Chapter 11 (Intelligence) Study Guide

Objective 1: What Is Intelligence?

Definitions:
- Intelligence – mental quality consisting of the ability to learn from experience, solve problems, and use knowledge to adapt to new situations.

Concepts:
- What is the difficulty in defining intelligence and explain what it means to reify intelligence. – Intelligence is not a single ability; it is a concept. IQ scores lead people to believe they are at a concrete level of intelligence when in fact the IQ scores is merely a measure of how one performed on a particular test. Intelligence is a description of what allows an individual to be successful within a culture.

Example:
- Saying that “She has an IQ of 120” as if that is a descriptor of her total ability.

Sample test question:
- Which of the following is not a description of intelligence:
  A. Ability to learn from experience.
  B. An IQ score
  C. Problem solving
  D. Use of knowledge to adapt to new situations.

Objective 2: General Intelligence

Definitions:
- Factor analysis – a statistical procedure that identifies clusters of related items (called factors) on a test; used to identify different dimensions of performance that underlies one’s total score.
- General intelligence (g) – a general intelligence factor that according to Spearman and others underlies specific mental ability and is therefore measured by every task on an intelligence test.

Concepts:
- Is intelligence one general ability or several specific abilities? –
  o Tested by factor analysis, Spearman believed that “g” underlies various clusters; those who tend to score high in one area likely will score high in others.
  o Thurston did not rank his subjects on a single scale but measured several clusters of abilities such as word fluency, verbal comprehension, spatial ability, perceptual speed, numerical ability, inductive reasoning, and memory. However again individuals who scored well in one domain also tended to score well in others.
Example:
- Satoshi Kanazawa notes that general intelligence is a form of intelligence that helps people solve novel problems like how to stop a fire from spreading, how to find food in a drought, etc.
- General intelligence scores do correlate with ability to solve various novel problems but do not correlate with individuals’ skills in “evolutionally familiar” situations like marrying, parenting, etc.

Sample test question:
- What psychological researcher believed there is a general intelligence factor that underlies various clusters?
  A. Spearman
  B. Gardner
  C. Thurston
  D. Skinner

Objective 3: Contemporary Intelligence Theories

Definitions:
- Savant syndrome – a condition in which a person otherwise limited in mental ability has an exceptional specific skill, such as in computation or drawing.
- Analytical intelligence – assess by intelligence tests, which present well-defined problems having a single right answer.
- Creative intelligence – demonstrated in reacting adaptively to novel situations and generating novel ideas.
- Practical intelligence often required for everyday tasks with multiple solutions

Concepts:
- Gardner believes there are eight difference intelligences while Sternberg only believes there are three theories of intelligence.
  - Clearly many of Gardner’s categories can be assumed within Sternberg’s.
  - Gardner’s critics noted that there are no tests to measure all of his intelligences. Music and athletics are areas best considered talents since we can manage without them.

Example:
Gardner’s 8 Intelligences:  
1. Linguistic
2. Logical-mathematical
3. Musical
4. Spatial
5. Bodily-kinesthetic
6. Intrapersonal (self)
7. Interpersonal (other people)
8. Naturalist

Sternberg’s Triarchic theory
1. Analytical (academic problem solving)
2. Creative intelligence
3. Practical intelligence
Sample test question:

- Which of the following is not one of Gardner’s 8 intelligences?
  A. Musical
  B. Linguistic
  C. Creative
  D. Intrapersonal

**Objective 4: Emotional Intelligence**

**Definitions:**

- Emotional intelligence – the ability to perceive, understand, manage, and use emotions.

**Concepts:**

- What are the four aspects of emotional intelligence and what is the criticism of the concept of emotional intelligence?
  - Perceive – to recognize emotions in faces, music, and stories
  - Understand – to predict emotions and how they change and blend
  - Manage – to know how to express emotions in various situations
  - Use emotions to able adaptive or creative thinking

- Some scholars believe that emotional intelligence stretches the concept of intelligence too far – ability to discern and be sensitive to emotions is a gift that should be respected as important but it is different from intelligence.

**Example:**

- A patient with brain damage had normal intelligence and memory but no emotion. He realized that he could not feel. He was unable to maintain a job, lost his marriage, ended up in custodial care
- Highly intelligent people do not necessarily become highly successful unless they have learned other skills like conscientiousness, energy, determination, political acuity

**Sample test question**

- What aspect of emotional intelligence gives you the ability to recognize emotion in faces, music, or stories?
  A. Understand
  B. Manage
  C. Use
  D. Perceive
Objective 5: Intelligence and Creativity

Definitions:
- Creativity - ability to produce novel and variable ideas.

Concepts:
- Identify the factors associated with creativity and describe the relationship between creativity and intelligence.
  - Expertise – well developed base of knowledge
  - Imaginative Thinking Skills – provide the ability to see things in novel ways, to recognize patterns to make connections.
  - A Venturesome Personality – Tolerates ambiguity and risk, preservers in overcoming obstacles, seeks new experiences rather than following the pack.
  - Intrinsic Motivation – People being most creative when they fell motivated primarily by the interest, enjoyment, satisfaction and challenge of the work itself.
  - A Creative Environment – Sparks, supports, and refines creative ideas

Example:
- Expertise – doctor, lawyer, college professor
- Imaginative thinking - Copernicus discovery that the earth revolved around the sun, Newton’s law of gravity, development of Teflon and Velcro for the space industry that is used in every household today
- A Venturesome Personality – Thomas Edison and the light bulb, Alexander Bell and the telephone, Wright Brothers and the airplane.
- Intrinsic Motivation – Thinking about a problem all the time, being absorbed with the process of solving a problem, seeing a possible solution in nearly every situation
- A Creative Environment – Getting support from the people around you; mentors, colleagues; friends; family – their belief in your ideas and willingness to work toward them for little personal gain.

Sample test question:
- Give an example of one of the five components of creativity.

Objective 6: Is Intelligence Neurologically Measurable?

Definitions:
- Neural plasticity – the ability during childhood and adolescence to adapt and grow neural connections in response to their environment.

Concepts:
- Describe the relationship between intelligence and brain anatomy.
  - There are correlations of about +.40 between brain size and intelligence scores. As people get older, brain size and nonverbal intelligence test scores fall.
Post mortem brain analysis reveals that highly educated people die with more synapses.

Higher intelligence scores are also linked with more gray matter in specific areas known to be involved in memory, attention, and language.

Example:
- After English poet Lord Byron died, doctors discovered that his brain was about 5 pounds.
- Beethoven’s brain had numerous, deep convolutions.
- However, many less intelligent people have large brains and many intelligent people have smaller brains, so size does not correlate perfectly.

Sample test question:
- How do different aspects of the brain effect intelligence levels?

Objective 7: Brain Function

Definitions:
- Perceptual Speed – speed of information processing.
- Neurological Speed – speed of brain waves.

Concepts:
- What are the correlations between perceptual speed, neural processing speed, and intelligence?
  - Correlations between intelligence scores and the speed of taking in perceptual information is about +.4 - +.5
  - Brain waves register a simple stimulus more quickly and with greater complexity. Brain response tends to be slightly faster when people have higher intelligence.
  - Controversy continues and is far from resolved.

Example:
- Persons who answer geometrical questions quicker tend to score higher on intelligence tests.
- People who process information more quickly may accumulate more information on a wide variety of topics.

Sample test question:
- Neurological speed is:
  A. The speed of information processing
  B. Not correlated with intelligence.
  C. The speed of brain waves.
  D. Conclusively correlated almost exactly with intelligence.
Objective 8: Assessing Intelligence

Definitions:
- Intelligence test – a method for assessing an individual’s mental aptitudes and comparing them with those of others using numerical scores.
- Mental age – a measure of intelligence test performance devised by Binet; the chronological age that most typically corresponds to a given level of performance. Thus a child who does as well as the average 8-year-old is said to have a mental age of 8.
- Stanford-Binet – the widely used American revision (by Terman at Stanford University) of Binet’s original intelligence test.
- Intelligence Quotient (IQ) – defined originally as the ratio of mental age to chronological age multiplied by 100. On contemporary intelligence tests, the average performance for a given age is assigned a score of 100.

Concepts:
- Define intelligence test and discuss the history of intelligence testing.
  - An intelligence provides a numerical measure of one’s innate ability through a series of tests.
  - Alfred Binet developed the first one in France to identify children in French public schools that needed special attention and thus minimize the subjective impressions of teachers.
  - By experimenting with a variety of test questions, they could determine how well children would handle schoolwork.
  - Binet further believed that environment could influence learning ability and wanted his test to be used to improve children’s education not to label them.
  - Lewis Terman a professor at Stanford University renormed Binet’s test for California school children and established age norms that extended the upper end of the test’s range for teenagers and adults.
  - The actual formula for IQ is no longer used because it would not work for adults.
  - The test scores reflect not only people’s innate mental abilities but also their education and their familiarity with the culture assumed by the test.
  - This has led to abuses of the test and a reminder that science can be value laden.

Example:
- An 8-year old with a mental age of 8 will have an IQ of 100. If they answer questions like an average 10-year old then their IQ will be 125.

Sample test question:
- An intelligence test is:
  A. A ratio of mental age to chronological age.
  B. A method for assessing an individual’s mental aptitude compared to others.
  C. Scientifically devoid of values.
  D. The definitive answer to the question “How intelligent are you?”
Objective 9: Modern Tests of Mental Abilities

Definitions:
- Aptitude test – designed to predict a person’s future performance; one’s capacity to learn.
- Achievement test – a test designed to assess what a person has learned.
- Wechsler Adult Intelligence Scale (WAIS) – the most widely used intelligence test; contains verbal and performance subtests.

Concepts:
- Distinguish between aptitude and achievement tests and describe modern tests of mental abilities such as the WAIS.
  - Aptitude test attempt to predict future performance and propensity to learn new skills while achievement tests measure what has already been learned.
  - Not easily distinguished since your learned vocabulary will influence your ability to take a test and your aptitudes influence your achievement scores.
  - The WAIS has 11 subtests that assess various verbal and nonverbal abilities. It yields scores to verbal comprehension, perceptual organization, working memory, and processing speed.

Example:
- Aptitude test - WAIS, Stanford-Binet (SAT because it is supposed to predict how you do in college but in actuality it is an achievement test.)
- Achievement test - chapter tests, also ACT, Woodcock-Johnson

Sample test question:
- This class test would be an example of an:
  A. Aptitude test
  B. Achievement test
  C. Intelligence test
  D. Standardized test

Objective 10: Standardization

Definitions:
- Standardization – defining meaningful scores by comparison with the performance of a pretested standardization group.
- Normal curve – the symmetrical bell-shaped curve that describes the distribution of many physical and psychological attributes. Most scores fall near the average, and fewer scores lie near the extremes.
- Flynn effect – unexplained phenomena where over time intelligence has risen even while controlling for any number of variables.

Concepts:
- Discuss the importance of standardizing psychological tests.
  - To enable meaningful comparisons tests are given under similar conditions and settings.
Describe the distribution of scores in a normal curve.
  
  - The mean (mathematical average) is at the 50\textsuperscript{th} percentile and the farther you gravitate from the mean the fewer individuals are represented.

**Example:**
- 68\% of the population falls within one standard deviation of the mean – on intelligence tests that score is $100 \pm 15$
- 95\% of the population falls within two standard deviations of the mean – on intelligence tests that score is $100 \pm 30$

**Sample test question:**
- A bell-shaped curve that characterizes a large sample of intelligence test scores is a graphic representation of a :
  
  A. Factor analysis
  B. Normal distribution
  C. Heritability estimate
  D. g factor

**Objective 11: Reliability**

**Definitions:**
- Reliability – the extent to which a test yields consistent results, as assessed by the consistency of scores on two halves of the test, on alternate forms of the test, or on retesting.

**Concepts:**
- Explain what it means to say a test is reliable.
  
  - Test scores are consistent over time. The score you receive the first time you take a test is likely the score you will receive on subsequent administrations of the test.
  - Reliability is tested when recreating a test by either
    1. test/retest of the same test after a given amount of time
    2. test/retest with an alternative but comparable form of the test
    3. splitting the test in half and comparing the two parts

**Example:**
- Comparing the results of test scores in this psychology class with those in another psychology class that is given the same test and studied the same material.
- Retaking an intelligence test 1-year later to see what your score is

**Sample test question:**
- T/F A good test must yield dependably consistent scores.
Objective 12: Validity

Definitions:
- Validity – the extent to which a test measures or predicts what it is supposed to.
- Content validity – the extent to which a test samples the behavior that is of interest (such as a driving test that samples driving tasks).
- Criterion – the behavior (such as a future college grades) that a test (such as the SAT) is designed to predict; this the measure used in defining whether the test has predictive validity.
- Predictive validity – the success with which a test predicts the behavior it is designed to predict; it is assess by computing the correlation between test scores and the criterion behavior.

Concepts:
- Explain what it means to say a test is valid.
  o A test measures what it says it measures.
- Describe two types of validity
  o Content validity means the test contains items that represent the criterion behavior it is reported to measure, i.e. a reading test measures reading skills.
  o Predictive validity means the scores obtained from the test can be used to predict performance in a specific area, reading scores at x level predict a student’s ability to do the reading in a history course.

Example:
- Using an inaccurate tape measure to measure height will give reliable results (always measure the same height) but the results are not valid because the measure being used does not provide an accurate measure.

Sample test question:
- The following are types of test validity with the exception of:
  A. Content
  B. Criterion-related
  C. Predictive
  D. Normal

Objective 13: Stability or Change?

Definitions:
- None

Concepts:
- Describe the stability of intelligence scores over the life span.
  o No valid or assessment has been developed to measure infant intelligence.
  o Intelligence test scores have increased stability with age. By age 4 scores begin to predict adolescent and adult scores. At age 7 scores become fairly stable and consistent
Example:
- A study that followed 93 nuns confirmed that those exhibiting less verbal ability in written essays when entering their convent in their teens were more at risk for Alzheimer’s disease after age 75.
- Study of Scots given an intelligence test at age 11 in 1932 were retested (542 that could be located) at age 80. High scoring 11-year olds were more likely to be living independently and less likely to suffer from Alzheimer’s disease.

Sample test question:
- If we retested people periodically throughout their lives, at what points would their intelligence scores most likely be stable?

Objective 14: Extremes of Intelligence

Definitions:
- Mental retardation – a condition of limited mental ability, indicated by an intelligence score of 70 or below and difficulty in adapting to the demands of life; varies from mild to profound.
- Down syndrome – a condition of retardation and associated physical disorders caused by an extra chromosome in one’s genetic makeup.

Concepts:
- Identify the extremes of intelligence on the normal distribution curve.
  - If the IQ scores is below 70 and has difficulty adapting to independent living. Only about 1% of the population and 50% more likely male.
  - An IQ score of over 135 may denote intellectual giftedness that may be associated with high academic and vocational achievement.

Example:
- Mildly mentally retarded individuals (IQ 50-70) can be educated at least partially in the mainstream and can be transitioned into group home life where they learn some self care and even employment skills.
- Moderately mentally retarded individuals (IQ 35-50) can attain about a 2nd grade level educational and can be employed in sheltered workshops and group living situations.
- Severely mentally retarded individuals (IQ 20-35) can learn to talk and so simple work tasks but must be closely supervised.
- Profoundly mentally retarded individual (IQ below 20) require constant care.

Sample test question:
- An individual who can learn some self care and employment skills in a sheltered workshop would be considered:
  A. Mildly mentally retarded  
  B. Moderately mentally retarded  
  C. Severely mentally retarded  
  D. Profoundly mentally retarded
Objective 15 Genetic Influences:

Definitions:
- Heritability – a variation explained by genetic influences.

Concepts:
- Discuss the evidence for the genetic contribution to individual intelligence.
  - Studies of identical twins demonstrate that intelligence test scores are more similar than fraternal twins or other siblings, even those raised apart.
  - Studies of adopted children show more intelligence test similarity with biological parents than adoptive parents.
- Explain what psychologists mean by the heritability of intelligence.
  - The extent to which differences among people are attributed to genetics, which is about 50% variation. We cannot say what percentage of an individual’s intelligence is inherited.

Example:
- There is some evidence of environmental effects such as fraternal twins who are raised more alike because they are the same age. Just as tall people often are selected for basketball teams and then improve due to more exposure and coaching, children with good math or language skills may be provided more opportunities to hone those skills through special programming.

Sample test question:
- If environments become more equal, heritability of intelligence would:
  A. increase
  B. decrease
  C. be unchanged

Objective 16: Environmental Influences

Definitions:
- none

Concepts:
- Discuss the evidence for environmental influences in individual intelligence.
  - Early intervention demonstrated that orphans in neglectful environments experienced severe developmental delays. When provided with verbal stimulation and attention they were able to learn to speak and respond to people with dramatic effect.
  - Schooling and intelligence contribute to each other. Higher intelligence leads to prolonged schooling and individuals who attend more years of school are likely to have higher intelligence scores.
Example:
- Head Start pre-school program enhances school readiness and success and boost cognitive and social skills.
- Children’s intelligence test scores tend to drop over summer months and rise during the school year.

Sample test question:
- Children’s intelligence test scores tend to ______ during the school year and ______ during the summer months.
  A. rise; rise
  B. rise; remain unchanged
  C. remain unchanged; fall
  D. rise; fall

Objective 17: Ethnic Differences in Intelligence Scores

Definitions:
- none

Concepts:
- Describe ethnic similarities and differences in intelligence test scores and discuss some genetic and environmental factors that might explain them.
  - Over all there are individual differences within a group but groups raised in different environments also have inter-group differences. Individual differences within a race are much greater than differences between races.
  - Race is not a neatly defined biological category but a social construct. People from varying ancestry may categorize themselves in the same race.
  - Asian students outperform North American students in math and science but also go to school longer and spend more time studying these subjects.
  - Intelligence test performance of today’s population with better nourishment and better education along with better test preparation is greater than populations of the same people in the 1930’s.
  - White and black children score equally well on infant intelligence tests.
  - In different eras, different ethnic groups experienced periods of remarkable achievement.
  - All of these facts make it difficult to attribute a racial superiority.

Example:
- Blacks make remarkable gains in ability compared to white in college where the environment is similar vs. in high school where schools may be vastly different.
Sample test question:
- Which of the following is true of ethnic differences in intelligence?
  A. Race is a neatly defined biological category. So differences are easy to measure.
  B. Individual differences within a race are much greater than differences between races.
  C. White infants outperform black infants on intelligence tests.
  D. Intelligence test performance between current white populations and those of the 1930’s are roughly equal.

Objective 18: Gender Similarities and Differences

Definitions:
- none

Concepts:
- Describe gender differences in abilities.
  o Girls are better spellers
  o Girls are more verbally fluent, remembering words, talk earlier.
  o Girls are better at locating objects.
  o Girls are more sensitive to touch, taste, odor.
  o Boys outnumber girls in special education classes and remedial reading.
  o Girls’ average math scores are equal to boys but there are differences at the extremes where boys are more likely to be math and science prodigies in the US but not in China.
  o Men are better at spatial abilities, are more willing to take risks.
  o Males edge out females in math problem solving with age after elementary school
  o Female appear more able to detect and express emotions.

Example:
- In 1997 a woman won the Putnam Mathematical Competition the first in 56 years.
- In 1998 the first female member was part of the U.S. math Olympics team.

Sample test question:
- On which of the following tasks are males most likely to outperform females?
  A. speed reading
  B. interpreting literature
  C. learning a foreign language
  D. mentally rotating three-dimensional objects
Objective 19: The Question of Bias

Definitions:
- Stereotype threat – a self-confirming concern that one will be evaluated based on a negative stereotype.

Concepts:
- Discuss whether intelligence tests are biased.
  - If an intelligence test performance has difference scores based on cultural experiences then it is considered biased.
  - Intelligence tests measure your developed abilities which reflect to some extent your education and experiences.
  - The scientific meaning of bias is whether a test is less valid for some groups than for others.
- Describe the stereotype threat phenomenon.
  - When students are told they won’t succeed then it may erode test performance.
  - Emotionally students who believe they will fail at school will disengage from the educational process and find other interests.

Example:
- If the SAT predicted only the college performance of men and not women it would be said to be biased.
- Group differences on intelligence tests prevail even on nonverbal items not tied to culture such as remembering numbers.
- Students who feel threatened while taking a test had lower test scores.

Sample test question:
- Blacks have been found to score lower on tests of verbal aptitude when tested by Whites than when tested by Blacks. This best illustrates the impact of:
  A. Standardization.
  B. Emotional intelligence.
  C. Stereotype threat.
  D. The Flynn effect.