore was a follower of Anandyoga the aesthetic path in achieving growth in consciousness. The path (yoga) was joy filled (anand) because it elicited from him consistent creativity. The whole man enters in to the work of creative expression. Art is the creation of the human personality because personality brings to consciousness the individuals' relationships to reality. (Knowledge is to know things in their relatedness). To know reality in its relatedness is to know the truth of things, and to have knowledge of things is to know them in their relation to the greater universe. Thus, personality for Tagore, is a category of human consciousness. Personality, discloses relationship and creativity expresses this reality in art when one functions on a higher level of consciousness.

4. Implication of epistemology in pedagogical sciences

In the preceding section, a brief survey has been made so far the epistemology of the east and the west. Now, we are to examine the implication of epistemology into pedagogical sciences. Education has something to do with knowledge; thus education is going, explicitly or implicitly, to have something to do with a theory of knowledge, with epistemology. The epistemological view highlighted by ancient Greek philosopher, especially, Socrates, Plato and others have exercised a lasting influence. They have cast a long shadow in the field. Indeed, Richard Peters, in his introduction to Paul Hirst's book *Knowledge and the Curriculum* says that Hirst is the first curriculum theorist since Plato to make any significant contribution to the subject. Plato's educational theory has a number of strengths in particular its anti-empiricism, its stress on understanding and its recognition of the need for students to be actively involved in the learning process. There are some enduring weaknesses in the theory. The stress on insight leads to a closure and absolutism about intellectual endeavour. This is to be avoided in favour of openness and fallibilism. Nowhere does Plato provide criteria for assessing rival claims to insight. Epistemology has to be good, it attended to, it will inevitable be put to use in practical programmes and in the creation of educational theories. Plato, Augustine, Aquinas, John Henry Newman, Alfred North Whitehead are just some of the classical figures for whom this claim is clearly true. In contemporary philosophy of education Paul Hirst at Cambridge, Israel Scheffler at Harvard and Paulo Freire, the once exiled Brazilian, all see that epistemology is the way to bring rigour to their theorizing, and relevance to their proposals for the practical conduct of education. Teachers are involved in the process of producing, transmitting and justifying public knowledge. They do this explicitly via the curricula and implicitly via the hidden curricula. Course content, teaching styles, grading procedures, power relations entered into, are all means whereby the school makes its contribution to the consciousness of students and to the store of public knowledge, public values, public culture. School children recite the Lord's Prayer; line up at assemblies ; salute the flag; attend History and English lessons; put on musicals; go on excursions; join cadet corps; segregate according to sex to use toilets, participate in sport, and attend certain lessons; hand work to teachers; sit exams and gain certificates. No important epistemology has ever been proposed which ignores scientific practice and the process of theory appraisal in science. Aristotle, Francis Bacon, David Hume, Immanuel Kant all based their epistemology upon an understanding of science. Although difficult, and prone to error, this procedure is a wise one. Much contemporary Anglo-Saxon epistemology is simply aberrant in this respect. It is a departure from the great tradition. It is of particular note that Paul Hirst's "Forms of Knowledge" theory, so influential in British philosophy of education, is altogether bereft of considerations of the history and philosophy of science.

Before we get into the pedagogical implication we are to clarify the operational definition of the concept pedagogy. The term pedagogy is used in the sense of the “science of teaching” (OED). Although, pedagogy is considered a science or an art is still under debate. Thus, in the present study, pedagogy will refer strategy of teaching or art of teaching also. It will be used in a very wider perspective and in a very comprehensive way, because education as a science was first used by Alexander Bain in 1879 since then less and less has been heard of this claim (Simon, 1999). The pedagogy followed by Socrates was question answer. Aristotle adopted inductive and deductive procedure, while Hegel used the logical measuring procedure. Descartes used to simple to complex method. Pragmatic Philosophers used to use the process of continuity by adopting experimental procedure. The content of knowledge is no doubt past but its reference is always future. The knowledge of an engineer is what he has studied about the experiences of others but he uses this knowledge in planning the construction of the roads, bridges, buildings, etc., and in executing his plans. Knowledge which is not used, is not knowledge at all. The pragmatist assumes the continuity of past and future. He holds that knowledge of the past is desirable so far as it is helpful in forecasting the future. Continuity means there is no fundamental difference between the knower and the thing known. Knowing is the process by which one experience gives meaning to another experience. One experience leads to another experience which in its own turn will lead to some other experience. The process goes on continuously. The Indian epistemology has also its pedagogical implication. The Jainism recognizes the importance of learning and training. There are five means of knowledge — Mati, Sruta, Awadhi, Manahaparyaya and Kevla. The last three belong to tapasvina. Mati and Sruta indicate sense — contact, lecturing, dialogue, discussion, seminar, visits and tours as techniques of teaching which may be adopted by a teacher. Jainism would include ethics, religion and philosophy in the curriculum but will not oppose science. The study of space and five elements are emphasized in Jainism. The Buddhism has also practiced its epistemology in the form of oral teaching, preaching, repetition, exposition, discussion and debates were all used. The Buddhistic council organized seminars’ to scholars to discuss the major issues at length.

The Shankhya Philosophy recognized a system of teaching for achieving the self conscious principle. This can be achieved by virtue and wisdom, by dispassion and clarity of consciousness. For, “passionate attachment leads to transmigration. Sankhya also recognizes that error has to be removed before supreme wisdom or Mukti can be attained. Error (Viparaya), is of five forms, i.e., Ignorance, Egotism, Passion, Hatred and Attachment, to the body as also to the objects of sense”.

In Nyaya, all learning was based upon the discussion method. Even the four sources of knowledge, i.e., Perception, Inference, Comparison and Trustworthy Testimony were put to the test of objective standards in the shape of discussion of various forms such as Vada Argumentation, consisting of objections and answers, both disputants, however carrying only for truth. The Upanishadic system of teaching was done at that time at all the three levels viz., memory, understanding and reflective. The emphasis was laid on discussions, questioning, induction and deduction. Commentaries, illustrations, descriptions, narrations and practical demonstrations may be easily inferred from the text of Upanishads. Prof. R.D. Ranade has analysed the method of Upanishadic as follows: (1) Engimatic method, (2) Aphoristic method, (3) Etymological method, (4) Mythical method, (5) Analogical method, (6) Dialectic method, (7) Synthetic method, (8) Monologic method, (9) Adhoc or Temporizing method and (10) Regressive method (Pandey R.S., 1997). The Upanishadas fall often into the form of a dialogue, which shows that the method of teaching was catechetical, the method of explaining a subject by an intelligent

and graduated series of questions and answers, anticipating the method of the great Greek teachers, Socrates. The pupils asked questions (there was no lack of boldness in some of them, e.g., Prasana 3b) and the teacher discoursed at length on the topic referred to him (e.g. Kenopanishad, Katha). In these discourses teachers utilized all the familiar devices of oral teaching such as apt illustrations (Prasana, 2) stories (Katha), and parables (Kena, 3) the Taittiriya Brahmana uses the technical terms Parsanin (questionnaire) and Prasana-Vivaka (answer), while the Atharveda knows of Pracachika or expounder (where Nirvachara and Nirukta). The use of discussion as a method of study led to the development of the science of Logic called Vakovakyam, by which Sankara understands Tarka-sastra, the science of disputation. The Brihadaranyaka Upanishada clearly states that education in the highest knowledge depends upon the three process following one another, viz., (1) Sravana (2) Manana, and Nidhidhasana. Sravana is listening to what is taught by the teacher. Manana, is defined as constant contemplation of the one Reality in accordance with the ways of reasoning aiding in its apprehension. Nidhidhasana is concentrated contemplation of the truth so as to realize it. (Bourai, H.H.A., 1993).

From the above brief reference of the implication of epistemology in pedagogy reveals that hermeneutics has occupied an important place in the pedagogical sciences in the west and the east. Hermeneutics refers a theory, a philosophy, a methodology, a view of reality and approach, a hope, a promise, an ideology or a slogan, a batterley... filed of study, a discipline (Gallagher, 1992). Although, there is still no uniformly accepted definition of Hermeneutics, however, we refer hermeneutics as understanding or interpretation, especially as related to language and text, as the subject matter of hermeneutics. If we characterize hermeneutics as a study or a theory of interpretation, we should also note that the paradigm or textual interpretation dominates hermeneutical studies. Thus, we should consider the hermeneutical approach to educational experiences. This Hermeneutics may be of conservative, moderate, radical and critical. Hermeneutics is employed as a means of penetrating false consciousness, discovering the ideological nature of our belief systems, promoting distortion free communication, and thereby accomplishing a liberating consensus. On the other hand, critical hermeneutics is conservative to the extent that it promises to destroy false consciousness rather than to live within it, as radical hermeneutics contends we must. It is conservative to the extent that it expects actually to accomplish an ideology-free situation of consensus.

5. Integration of pedagogy and epistemology

If we wanted to transmit knowledge and help to imbibe the development of mental faculties of the learners, integration of knowledge and pedagogy is essential. A teacher must have knowledge base of the discipline or the content and also must have the knowledge of the pedagogical sciences, such as, which subject and which learning experiences is to be imparted through which pedagogy or through which approach. There is no unified universal pedagogy for all the knowledge base areas. Every branch of knowledge demands different types of strategies and approaches for teaching and for learning. Kathy Cater made an exhaustive study “teachers knowledge and learning to teach” where she has examined the knowledge to teach question, research on teachers’ knowledge, such as, information processing, practical knowledge i.e., personal practical knowledge, class room knowledge, and pedagogical content knowledge. There she has reported that the final approach to studying teacher knowledge represents an attempt to determine what teachers know about their classroom curricular events. There has been recent concern that, the discipline knowledge that many beginning and experienced teachers possess poorly, equips them for this transformation process (see for example, Anderson 1989; Ball, 1988; Buchmann, 1984;

Gomez, 1988). The process, to be sure, is multifaceted and complex. L. Shulman and Sykes (1986) suggested that pedagogical content knowledge includes: understanding the central topics in each subject matter as it is generally taught to children of a particular grade level and being able to ask the following kinds of questions about each topic: what are core concepts, skills and attitudes which this topic has the potential of conveying to students? ... What are the aspects of this topic that are most difficult to understand for students? What is the greatest intrinsic interest? What analogies, metaphors, examples, similes, demonstrations, simulations, manipulations, or the like, are most effective in communicating the appropriate understandings and prerequisites? What students' preconceptions are likely to get in the way of learning?

Tamir (1988) suggests that additional aspects of what he terms "subject matter specific" pedagogical knowledge include a teacher's knowledge of students' interest and motivation to learn particular topic within a discipline, a teacher's understanding of how to make outside-school settings (e.g., museums and laboratories) quality learning environments for special content areas, and a teacher's discipline based knowledge of special needs for testing and evaluating students' work (e.g., practical laboratory tests in science). Inquiry into teachers pedagogical content knowledge has been particularly active since about 1985, and yet it is important to preface a review of representative studies by saying that the work is still in its early stages.

Further, Shulman, L. S. (1999) has made a remarkable contribution in his article "Knowledge and Teaching: Foundations of the New Reform" where the author has explain the knowledge base of teaching and its pedagogical skills. There the author made the following categories of knowledge base:

- Content knowledge;

- General pedagogical knowledge, with special reference to those broad principles and strategies or classroom management and organization that appears to transcend subject matter;

- Curriculum knowledge, with particular grasp of the materials and programs that serve as 'tools of the trade' for teachers;

- Pedagogical content knowledge, that special amalgam of content and pedagogy that is uniquely that province of teachers, their own special form of professional understanding;

- Knowledge of learners and their characteristics;

- Knowledge of educational contexts, ranging from the workings of the group or classroom, the governance and financing of school districts, to the character of communities and cultures;

- Knowledge of educational ends, purposes, and values, and their philosophical and historical grounds.

Among those categories, pedagogical content knowledge is of special interest because it identifies the distinctive bodies of knowledge for teaching. It represents the blending of content and pedagogy into an understanding of how particular topics, problems, or issues are organized, represented, and adapted to the diverse interests and abilities of learners, and presented for instruction. Pedagogical content knowledge is the category most likely to distinguish the understanding of the content specialist from that of the pedagogue (Leach and Moon,

1999). The author has presented a model of pedagogical reasoning and action which includes the components like, comprehension, transformation, instruction, evaluation, reflection and new comprehension.

6. Relevance of knowledge and pedagogy in teacher preparation

Thus, it appears that there is debate and dispute regarding the integration of knowledge base with the pedagogy. No school of epistemological theory is sufficient or complete or perfect so far knowledge formation is concerned. Further, none of the pedagogical models is complete for acquiring and practicing the knowledge and also transmitting the knowledge. We are to do the educational business to help the student to attain the maximum of the knowledge level. Hence, we can make it clear that none of the knowledge system can be redundant. Rather, one is complementary to other, again pedagogical techniques of the east and the west, ancient and the modern are complementary to each other. So an integrated approach is to be made for preparing the teacher by considering all the epistemological and pedagogical theories emerged out from the educational exercises. The present century is the century of cooperative learning. Hence, the teacher education programmer through out the world should be managed and organized in a cooperative manner not in competitive manner. The present study will help the teacher education policy maker to develop such curriculum for teacher education, where the knowledge base of the discipline and of the pedagogical sciences intertwined in a single platform.

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