Intelligence: Concept, Theories: Spearman, Thurston and Gardner; Uses and Limitations of Intelligence Tests

(1) CONCEPT OF INTELLIGENCE

There is no agreement as regards the exact definition and nature of intelligence. Intelligence is the capacity for relational constructive thinking directed to the attainment of some end. In intelligent study of literature, in intelligent running of a house, in intelligent business organization- in all forms of activities, capacity for relational constructive thinking is involved which is directed to the attainment of some end.

Spearman supports our views when he says that intelligence is comprised three abilities which are:

(a) Ability to observe one's own mental processes.

(b) Ability to discover essential relations between items of knowledge whether perceived or thought of.

(c) Ability to induce correlates.

Some more meanings and definitions of intelligence are given a head:

1. **Derivative meaning:** The word intelligence comes from a Latin word which means "cognitive processes."

2. **Dictionary meaning:** Intelligence is "the capacity to accumulate knowledge and put it into use."

Many definitions of intelligence have been given. We can divide them in three

1. **Ability to adjust:** One group of definitions emphasizes that intelligence is the ability to adapt or adjust to new situations. Ross, Burt, Stern, Woodworth, William James and many others belong to this group.

   (i) Ross' view : "Conscious adaptation to new situation is intelligence."

   (ii) Burt's view: "Intelligence is the capacity of flexible adjustment."

   (iii) Stern's view: "Intelligences is the ability to adjust oneself to a new situation."

2. **Ability to learn:** According to another group of psychologists intelligence is the ability to learn. Buckingham, Dearborn, Thorndike, and Colvin belong to this group.

   (i) Buckingham's view: "Intelligence is the ability to learn."

   (ii) Dearborn's view: "It is the capacity to learn or profit by experience."

   (iii) Thorndike's view: "Intelligence is the ability to make profitable use of past experience."

3. **Ability to carry on abstract thinking:** According to this group of definitions, intelligence is the ability to carry on abstract thinking. Spearman, Terman, Binet, Burt, Garret and Gates and Others represent this group.

(i) Spearman's view: "Intelligence is relational thinking."

(ii) Terman's view: "An individual is intelligent in proportion as he is able to carry on abstract thinking.

Comprehensive Definitions of Intelligence:

1. **Wechsler's definition:** "Intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with the environment." According to this definition, intelligence is the global and aggregate capacity with three important dimensions. They are (1) Purpose, (2) Rational thinking and (3) Effectiveness in the environment. This definition seems to combine and extend the above three groups of definitions.

2. **Stoddard's definition:** "Intelligence is the ability to undertake activities that are characterized by (1) difficulty, (2) complexity, (3) abstraction, (4) economy, (5) adaptiveness to a goal, (6) social value, and (7) the emergence of originals, and to maintain such activities under conditions that demand a concentration of energy and resistance to emotional forces." This definition is very comprehensive and seems to be better with wide scope.

What Intelligence is Not?

1. Not knowledge
2. Not talent
3. Not memory
4. Not skill

Characteristics of Intelligence:

1. Innate: Intelligence is an innate, natural power and not acquired.

2. Varies: Power of intelligence differs from individual to individual.

3. Helpful in learning and adjustment: It helps the individual in learning things and making adjustments.

4. Helpful in solving problems: It helps the man to face and solve the complicated and difficult problems and situations.

5. Influenced by heredity: Heredity exercises a good deal of influence on intelligence.

6. Influenced by environment: Environment, training or education affect intelligence. Studies by Freeman and Freeman and Flory, Terman and Merril , Tudenhem, Kephart and Schmidt illustrate this point.

7. Influenced by socio-economic factors: Socio-economic and cultural factors as well as racial differences affect intelligence tests scores. differences

8. Not influenced by sex: There is no difference in intelligence due to in sex.

9. Average intelligence: Intelligence tests have proved that generally children are of average intelligence and ability.

10. Ceases: Development of intelligence ceases towards the middle of adolescence.

11. Relationship between intelligence and knowledge: There is close relationship between intelligence and knowledge. Knowledge that may be of practical use in life may be termed as intelligence. With the help of intelligence knowledge can be acquired but with knowledge it is not possible to develop greater intelligence. In the words of Ross, wisdom is the goal and knowledge is only the means of reaching it."

(2) THEORIES OF INTELLIGENCE

(1) SPEARMAN'S ECLECTIC THEORY OR TWO (NOW THREE) FACTOR THEORY:

This theory was advocated by Spearman. According to him intelligence consists of two factors- one is "g" factor and the other is "s" factor. The "g" factor stands for the general ability and the "s" factor stands for the specific ability. Every individual has one "factor and some "s" factors (or Specific abilities). The "g" factor is always the same for the same individual and the "s" factor varies from task to task. Different individuals differ both in their "g" as well as "s" factors. For doing any activity, "g" factor is always involved and some of the "s" factors are also involved.

Characteristics of 'g' Factor:

1. Universal ability: It is universal ability i.e., it is found in case of all human beings.

2. Inborn ability: It is innate, natural or inborn ability. It is obtained by human beings from birth. Modern psychologists believe that it is fixed at the time of the conception of an individual.

3. General mental ability: It is general mental ability or common ability.

4. General mental energy: It is also regarded as general mental energy of an individual.

5. Used in every activity: It is used in every life activity of human beings. It is essential for all the activities. No activity can be performed without its involvement.

6. Constant: It is constant in the sense that for any individual in respect of all the correlated abilities it remains the same and unchanged.

7. Varies from individual to individual: The amount of 'g' differs (varies) from individual to individual.

8. No influence of learning: It is not influenced or modified by the effect of learning or habitual training.

9. Responsible for success: The 'g' factor is responsible for success of a human being in life.

10. Extent of success: The greater the amount of 'G' factor in an individual, the more successful he will be in life.

Characteristics of 's' Factor:

1. Special ability: 's' factor is called as the specific or special ability of an individual to perform an intellectual activity.

2. Specific activities: It is involved only in specific type of activities which human beings undertake. It is not involved in all the activities.

3. Learned: 's' factor is learned or acquired in the environment. It is not innate or inborn. It is influenced and modified by learning and habitual training.

4. Varies from activity to activity: It varies from activity to activity or task to task in the same individual. Different 's' factors are used by the individual in different types of activities. Thus the amount of 's' factor is not constant in the case of a particular individual.

5. Varies from individual to individual: Individuals differ in amount of 's' ability. The number of 's' factors also differs from individual to individual.

6. Many 's' factors: 's' factor is not one but there may be many 's' factors in case of one particular individual. Different 's' factors are used by the same individual while performing different tasks.

7. Specific mental energy: 's' factors are considered to be the specific mental energy possessed by an individual.

8. Success in particular field: 's' factor is responsible for the success of an individual in a particular field.

9. Amount of success: The greater the amount of 's' factor in an individual, the more successful will be the individual in a particular field.

Educational Implications of Spearman's Theory of Intelligence:

1. Knowledge of general and specific ability: Spearman's theory of intelligence provides knowledge about the general and specific "g" and "s" factor of intelligence of students to guide them in the right direction. An analysis of "g" factor, "s" factor and group factor by the guidance worker can suggest a sound basis on which future learning can be based.

2. Causes of slow progress: Spearman's theory of intelligence is useful in finding out the reasons of slow or unsatisfactory performance of the students inspite of their adequate intelligence. Thus this theory has diagnostic value.

3. Enrichment of curriculum and methodology: Spearman's theory of intelligence states that for understanding human learning and mental processes of memory, thinking, reasoning, problem solving and creativity, etc. suitable modifications are required in our theory of curriculum construction and methods of teaching.

4. Attention to intellectual abilities: The theory explains intelligence in terms of "g" factor, "s" factor and "Group" factor and this enables us to know whether we are paying adequate attention to each of them. If now, how to improve.

5. Enrichment programme: Spearman's theory of intelligence guides us to devise enrichment programmes for the gifted, the creative, the backward or slow learners, etc.

6. Focus of attention: The theory emphasises that "g" factor, "s" factor and "Group" factor should be our focus of attention.

(2) THURSTON'S GROUP FACTOR THEORY OF INTELLIGENCE

Thurston's Group Factor Theory of Intelligence is also known as Theory of Primary Mental Abilities, Multiple Factor Theory of Intelligence, and Factor Analysis Theory of Intelligence. The term 'Group Factor' was suggested for the factors not common to all of the intellectual abilities, but common to certain activities comprising a group.

Thurston's Theory of Intelligence is a midway between Spearman's Two Factor Theory and Thorndike's Anarchic or Multiple Factor Theory of Intelligence. According to Thurston, intelligence is neither the projection of general ability nor of specific factor. He does not recognise the existence of 'g' or 's' factor. He talked about primary mental abilities in mental activities.

In 1938, Thurston gave his theory of intelligence after using 56 different tests ranging from 2 to 20 minutes in duration to 240 students of Chicago University. On the basis of factorial analysis, he found that intelligence is comprised of seven primary mental abilities. Thurston concludes that certain mental operations have a common primary factor that gives them psychological and functional unity and also differentiates them from other mental operations. These mental operations constitute a group. A second group of mental operations has its own unifying primary factor, and so on. In all, there are seven such groups which cover the entire range of mental abilities. Each of these primary factor is independent of others.

Seven Primary Mental Abilities are:

1. Verbal comprehension (V): It is the ability to understand and use verbal relations, words and ideas. In other words it is the ability to use words in planning, thinking and communication.

2. Numerical ability (N): It is the ability to do numerical calculations quickly and accurately.

3. World fluency (W): It is the ability to express in words or to find the words at appropriate time.

4. Memorising ability (M): It is the ability to memorise quickly and accurately.

5. Spatial ability (S): It is the ability to manipulate an object imaginatively in space.

6. Perceptual ability (P): It is the ability to perceive objects accurately.

7. Reasoning ability (R): It is the ability to see relationships in situations described in symbols. It may be inductive or deductive type of reasoning:

(i) Inductive reasoning ability (IR): It is the ability to draw inferences on conclusions on the basis of specific instances.

(ii) Deductive reasoning ability (DR): It is the ability to make use of generalised results.

Provisionally Interpretable Factor:

Besides the seven primary mental abilities, Thurston has given a provisionally interpretable factor which is known as:

8. Problem solving ability (P): It is the ability to solve problems with independent efforts. Thurston believes that the performance of any task will require one or more of these mental abilities. He considered these factors independent and stated that there is no correlation with each other in these factors.

Latest views on Thurston's Theory of Intelligence:

1. **Independence of primary mental abilities:** Research has been conducted to show: Have these seven primary mental abilities no connection with one another? Is there no 'g' amongst them? The answer to this question has already been given that these primary mental abilities are independent of each other. But after analysing the results Thurston found some positive correlation between these factors. It means that there is a general factor also. Thurston admits this in a very cleverly manner by saying there is a second order general factor, that could not be sub-divided.
2. **Absoluteness of primary mental abilities:** Research has been conducted to show: Are these primary mental abilities absolute ? Are they not further reducible? A lot of research has been done to determine the absoluteness of primary mental abilities. Even Thurston and his associates now agree that these abilities are not absolute. These abilities can be further (split) sub-divided. The splitting of erstwhile absolute abilities has led to another theory called Hierarchy Theory, and P.E. Vernon is connected with it. It was, however Guilford who first of all split these abilities and got three dimensions: (1) Products, (2) Operations and (3) Contents.

Application of Thurston's Group Factor Theory

1. Percentile rank and profile of mental abilities: As regards the application of this theory to a testing of intelligence Chicago Tests of Primary Mental Abilities has been found useful for it gives separate percentile rank in each of primary factors for an individual. These percentile ranks are used to make a profile for each person to get an over all view of the subject's mental abilities and disabilities. In this way it is possible to get a clearer picturers of person's mental abilities for guidance. Recent editions of Primary Mental Abilities (PMA) Tests provide I.Q. and M.A. equivalents.This theory has helped in providing such a conceptual work as is useful in making tests of mental abilities dealing with definite categories of mental activities.

2. Diagnostic work and practical guidance: Thurston's tests of mental ability are useful in diagnostic work and practical educational and vocational guidance as they are now reported in global measurement like an 1.0. (Intelligent Quotient) but in profile form.

For our present purpose of educational and vocational guidance there has been two implications of this theory:

(1) Conceptual framework has resulted in clearly specified and defined categories and types of test items.

(2) Several batteries of tests have been constructed on the basis of group factor theory, assigning suitable weightage to each factor.

Limitations of Thurston's Group Factor Theory of Intelligence:

1. Misleading: Thurston used the word 'Primary Mental Ability' but the same was found to be misleading because the factors are in no way psychologically basic.

2. Mental abilities-not independent: Thurston believed that mental abilities areindependent of one another but in reality they are not independent. They are correlated to some extent with each other.

3. Discarding common factor: The weakest link in the Group Factor Theory was that Thurston discarded the common factor. Afterwards he realised his mistake and agreed to the presence of 'general factor' in addition to 'group factors'.

4. Limited conception: Despite the analytical nature of multifactor approach, it is still based on a limited conception of intelligence since little weight is given to social intelligence, mechanical intelligence and to abilities in special fields such as athletic, music and drama etc.

Conclusion:

Inspite of these limitations, Thurston's Group Factor Theory of Intelligence is useful in having a clear picture of person's mental abilities, and thus helps in diagnostic work and practical guidance. Moreover this theory is useful in preparing tests of mental abilities dealing with definite categories of mental activities.

(3) HOWARD GARDNER'S THEORY OF MULTIPLE INTELLIGENCES

Theory of multiple intelligences was propounded by Howard Gardner in 1983 as a model of intelligence that differentiates intelligence into various specific (primary sensory)modalities, rather than seeing it as dominated by a single general ability.

Gardner argues that there are a wide variety of cognitive abilities which are only weakly correlated with one another, despite the close correlations between aspects of intelligence generally measured by traditional intelligence (I.Q.) tests. For example, the theory predicts that a child who learns to multiply easily, is not necessary generally more intelligent than a child who has more difficulty on this task. The child who takes more time to master simple multiplication:

(1) May best learn to multiply through a different approach.

(2) May excel in field of mathematics.

(3) May even be looking at and understand the multiplication process at afundamentally deeper level.

Such a fundamentally deeper understanding can result in what looks like slowness and can hide a mathematical intelligence potentially higher than that of a child who quickly memorises the multiplication table despite a less detailed understanding of the process of multiplication.Gardner articulated eight basic types of intelligence to date, without claiming that this is a complete list. Gardner's original list included seven of these. In 1999 he added a naturalistic intelligence. He also considered existential intelligence and moral intelligence. But he did not find sufficient evidence for these based upon his p articulated criteria.

The theory's eight currently accepted intelligences are as follows:

1. Logical-mathematical intelligence: Logical- mathematical intelligence is the ability to use reason, logic and numbers. It is responsible for all types of abilities, talents and skills in areas related to logic and mathematics. It has to do with numerical ability, such as solving logical puzzles and mathematical problems. It can be divided into components like (1) Deductive reasoning, (2) inductive reasoning and (3) scientific thinking including solving of logical puzzles, carrying out calculations and the like. Professionals like scientists, mathematicians and philosophers are found to have this type of intelligence.

2. Verbal linguistic intelligence: Linguistic intelligence is generally called verbal ability. It is the ability to use words and language. It is the ability to deal with grammar and speech. It is responsible for all kinds of linguistic competence, abilities, talents and skills, available in human beings. Linguistic skills include listening, speaking, writing, storytelling, explaining, teaching, using humor, understanding the syntax and meaning of words, remembering information, convincing someone of their point of view, analysing language usage. This type of intelligence is most visible in professionals like lawyers, lecturers, writers, lyricists, journalists etc. Possible career interests/paths: Interests of people with linguistic ability are: writers, teachers, translators, poets, politicians, lawyers etc.

3. Musical rhythmic intelligence: Musical intelligence, also known as rhythmic intelligence is concerned with the abilities, talents and skills pertaining to the field of music. It may be well demonstrated through one's abilities to produce and appreciate rhythm, pitch, texture, timbre and appreciation of the forms of musical expressiveness. People with musical intelligence have ability to produce and appreciate music. These musically inclined learners think in terms of sounds, rhythms and patterns. They immediately respond to music either appreciating or criticising what they hear. Many of these learners are extremely sensitive to environmental sounds like bells, dripping taps, etc. Musical skills include singing, whistling, playing musical instruments, recognising tonal patterns, composing music, remembering melodies, understanding the structure and rhythm of music. Musical carer paths include musicians, singers, composers, disc jockeys, etc. This type of intelligence is visible in a quite large proportion in professionals like musicians and composers.

4. Spatial/visual intelligence: Spatial intelligence also known as visual intelligence is concerned with the abilities, talents and skills involving the representation of and manipulation of spatial

configuration and relationship. It is distinguished from logical-mathematical intelligence by its concern with orientation in space: map reading, visual arts, and even playing chess. Many persons like painters, architects, engineers, mechanics, surveyors, navigators, sculptors and chess players use spatial intelligence in their fields of work in their own way. People with spatial/visual intelligence have the ability to perceive the visual. These learners tend to think in pictures and need to create vivid mental images to retain information. They enjoy looking at maps, charts, pictures, videos, and movies.

Spatial/visual skills include reading, writing, understanding charts and graphs, a good sense of direction, sketching, painting, creating visual metaphors and analogies (perhaps through the visual arts), manipulating images, constructing, fixing, designing practical objects, interpreting visual images.

Career interests of visual people are: Visual artists, painters, architects, engineers, mechanics, surveyors, navigators, sculptors, inventors, interior designers.

5. Bodily/kinesthetic intelligence: It is the ability to control body movements and handling objects skillfully. It is concerned with the set of abilities, talents and skills involved in using one's bodily or its various parts to perform skillful and purposeful movements. These learners express themselves through movements. A child may demonstrate such intelligence in moving excessively in response to different musical and verbal stimuli or bending different body parts in organised sports. They have a good sense of balance and eye-hand co-ordination (e.g. ball play, balancing beams). Through interacting with the space around them, they are able to remember and process information. Professionals like athletes, dancers, actors and surgeons may be seen to demonstrate a high degree of bodily kinesthetic intelligence in their respective fields.

Bodily/kinesthetic skills: Sports, dancing, physical co-ordination, using bodily language, hands-on experimentation, using their hands to create or build, expression of emotions through the body.

Possible career paths: Athletes, dancers, actors, surgeons, firefighters, artisans, physical education teachers.

6. **Inter-personal Intelligence:** Inter-personal intelligence is the ability to understand others, ie, individuals other than one's self and one's relations to others. In addition its includes the ability to act productively, based on the understanding of others. These learners try to see things from other people's point of view in order to understand how they think and feel. They often have ability to sense feelings, intentions and motivations. They are great organisers, although they sometimes resort to manipulation. Generally they try to maintain peace in group settings and encourage co-operation. They use both (e.g. speaking) and non-verbal language (e.g. eye contact, body language) to open communication channels with others. The knowledge and understanding of others is the quality that is needed for social interactions in one's day to day life. In practical life this type of intelligence is visible among teachers, psychotherapists, salesmen, politicians and religious leaders.

Inter-personal skills are seeing things from other perspectives (dual perspective). listening, using empathy, understanding other people's moods, motivations and intentions, communicating

both verbally and non-verbally, building trust, peaceful conflict, resolution, establishing positive relations with other people.

Career paths: Teachers, counsellors, psychotherapists, salesmen, politicians, religious leaders, business persons.

7. **Intra-personal intelligence:** It is the ability to self-reflect and be aware of one's inner state of being. These learners try to understand their inner feelings, dreams, relationships with others, and strengths and weaknesses. It consists of knowledge of the internal aspects of oneself (understanding of self); access to one's own feelings. Intra-personal intelligence consists of an individual's abilities to know, his self. It includes knowledge and understanding of one's own cognitive strengths, styles and mental functioning, as well as one's feelings range of emotions and skills to utilise one's fund of knowledge in practical situations. In short intrapersonal intelligence helps an individual to understand his own self by providing an insight into his total behaviour-what he feels, thinks or does. Hence it is considered as the most private of the intelligencies that a person possesses. The access to this type of intelligence in an individual is available only through self-expression ie, language, music, visual art and similar other forms of expression. In our practical life this type of intelligence is demonstrated by saints, mahatmas, rishis and yogis.

Intra-personal intelligence skills include recognising their own strengths and weaknesses, reflecting and analysing themselves, awareness of their inner feelings, desires and dreams, evaluating their thinking patterns, reasoning with themselves, understandings their role in relationship to others.

8. **Naturalistic intelligence:** Naturalistic intelligence has to do with nurturing and relating information to one's natural surroundings. It enables human beings to recognise, categorise and draw upon certain features of the environment. It combines a description of the core ability with a characterisation of the role that many cultures value.

Career paths: Careers which suit those with naturalistic intelligence are naturalists, farmers and gardeners.

Other Types of Multiple Intelligences:

9. **Existential intelligence:** Some proponents of multiple intelligences theory propose spiritual or religious intelligence as a possible additional type Gardner in his treatise 'Intelligence Reframed: Multiple Intelligences for the 21st Century, 1999 did not want to commit a spiritual intelligence, but suggested that an existential intelligence may be a useful construct. The hypothesis of an existential intelligence has been further explored by educational researchers like Tupper K. W. (2002). Existential ability is the ability to contemplate phenomenon or questions beyond sensory data, such as the infinite and infinitesimal.

Career paths: Careers or callings which suit those with this intelligence include priests, physicists, scientists, mathematicians, cosmologists and philosophers.

10. **Moral intelligence:** Gardner suggests that it is difficult to come to any consensual definition, but argues that it is possible to an understanding that takes exploration forward. Central to moral domain is concern with those rules, behaviour and attitudes that govern sanctity of life and, in particular the sanctity of human life, and in many cases, the sanctity of other living creatures and the world they inhabit. Gardner argues that researches and writers have not yet captured the essence of moral domain as an instance of human intelligence.

Implications of Multiple Intelligences for Understanding Learners' Variations and their Learning Needs:

1. **Broad vision of education:** Gardner's theory of multiple intelligences entails a broad vision of education. All seven intelligences (logical-mathematical, verbal/linguistic, musical, spatial/visual, bodily/kinesthetic, inter-personal and intra-personal) are needed to live life well. Therefore, teachers need to attend to all intelligencies. As Kornhaber (2001) stated thatIt involves educators opting for depth over breadth. Understanding entails taking knowledge gained in one setting and using it in another. Students must have extended opportunities to work on a topic.
2. **Developing logical and flexible programmes:** Gardner's interest in deep understanding, performance, exploration and creativity are not easily accommodated within an orientation to the delivery of a detailed curriculum planned outside of the immediate educational context. A multiple intelligence setting can be undone if the curriculum is too rigid or if there is but a single form of assessment. In this respect the educational implications of Gardner's work stand in a direct line from the work of John Dewey.
3. **Looking to morality:** We must figure out how intelligence and morality can work together to create a world in which a great variety of people will want to live. While there are considerable benefits of developing understanding in relation to disciplines, something more is needed
4. **Use of different methodologies and activities:** Traditionally the schools have emphasised the development of logical intelligence and linguistic intelligence mainly reading and writing. I.Q. tests focus mainly on logical and linguistic intelligence as well. While many students function well in this environment, there are those who do not. Gardner's theory argues that students will be better served wherein teachers use different methodologies, exercises and activities to teach all students, not just those who excel at linguistic and logical intelligence.
5. **Varied applications:** The application of theory of multiple intelligence varies widely. It runs the gamut from a teacher who, when confronted with a student having difficulties uses a different approach to teach the material, to an entire school using multiple intelligences as a framework. In general, those who subscribe to the theory strive to provide opportunities for their students to use and develop all the different intelligences not just the few at which they naturally excel.

6. **Identifying talented students:** Theory of multiple intelligence can serve as a basis for identifying talented students at an early age.
7. **Development of talent:** The theory can serve as a basis for encouraging the development of their talent.
8. **Culture of hardwork and high quality work:** A Gardner-led study of 41 schools using the theory came to the conclusion that in these schools there was "a culture of hard work, respect and caring-a faculty that collaborated and learned from each other; classrooms that engaged students through constrained but meaningful choices, and a sharp focus on enabling students to produce high quality work.
9. **Implementation of theory:** Of the schools implementing Gardner's theory, the most well known is New City School, in St. Louis, Missouri, which has been using the theory since 1988. The school's teachers have produced two books for teachers, (1) Celebrating Multiple Intelligencies and (2) Succeeding with Multiple Intelligences. Moreover, the principal, Thomas Hoeu, has written Becoming a Multiple Intelligences School as well as many articles on the practical applications of the theory. The school has also hosted four conferences, each attracting over 200 educators from around the world and remains a valuable resource for teachers interested in implementing the theory in their own classrooms. Thomas Armstring argues that Waldr of education organically engages all of Gardner's original seven intelligence. Many schools are currently attempting to construct curriculum based on Gardner's model simply through at additive process. Stein's approach however, was to begin with a deep inner vision of the child and the child's needs and build a curriculum around the vision.

Criticism/Limitations of Multiple Intelligencies Theory:

1. **Ad hoc:** Theory of multiple intelligences is ad hoc. Gardner is not expanding the definition of intelligence. Rather he denies the existence of intelligence as traditionally understood and instead uses the word "intelligence" when other people have used the word "ability". This practice has been criticised by Robert Sternberg, Eysenck and Scarr
2. **No test of multiple intelligences:** Gardner did not provide a test of his multiple intelligences. He originally defined it as the ability to solve problems that have value in atleast one culture, or as something that a student is interested in.
3. **Artistic judgement and not scientific assessment:** However he added a disclaimer that he has no fixed definition, and his classification is more of an artistic judgement than fact. Ultimately it would be desirable to have an algorithm for the selection of an intelligence, so that any trained researcher could determine whether a candidate's intelligence met the appropriate criteria. It must be admitted that the selection (or rejection) of a candidate intelligence is reminiscent more of an artistic judgement than of a scientific assessment.
4. **Ignore connotation:** Gardner argues that by calling logical-mathematical and linguistic intelligences, but not musical, artistic, athletic, etc. abilities, the former are needlessly aggrandised. Certain critics balk at this widening of the definition, saying that it ignores the connotation of intelligence (which) has always connoted the kind of thinking skills that makes one successful in school.
5. **Tautology:** The theory of multiple intelligences has been criticised by Perry Klein as being so unclear as to be tautologous. Having a high musical ability means being good at music while at the same time being good at music is explained by having a higher being musical ability.

6. **Underestimation of effects of domains:** Gardner is criticised for understanding the effects exerted on the various domains of intelligences by processes that define general processing efficiency, such as speed of processing, executive functions, and working memory, and meta-cognitive processes underlying self-awareness and self-regulation. All these processes are integral components of general intelligence that regulate the functioning and development of different domains of intelligence.
7. **Element of subjectivity:** Gardner himself admitted that there is an element of subjective judgement involved.
8. **Criticism around specific intelligences:** A further set of criticisms centre around the specific intelligences that Gardner identified. For example, it can be argued that musical intelligence and bodily (kinesthetic) intelligence are better approaches as talents.
9. **Lack of empirical evidence:** There is insufficient empirical evidence to suppon Gardner's theory of multiple intelligences. His theory of multiple intelligences derives rather more strongly from his own intuitions and reasoning than from a comprehensive and full grounding of empirical research. There is not a properly worked-through set of tests to identify and measure the different intelligences.

Conclusion: Besides certain limitations of Gardner's theory of multiple intelligences it still has had utility in education. It has helped a significant number of eudcators to question their work and to encourage them to look beyond the narrow confines of the dominant discourses of skilling, curriculum, and testing. Gardner's multiple intelligences theory has helped educators to reflect on their practice, and given them a basis to braoden their focus and to attend to what might assist people to live, then it has to be judged a useful addition.

USES OF INTELLIGENCE TESTS:

1. **Education Uses:** Educational uses of intelligence tests are given below:

(i)Selection of courses: Selection of courses for pupils can be made on the bas of intelligence tests. Some subjects require higher order of intelligence and other require low order of intelligence.

(ii)Selection of pupils to school: In good school there is always a rush for admission. All the applicants though eligible for admission cannot be admitted. Intelligence tests help to meet out this difficulty.

(iii)Classification of pupils: Children can be classified into various categories on the basis of intelligence tests. We have children who are of superior intelligence, average intelligence, dull and feeble-minded. Children having the same I.Q. may be grouped together and constitute a class. This will endure the uniform progress and avoid educational wastage.

(iv) Detection of various types of pupils: Various types of pupils i.e. gifted and feeble-minded etc. can be detected with the help of intelligence tests. Moreover causes of backwardness, delinquent and problematic behaviour can be found. Help may be given to them in making adjustments.

(v) Award of scholarships: Scholarships may be given to suitable and appropriate students on the basis of intelligence tests. The Government of India selects some students for the award of scholarships on the basis of intelligence and achievement tests.

(vi) Promotion of pupils: Intelligence tests can be used to promote pupils.

(vii) Prediction of success: Subsequent success can be predicted on the basis of intelligence tests.

(viii) Assessment of teacher's work: Teacher's work can be assessed with the help of intelligence tests. When the achievement of the pupils In a subject does not correspond to the scores of intelligence tests, it indicates that the subject has not been properly taught by the teacher.

(ix) Evaluation of methods and material of instruction: Intelligence tests are useful in evaluating the results of the experiments conducted by a school in the relative importance of different textbooks or with a certain textbooks with extensive reading material.

(x) Educational guidance: Educational guidance can be given on the basis of intelligence tests.

2. Uses in vocational guidance: Intelligence tests may be of great use in vocational guidance. Vocational guidance can be given on the basis of intelligence tests.

3. Uses in army and civil services: Since the first World war intelligence tests are extensively used in the Army. Amy Alpha and Army Beta Tests have been used on lacs of persons. Army General Classification Tests have been used on millions. In India, intelligence tests are used in the selection of army officers. Moreover, they are being used in various competitive examinations.

4. Uses in research: Intelligence tests are very useful for research.

5. Uses in industry: Intelligence tests are very useful in industry i.e. in selection of the employees in industries, in locating workers who require training and to study working conditions which lead to efficiency.

6. Uses in the study of national and racial differences: With the help of intelligence tests we can know the intelligence level of various races and nationalities. Intelligence tests scores show that I.Q. Scores of Germans, Japaneese and Americans are more than those of Africans and Maxicans.

LIMITATIONS OF INTELLIGENCE TESTS:

1. **Shortage:** There is shortage of standardised intelligence tests. The result is that we cannot predict the future success of the child in any educational course or vocation with great certainty.

2. **Not reliable:** Intelligence tests are not reliable. They are not exact measures of intelligence.
3. **Not accurate:** Intelligence tests are not accurate. They contain only a limited number of questions. This is a very crude method for measuring something as subtle and complex as intelligence.
4. **Speed tests:** Intelligence tests put premium on speed. Children who are original thinkers and who can give many original alternative answers are penalised.
5. **Culture bound:** Intelligence tests are inevitably culture bound and favour the children of well educated parents. On the other hand children whose home environment provides little exposure to books, magazines and cultural interests are penalised.
6. **Few abilities:** Intelligence is comprised of many abilities and traditional intelligence tests measure only a few of these abilities. Many of the abilities which are an essential part of intelligence are not measured by intelligence tests.
7. **Partiality:** Once the teacher knows the I.Q. of the child, he tends to see him through his I.Q. Thus he becomes partial.