CHAPTER I

INTRODUCTION

Education is a powerful instrument used by the society to shape the future and mould the next generation. Of all the stages of education, namely: kindergarten, primary and secondary, secondary education plays an important and crucial role in the meaningful development of a child. Secondary education is a period of education planned especially for young people of ages approximately from 15 to 18, in which the emphasis is on the basic tools of learning, expression, and understanding to the use and extension of the tools in exploring areas of thought and thinking, and in exploring and acquiring information, concepts, intellectual skills, and attitudes. It is one which is all the more important because it lays the foundation of the individual’s future education or vocational choices, which determines the future occupational, social or economic positions in the society. Without an efficient and progressive system of secondary education, rich and forward looking university education is impossible.

The major task of school is to educate students and to provide them with the fundamental knowledge and skills deemed necessary for survival and healthy development in the modern world. School achievement is of paramount importance in the present socio-economic and cultural context. The effectiveness of any educational system depends to a very great extent on what students achieve. In
general terms, achievement refers to the scholastic or academic achievement of the student at the end of an educational program. To maximize the achievement within a given set-up is therefore, the goal of every educationist. It is also believed that it is proper to focus on student achievement because this embodies the given goal of schools.

Success in school is usually conceived of as a consequence of mental ability (Brody & Brody, 1976, P.88). Jensen (1973) found that 60 percent of the true variance in individual differences in scholastic achievement is accounted for by individual differences in intelligence measures. Traditionally, intelligence has been regarded as the capacity for acquiring knowledge and skills, while achievement is the knowledge and skills. Intelligence tests measure a wider variety of skills necessary for academic success.

Mental ability test scores are useful in schools for predicting achievement, for placing students in special classes. They can be used for vocational guidance and selection, child guidance, educational guidance, preparing a profile, and diagnosing pupil’s learning difficulties. The use of intelligence tests as a measure of mental abilities has become widespread in schools, clinics and industries, and they have been utilized for different purposes.

Thus, this study is concerned firstly with the student’s mental ability (intelligence) and its relationship with sex, age, and school achievement and secondly to verify the validity of Otis-Lennon Mental Ability Test (OLMAT) (1967) advanced level form (K) (which is one of the important group tests). The
test can be used in the Yemeni environment as that there are no standardized measures, which are applicable to the Yemeni environment.

1.1. DEFINITION OF INTELLIGENCE (MENTAL ABILITY)

Some distinctions in terminology are warranted at this point. In educational and psychological literature, the terms “intelligence” and “mental ability” are often used in an interchangeable manner (Snyderman & Rothman, 1988).

The concept of intelligence is found in the writings of Greek philosophers, Plato and Aristotle, and it predates the birth of Jesus Christ (Walsh & Betz, 1985). The term intelligence is vague and ambiguous in its meaning. Psychologists have been interpreting the term in different ways, and are in disagreement with each other on the meaning of the term, ‘intelligence’.

According to Cyril Burt, the word “intelligence,” originally comes from Latin. It was revived by Herbert Spencer and Francis Galton in the mid nineteenth century as a scientific term, which means “innate, general cognitive capacity” (Snyderman & Rothman, 1988). However, it must be noted that several definitions have been suggested by psychologists but no two psychologists agree on a single definition of the term (Chauhan, 1995).

In the early days of philosophical enquiry, the term intelligence was mostly considered from the narrower point of view of “abstract intelligence”. The early studies of ‘intelligence’ by psychologists in this century were also concerned with
operations of abstract intelligence, or performances of the ‘higher mental processes (Kuppuswamy, 2003).

The term “intelligence” is defined with a wide diversity of meaning, not only by the general public but also by members of different disciplines, such as Biology, Philosophy, or Education, and by psychologists who specialize in different areas. Different scientists have had different ideas concerning the nature of intelligence and how to measure it (Walsh & Betz, 1985), and as to whether intelligence is a general ability or a concatenation of many separate abilities concerning the different theoretical orientations.

Some definitions of intelligence emphasize on the adjustment ability of an individual with his environment. Such definitions are presented by Stern, Pintner, and Piaget. Stern (1921, cited in Anastasi, 1958; Chauhan, 1995) defined intelligence as a general capacity of an individual, to consciously adjust his thinking to new environment. Pintner (1944, cited in Sternberg 1982) defined intelligence as “the ability of the individual to adapt himself adequately to relatively new situations in life”. According to Piaget, intelligence constitutes a state of equilibrium towards which tend all the successive adaptation of sensori-motor and cognitive nature, as well as all assimilatory and accommodatory interactions between the organism and the environment (Piaget, 1971).

Other definitions of intelligence emphasized on the importance of an individual’s ability to learn. Learning ability is an index of one’s intelligence. Such definitions are presented by Goddard, Backingham and Woodrow. Goddard (1946) defined intelligence as “the degree of availability of one’s experiences for the
solution of immediate problems and the anticipation of future ones”. Backingham defined intelligence as “the learning ability”, and Woodrow (cited in Sternberg, 1982) as “the capacity to acquire capacity”.

Some of the other definitions of intelligence have emphasized on the effective use of concepts and symbols in dealing with situations, especially, in presenting a problem to be solved through the use of verbal and numerical symbols. Such definitions are presented by Terman, Spearman, and Binet. Terman (1937) defined intelligence as an individual’s ability to carry on abstract thinking, and to use abstract symbols in the solution of all kinds of problems. Spearman (1923) held that intelligence is essentially the perception of relation, especially the perception of difficult or subtle relations. According to Binet’s concept, in order to behave intelligently a person must have the ability to select, to make judgments and, to criticize any solution that he may have to solve a problem (Robb et al, 1972).

According to Wechsler (1944) “intelligence is the aggregate or global capacity of the individual to act purposefully, to think rationally and to deal effectively with his environment”. Stoddard’s (1943) definition states that “intelligence is the ability to undertake activities that are characterized by (1) difficulty, (2) complexity, (3) abstractness, (4) economy, (5) adaptiveness to a good situation, (6) social value, and (7) the emergence of originals, and to maintain such activities under conditions that demand a concentration of energy and a resistance to emotional forces”.

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Few of the definitions offered by experts have contained a clear commitment about the relative effects of hereditary by defining intelligence as ‘innate general cognitive ability’. Since scores of existing tests have often been shown to be susceptible to environmental influences, a consequence of this definition is that intelligence as defined as innate general cognitive ability differs from intelligence as measured by tests. Psychologists have attempted to escape from this dilemma to adopt an operational definition of intelligence (Butcher, 1988), and this view became very popular in science during the 1930. The definition presented by Boring (1923) is that “intelligence is what these tests measure”, and Sanford’s (1962) definition is, “intelligence is what the intelligence tests test”. Sanford (1962) commented that an intelligence test is a device that confronts an individual with an array of tasks, and the individual responds to the test, and his behavior is quantitatively compared with the behavior of a known population of people who have responded to the same array of problems. We take an individual score to be indicative of the intelligence that consistently characterizes the individual’s behavior (Sanford, 1962).

Vernon (1960) classified all the definitions of intelligence under three broad categories such as biological, psychological and operational.

- **Biological approach-** This category of definitions emphasize the adaptive nature of human beings.

- **Psychological approach-** Few of the definitions advanced by experts contained a clear commitment about the relative effects of hereditary and environmental influences on the development of intelligence.
• Operational approach- Operational definitions are important to understand the concept of intelligence in clear and definite terms.

Freeman (1962) divides them into those emphasizing:

a) Power of adaptation to the environment.

b) Capacity for reasoning.

c) Ability for abstract thinking.

Probably the best-known study of experts’ definitions of intelligence was one done by the editors of the Journal of Educational Psychology, 1921. Fourteen experts have discussed their definitions and their views on the nature of intelligence (Sternberg, 2003). One well-known set of definitions was published in 1986 as an explicit follow-up to the 1921 symposium. Sternberg and Berg (1986) attempted a comparison of the views of experts in 1921 with those of the experts in 1986. They reached three general conclusions:

1. There was at least some general agreement across the two symposia regarding the nature of intelligence.

2. Central themes occurred in both symposia. One theme was, one versus the many: Is intelligence one thing or is it a multiple of things? How broadly should intelligence be defined? What should be the respective roles of biological versus behavioral attributes in the seeking and understanding of intelligence?

3. Despite the similarities in views over the sixty-five years, some salient differences could also be found. Metacognition – conceived
of as both knowledge about, and control of cognition – played a prominent role in the 1986 symposium but virtually no role at all in 1921. The latter symposium also places a greater emphasis on the role of knowledge and the interaction of mental processes with this knowledge.

The term intelligence is used in many contexts, with a diversity of meanings. Although these meanings are not irreconcilable, they certainly emphasize different aspects of intelligent behavior (Anastasi, 1983). All these meanings have contributed to our current understanding of the nature, meaning, and measurement of intelligence.

1.2. CONCEPT OF INTELLIGENCE

Psychologists often distinguish between three kinds or three areas of intelligence activity – the abstract, the mechanical, and the social (Garrett & Bonner, 1961).

- Abstract intelligence is exhibited in our handling of symbols – words, numbers, formulas and diagrams diagrams. The abstractly intelligent person is able to discover the relations among symbols and to solve problems with their aid.
- Mechanical intelligence enables its possessor to deal readily with machines and mechanical contrivances.
• The social intelligence is shown in personal and social affairs. The socially intelligent person is an extrovert, makes friends easily and is tactful and understanding in human relationships.

Psychologists, too, differ from one another in their opinion about the concept of intelligence. There were two different conceptual approaches to intelligence, the psychometric and Piagetian (Kohlberg et al; 1987).

Psychometric approaches: Two psychometric approaches are distinguishable. The first is the classic British biological view of intelligence as hereditary and maturational. This view is represented by Galton (1869), Spearman (1904, 1923. 1930), and Cattell (1972). With regard to the theoretical issue of nature and origin, they believed that intelligence is “an innate, general cognitive ability”. With regard to the issue of assessment of cognitive functioning, the British school developed a method that maximized the chances of observing intelligence as a general biological capacity relatively independent of experience. Since intelligence is conceived of as a fixed capacity by this approach, the educational use of intelligence tests must be for educational selection, not for assessing educational progress or change.

The second psychometric approach is the environmental-learning view (Kohlberg et al; 1987). With regard to this theory, an environmental-learning conception of intelligence is reflected in various American writings. Hayes (1962), for example says that “manifest intelligence is an accumulation of learned facts and skills”. Environmental-learning approach has not provided a clear conceptual distinction between “intelligence” and specific skills of school achievement. The
value of intelligence as defined by the environmental-learning view is relative to its prediction of success in a particular culture (Kohlberg et al; 1987).

The third view is given by Piaget. Piaget’s position is interactionist; it is not a doctrine about the quantitative contribution of heredity and environment to intelligence, but a doctrine about the origins of the structure of intelligence and its development. While he has acknowledged biological rate and environmental learning factors (Kohlberg et al; 1987), Piaget’s (1971) position is that intelligence is the product of the individual’s active construction and interpretation of experience through a process of equilibration. Thus Piaget adds the third factor i.e equilibration, a balance of assimilation and accommodation that represents intelligence as adaptation itself, to already existing two factors, that is (1) biological heredity and maturation and (2) cultural and social learning (Kohlberg et al; 1987). Intelligence is thus only generic to indicate the superior forms of organization or equilibrium of cognitive structuring (Piaget, 1971).

Binet never developed a final theoretical conception of intelligence. He suggested that intelligence is defined by a diverse set of independent abilities. Yet he eventually developed a test of intelligence that provided for the computation of a single index, implying that intelligence was one thing. Binet sought in his tests to measure not an entity or single dimension (general intelligence) but rather an average level of intelligence in general (Brody & Brody, 1976). Binet (1905) believed that there were separate mental “faculties” such as memory, imagination, attention, and judgment. He believed that these “faculties” are only revealed in complex performances calling for a number of these faculties at the same time.
Cattell (1972) presented his view about the nature of intelligence when he distinguished between two kinds of intelligence, fluid and crystallized. Fluid intelligence is reflected from inference and reasoning on tests, that are relatively free of cultural or informational content. On the other hand, crystallized intelligence is manifested in the results of tests that are strongly influenced by the trappings of culture, such as tests of vocabulary, facts, and information. Fluid intelligence is more culture-free than crystallized intelligence and corresponds more closely to Spearman’s “g”.

Cronbach (1970), states that the most promising way to view the nature of intelligence is as a hierarchical structure in which there are broad factors, each of which accounts for performance in a wide range of tasks, and below these, more specific task abilities, that account precisely for the varied tasks in the domain. While there are no mechanical procedures for extracting a hierarchical structure from a correlation matrix, a combination of conventional factor analysis and substantive reasoning can produce a structure that provides a reasonable working hypothesis (Cronbach, 1970).

From the biological point of view, intelligence thus appears as one of the activities of the organism, while the objects to which it adapts itself constitute a particular sector of the surrounding environment (Piaget, 1971).

The other question about the nature of intelligence is, how much of a person’s intelligence – test rating, depends on native and inherited powers, and how much of it can properly be attributed to opportunity and circumstances.
Unfortunately, no exact answer can be given to this often – discussed question (Garrett & Bonner, 1961).

Various methods have been used in attempting to arrive at a quantitative estimate of the relative influences of heredity and of environment on the development of intelligence.

Eysenck (1972, 1979) also estimated that 80 percent of general intelligence is hereditary using the estimates of correlation corrected for attenuation, as described earlier in Spearman’s (1904) work.

The study of Newman et al., (1937) reveals the effect of environment on intelligence and also gives some support to the claim of Cattell (1972) and Eysenck (1972) that 75 percent of the variance in general intelligence is due to heredity.

There are at least three different positions on the influence of heredity in intelligence. The “classical” position which has been reaffirmed in recent years by Jensen (1973) and Herrnstein (1973) suggests that approximately 80% of the variance in intelligence test scores is attributable to genetic differences among individuals. Jencks (1972) has concluded that the best estimate is that genotypic differences explain approximately 45% of the variance in scores. Finally, Kamin (1974) has reviewed the literature on the inheritance of intelligence test scores and concluded that, “there exists no data which should lead a prudent man to accept the hypothesis that I.Q. test scores are in any degree heritable”.

Psychologists today agree that development is shaped by the interaction of heredity and environment. Within this interaction, our genetic endowment for
many characteristics provides us with a reaction range – that is, a range of possible levels that we may ultimately reach, depending on the quality of our experience (Morgan et al; 1997).

A major point to bear in mind is that intelligence is not a single, unitary ability, but a composite of several functions. The term is commonly used to cover that combination of abilities required for survival and advancement within a particular culture (Anastasi, 1986). It follows that the specific abilities included in the composite, as well as their relative weights, vary with time and place. In different cultures and at different historical periods within the same culture, the qualifications for successful achievement differ (Anastasi & Urbina, 1997).

The importance of intelligence and the influence of intelligence on behavior clearly show up, when individuals are confronted with novel or complex situations. Every day observation, however, is not sufficient to determine whether intelligence is a scientifically valid and useful construct (Murphy & Davidshofer, 1998).

1.3. THEORIES OF INTELLIGENCE

While definitions of intelligence generally attempt to indicate how intelligence functions, the theories of intelligence regard the nature of intelligence. Psychologists, too, differ from one another in their description of the structure of intelligence. One group consists of theorists who have studied the organization of
mental ability; their primary interest is in identifying the factor or factors which constitute intelligence.

The second group of theorists has focused not on the component parts of intelligence, but on the processes involved in intelligence activity, that is the processes involved in solving problems, or planning how to remember something (Morgan et al; 1997). The theories in the first group are called factor theories, and the theories in the second group are called process-oriented theories of intelligence.

1.3.1. Factor Theories of Intelligence

Two-Factor Theory

Two-Factor theory was developed by an English psychologist, Charles Spearman in 1904. He proposed that intellectual abilities comprised of two factors, general ability or common factor, called the general factor, or “g”, and group of specific abilities or factors called “s”. Although two types of factors, general and specific, are posited by this theory, it is only the single factor “g” that accounts for correlation. Positive correlation between any two functions was thus attributed to the g factor (Anastasi & Urbina, 2003).

Multifactor Theory

Multifactor theory was developed by E.L. Thorndike, an American psychologist in 1927. According to Thorndike, any mental activity consists of a
great number of very specific elements or factors. Although every mental act is distinct from every other one, some have enough elements in common to warrant their being grouped and classified as: (a) concrete – the ability to deal with things; (b) social – the ability to deal with people; and (c) abstract – the ability to deal with ideas (Dandekar, 1998).

**Thomson’s Theory of Bond**

Thomson (1921) pointed out that the two-factor theory was not the only theory that was consistent with Spearman’s factor-analytic results. He argued that the obtained general factor could be indicative of a mathematical rather than a psychological unity. Thomson (1938) proposed a theory of bonds, in which the mind is conceived of as possessing an enormous number of “bonds,” including reflexes, habits, learned associations, and the like. Performance on any one task would activate a large number of these bonds (Sternberg, 1977).

**Group- Factor Theory**

Thurston (1938) used factor analysis in the process of manipulating test results and discovered that frequently, group factors appear. That is, a selected number of tests seem to contain a limited number of factors, but not a very large number of elementary factors or a universal ‘g’. Thurston tends to discount the ‘g’ factor and the independent factors as being crucial to the structure of intelligence. He contends that a “group-factor theory,” which is based on the correlation of a limited group of tests, is the best theoretical base for discussing intelligence (Robb et al; 1972).
Guilford’s Structure -of- Intellect Model

Guilford (1967, 1988) proposed a boxlike model, which he called the structure -of- intellect (SI) model. This model classifies intellectual traits along three dimensions:

- Operations – what the respondent does.
- Contents – the nature of the materials or information on which operations are performed.
- Products – the form in which information is processed by the respondent.

Since this classification includes $6 \times 5 \times 6$ categories, there are 180 cells in the model. In each cell, at least one factor or ability is expected.

Hierarchical Theories.

Burt (1940) separated statistically four factors of intellect, namely, (i) general factors which are common to all traits, (ii) group factors which are common to some of the traits, (iii) Specific factors that are limited to each trait whenever it is measured, (iv) error factors which are limited to each, on each particular occasion it is measured. He proposed a 5 level hierarchical model which is as follows: (i) Human, mind, (ii) Relational level or general factor, (iii) Associations, (iv) Perceptions, and (v) Sensations.

Vernon (1950) developed another factor analytic view of the organization of intelligence. He conducted extensive research and on the basis of empirical
data, he proposed the hierarchical group factor theory. Vernon’s theory suggests that intelligence tests measure an overall factor “g” as well as two main types of mental abilities. The major group factors are: (1) Ved: verbal, numerical, and educational, and (2) KM: practical, mechanical, spatial and physical. These two major factors can be divided into minor group factors such as mechanical, manual and ultimately, these minor factors can be further divided into various specific factors (Chauhan, 1995).

1.3.2. Process – Oriented Theories of Intelligence.

*Piaget’s Theory*

Piaget’s view of intelligence reflects his background both as a biologist and as a developmental psychologist. Piaget’s theory is the idea that we have two types of heredities – specific and general. Specific heredity is believed to be composed of the biological structures that limit what one perceives. General heredity is described as the inheritance of a “mode of intellectual functioning” that amounts to the manner of dealing with our environment. Two characteristics of intellectual functioning are organization and adaptation. Organization is defined as a system or structure underlying our acts that is motivated toward the goal of maintaining equilibrium. Adaptation is divided into assimilation and accommodation. In the process of attempting to maintain equilibrium, the organism develops cognitive structural units called “schema”. These schemas develop and form interlocking systems with each other, and are classes of similar action sequences (Robb et al; 1972).
Bruner’s Theory

Jerome Bruner (1973) is a process theorist who sees intellectual development partly as a growing reliance on internal representation. Babies, according to Bruner, have a highly action-oriented form of intelligence; they “know” an object only to the extent that they can act on it. Young children know things by perceiving them and are consequently strongly influenced by the vivid perceptual characteristics of objects and events. Older children and adolescents know things internally and symbolically. This means that they are able to devise internal symbols, or representations, of objects and actions and to hold these mental images in mind. Bruner’s interest is in how these growing abilities are influenced by the environment – especially by the rewards and punishments people receive, for using particular intellectual skills in particular ways.

Information-Processing theories

Among the most influential process-oriented approaches to intelligence, are those known as information-processing theories. These theories, break intelligence down into various basic skills that people employ, to take in information, process it, and then use it to reason and solve problems. Robert Sternberg (1984) distinguishes between information-processing “components” and “metacomponents.” Components are the steps one goes through to solve the problem; metacomponents are the kinds of knowledge one has, about how to solve the problem.
1.4. HISTORY OF MENTAL MEASUREMENT

No one actually knows the beginning of the testing movement, but Itard’s study of the “wild boy of Aveyron” may have been the initial scientific investigation in this area. At any rate, this intriguing experiment stimulated psychologists to explore the problems of mental deficiency and mental measurement. In 1838 the French physician Jean Etienne Esquirol, who was interested in the study of mental disorders, made an important distinction between mental deficiency and mental illness. Another French physician Edward Seguin, (1866-1907), was a pioneer in the area of education, and training the mentally deficient. Seguin felt that the retarded could be brought closer to normality by the utilization of special training procedures and techniques (Robb et al; 1972).

There were many scientists, who though experimentally oriented, directed their attention to general problems and theories, rather than to variations and differences in human ability. Among these was Ernst Heinrich Weber (1795-1878) who was educated as an anatomist and physiologist. Weber’s contributions included an exhaustive investigation of the sense of touch. He established a methodological orientation that seemed to demonstrate the possibility of quantifying mental or psychological operations. In fact he succeeded in using a quantified approach to sensations (Brennan, 1991).

Johannes Muller (1801 -1858), a professor of physiology, was especially interested in the physiology of the senses and in reflex action. In his significant experiments in space perception, he attempted to reconcile the opposed theories of
“nativism” versus “empiricism”. William Hamilton (1788-1856) and James Mill (1773 – 1836) were concerned with reformulating more completely and rigorously the classical association theory.

A famous pioneer in the field of psychological testing was Sir Francis Galton, an English biologist. He was interested in intelligence, and he studied individual differences, and the development of techniques for measuring them. Galton, not only stimulated investigation of individual differences, but he also strongly influenced the direction of the experimental efforts to measure intelligence by means of a test for the measurement of the delicacy of weight, for measuring sensitivity to high tones. In addition, he suggested devices for testing visual and auditory discriminations, reaction time and muscular strength. In (1882) he opened a laboratory in London. In this and other laboratories, he collected a wealth of data on individual differences. At the same time his statistical methods and techniques were used by such great statisticians as Karl Pearson and Charles Spearman.

At the same time when Galton was formulating his ideas about human mental ability, the American psychologist Jame McKeen Cattell (1860-1944) completed his doctoral work in Leipzig, Germany. Cattell shared Galton’s view that a measure of intellectual functioning could be obtained through tests of sensory discrimination and reaction time. In an article written by Cattell in 1890, the term “mental test” was used for the first time in the psychological literature. In Cattell’s work we find a convergence of two parallel movements in America: the
rise of experimental psychology and the measurement of individual differences (Anastasi, 1958).

In the 1890s several other psychologists were engaged in testing and related research to find devices or techniques which would provide accurate estimates of mental ability. Among the noteworthy names were Kraepelin, Oehrn, and Ebbinghaus in Germany; and Jastrow, Munsterberg, Boton, Gilbert, and Sharp in the United States, but their efforts to find valid measures of intelligence were unsuccessful, for as we know now, intellectual ability is not highly correlated with simple sensory or motor functions or physical measurements (Robb et al; 1972).

In fact, the next great concrete step in the direction of intelligence tests was taken by the famous French psychologist Alfred Binet. Binet was the first psychologist to devise an acceptable scale of intelligence. He published the first scale in 1905, with Simon’s assistance that was known as the Binet–Simon Scale. He was commissioned by the French Minister of Public Instruction to construct a test that could be used to identify mentally defective children, so that they could be placed in special classes (Thompson, 1977). This scale consisting of 30 problems, was presented as a preliminary and tentative instrument, and no precise objective method for arriving at a total score was formulated. But in the second scale (1908), the number of tests were increased and some unsatisfactory tests from the earlier scale were eliminated. The third revision of the scale appeared in 1911. In this revision, no fundamental changes were introduced.

The Binet–Simon tests attracted wide attention of psychologists throughout the world. Translations and adaptations appeared in many languages (Anastasi,
1988). For example revisions of Binet scale are those of Goddar (1911), Kuhlmann (1912 and 1922), and the point scale of Yerkes, Bridges and Hardwick (1915). In America, a number of different revisions were prepared, the most famous of which is the one developed under the direction of L. M. Terman at Stanford- University (Kamat, 1967). In 1937 Terman and Merrill produced the first Stanford- Binet revision that had two alternate forms, known as forms L and M. the third revision of test occurred in 1960 and resulted in a single form (known as L-M) using the best items from the previous forms L and M (Walash & Bruce, 1985).

The fourth edition of the Stanford-Binet was published by R.L. Thorndike, E. P. Hagen and J. M. Sattler in (1986) and E. Delaney and T. Hopkins in (1987). While retaining the chief advantages of the earlier editions as an individually administered clinical instrument, this revision reflects intervening developments in both theoretical conceptualizations of intellectual functions and methodology of test construction (Thorndike, Hagen & Sattler 1986; Delaney, & Hopkins, 1987).

In 1939 David Wechsler developed successive editions of three intelligence scales, one designed for adults, one for school-age children, and one for preschool children, known as the Wechsler-Bellevue Intelligence Scale. In 1949, the Wechsler Intelligence Scale for Children (WISC) was prepared as a downward extension of the Wechsler-Bellevue. Many items were taken directly from the adult test, and easier items of the same type were added to each subtest. The first edition of the WISC was criticized because its content was not sufficiently child-oriented. In the revised edition (WISC-R), published in 1974 and designed for 6 to 16 year olds, special efforts were made to replace or modify adult-oriented items so as to
bring their content closer to common childhood experiences. The other versions, published under the name of David Wechsler even after his death in 1981, are the Wechsler Adult Intelligence Scale-Revised (WAIS-R), which covers the age span of 16 to 74 years. The Wechsler scales have been translated, adapted, and standardized for use in other languages and in other countries.

The Binet tests, as well as all their revisions, are individual scales in the sense that they can be administered to only one person at a time. Many of the tests in these scales require oral responses from the examinee or necessitate the manipulation of materials. For these and other reasons, such tests are not adapted to group administration. Another characteristic of the Binet type of test is that it requires a highly trained examiner.

Since World War I other types of tests have been developed by a large number of workers. These are group tests. The necessities of the war required a large number of recruits in America to be tested in a very short time. The main task was to separate those who were fit to be officers, those who were fit to be ordinary soldiers and finally those who could do the job of a labourer. Army psychologists (1917) developed two tests: Army Alpha for persons who could read and Army Beta for persons who could not read or who did not speak English. The Army Alpha and Beta proved useful during the war, and later on several revisions of Alpha were used extensively with civilians.

Since then a number of verbal and non-verbal tests have appeared. The more important of these are the Otis Group Intelligence scale (1918), and the Terman Group Test of Mental Ability (1920). These are very useful to test adult
and adolescents intelligence in large groups in a short time. Norms are obtained for adults and also for children in the higher age- groups.

Soon group intelligence tests were being devised for all ages and types of persons, from preschool children to graduate students. Large-scale testing programs, previously impossible, were now being launched.

1.5. NEED OF THE STUDY

It is a common knowledge that ‘education’ has a significant role to play in the development of an individual. The basic purpose of education is to draw the best out of the student in terms of his physical, mental and spiritual development.

Until recently, remarkable importance had been given to the education sector by the government in Republic of Yemen. The costs of education sector with its different levels went up from (YR 89,543) billion in 2000, to (YR 137,872) billion in 2003 (Educational Denoters, 2004).

The statistics that is issued by the Ministry of Education for the academic year 2002 - 03 states that the number of accepted students in secondary school reached (213,817), male and female distributed into (150,151) and (12,772) respectively (Statistical Year-Book, 2004). The enrolled students in secondary school comprised only (38%) of the total population of the age category equal to (15 – 17) years, which is actually a low rate. Although the internal efficiency of the educational system is low, the graduated students in the academic year 2002 - 03 reached (120,204) (male and female) students from a total of (184,801) who, were
accepted at the first level of secondary school in the year 2000 - 01. This equals a graduation rate of (65 %) of the total acceptance whereas the balance i. e. (35 %) are considered as failed students. This is attributed to weak inputs of the educational process, such as equipment, teacher, aids, curricula and laboratories etc. (Educational Denoters, 2004). In addition this is attributed to waste of the curricula structural composition, the prescriptive academic material, the absence of scientific application and the Audio-visual aids that lead to the supremacy of the theoretical part over the applied one. Consequently, the student lags behind in this modern age that is described as the age of information revolution, communications, and technical progress.

The problem of this research was defined by the lack of an educational study of the mental ability of the secondary school students in Yemen, by the use of solid and integrated – dimensional measurement instruments, in a time when the mental ability is one of the priorities of the educational work to develop the modern society and push the wheel of advancement.

There is a very close relation between intelligence or mental abilities and the scholastic growth which the teacher is expected to induce. Over and above its bearing on academic achievement, intelligence is most important in its own right (Stephens, 1999).

The most widespread use of intelligence tests is within the public schools (Brody & Brody, 1976). Thus, this study is concerned firstly with the student’s intelligence and its relationship with age, sex, and school achievement and secondly to verify the validity of Otis-Lennon Mental Ability Test (OLMAT)
(1968) advanced level form (K) (which is one of the important group tests and is a measure of intelligence). The test can be used in the Yemeni environment due to the fact that there are no standardized measures of intelligence, which are applicable exclusively to the Yemeni environment. Such a measure will facilitate research on intelligence in Yemeni culture. The test can be used to assess intelligence for various purposes like predicting achievement, placing students in special classes, vocational guidance and selection, child guidance, educational guidance, preparing a profile, and diagnosing pupil’s difficulties.

Moreover, standardizing these measures will help researchers to use it in their educational and psychological studies, which aim at measuring the intelligence according to the general standard of the sample. It is known that in the psychological measurement in general, the measures and tests are full of cultural and social elements. Hudson et al; (1959) mentioned that there are sides which can be affected by cultural and social factors at the time of the response to be measured such as; meaning of similar concepts, the importance of the response, experience and cognition and finally social and family similarities.

1.6. STATEMENT OF THE PROBLEM

Considering the background of the studies on intelligence in Yemen the study was undertaken with the following statement: A study in the relationship of mental ability with age, sex, and school achievement of secondary school students in the republic of Yemen.
1.7. OBJECTIVES OF THE STUDY

1. To study the relationship between students’ mental ability (intelligence) scores and their age, sex, and school achievement.
2. To study the difference between males and females in mental ability (intelligence) scores.
3. To study the difference between mental ability (intelligence) across age.
4. To study the difference between mental ability (intelligence) of students with high and low school achievement.
5. To find out the relative significance of different subtests of mental ability (intelligence) in predicting school achievement.
6. To adapt and standardize Otis-Lennon Mental Ability Test (OLMAT) (1968) advanced level form (K) for Yemenis culture.

1.8. HYPOTHESES OF THE STUDY

The following hypotheses were formulated for empirical testing and for conclusions to be made:

1. There is a positive correlation between the mental ability (intelligence) scores (verbal comprehension, verbal reasoning, figural reasoning and quantitative reasoning) and age (15, 16, 17, 18, and 19 age groups) of the Yemeni secondary school students.
2. There is no significant correlation between the mental ability (intelligence) scores (verbal comprehension, verbal reasoning, figural reasoning and quantitative reasoning) and sex of the Yemeni secondary school students.

3. There is a positive correlation between the mental ability (intelligence) scores (verbal comprehension, verbal reasoning, figural reasoning and quantitative reasoning) and school achievement of the Yemeni secondary school students.

4. The older students (based on age group) will have higher scores on mental ability (verbal comprehension, verbal reasoning, figural reasoning and quantitative reasoning) than the younger students (based on age group).

5. There is no sex difference on mental ability (intelligence) test scores of Yemeni secondary school students.

6. The students with high school achievement will score higher on mental ability (intelligence) than the students with low school achievement.