AN ANALYSIS ON RELATIONSHIP OF ACADEMIC ACHIEVEMENT WITH INTELLIGENCE QUOTIENT TEST AND EMOTIONAL INTELLIGENCE

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THIS DISSERTATION IS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE WITH HONOURS

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DECLARATION

I hereby declare that this dissertation contains my original research work. Sources of findings reviewed herein have been duly acknowledged.

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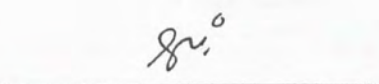

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ABSTRACT

The main purpose of this study is to examine the relationship between cognitive intelligence, emotional intelligence, and academic achievement. Furthermore, a model to predict academic achievement will also be developed. A group of 293 undergraduates of Universiti Malaysia Sabah (UMS) took the MENSA Admission Test (MAT) and an Emotional Intelligence Test on March 2006. The MAT is using Raven's Advanced Progressive Matrices (APM) to measure cognitive intelligence. Meanwhile, the EI test is based on the model of Goleman. The academic achievement of participants is in term of their Cumulative Grade Point Averages (CGPA) in two semester of first year. Result reveals that the only IQ is having a significant positive correlation with CGPA. The models obtained also indicating that IQ might be an important predictor for academic achievement. The importance of EI is still ambiguous in this analysis.

ABSTRAK

ANALISIS BAGI UJIAN KECERDASAN INTELEK MENSA DAN UJIAN KECERDASAN EMOSI DI UNIVERSITI MALAYSIA SABAH

Disertasi ini adalah bertujuan untuk mengecam kewujudan hubungan antara kecerdasan intelek, kecerdasan emosi, dan pencapaian academik. Model untuk meramal pencapaian academik juga akan dibina. Sebanyak 293 mahasiswa dari Universiti Malaysia Sabah (UMS) telah menduduki ujian kemasukan MENSA (MAT) dan ujian kecerdasan emosi (EI) pada March 2006. MAT adalah satu ujian yang menggunakan "Raven's Advanced Progressive Matrices" untuk megukur kecerdasan intelek. Manakala ujian kecerdasan emosi adalah dubah suaikan berdasarkan model Goleman. Pengukuran bagi pencapaian academik semua peserta adalah dengan mengambil kira PNGK dus semester bagi tahun pertama mereka. Hanya IQ menunjukkan korelasi yang signifikan dengan CGPA daripada keputusan. Model yang didapati juga menunjukkan IQ mungkin merupakan faktor dalam ramalan pencapaian akademik. Kepentingan EI sebagai faktor ramalan masih tidak nyata.

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CHAPTER 1

INTRODUCTION

1.1 DEFINITION OF COGNITIVE INTELLIGENCE

In the early 1920s, the journalist Walter Lippmann mentioned that, "We cannot measure intelligence when we have not defined it." (Strydom & Du Plessis, 2006). Thus, definition of cognitive intelligence needs to be known first before exploring more deeply about it. Generally, cognitive intelligence is the ability to understand, analyze, plan, and solve a complex problem logically. In addition, an intelligent person will be able to adapt to environment, learn from experience, and reason logically. From the Straight Talk about Mental Test of Jensen in 1981, "the achievements of a Shakespeare, a Michelangelo, a Beethoven, or an Edison depend on special talents and other traits and circumstances, but such achievements would not be possible without superior general intelligence as well". Hence, cognitive intelligence is said to contribute in effectively used and developed abilities or talents too.

There are a number of tests to measure cognitive intelligence. To name a few, Stanford-Binet test, Wechsler Adult Intelligence Scale, and Raven's Progressive Matrices are the examples. They can be divided into two: group factor tests and g-factor tests as intelligence can be divided to group factor and g-factor specifically.

Group factor tests are tests that measure specific dimensions of cognitive ability. For instance, verbal factor, spatial factor, and perceptual speed factor are examples of group factors (Petrill & Wilkerson, 2000).

In 1904, a British psychologist, Charles Spearman, developed the Two Factor Theory. This theory stated that there was a correlation among all ability tests and Spearman named the intersection part as general or g factor. Hence, if a person does well in one ability test, he tends to do well on other abilities tests too. Psychologists such as Arthur R. Jensen and John B. Caroll had confirmed his findings (Vernon, 1979). The remaining variance in the abilities tests after g-factor is removed will then be accounted by group factors (Jensen, 1980). However, there is still no agreement in defining g-factor. For an example, it is defined as a mere statistical regularity by Thompson, a mental energy by Spearman, an ability of abstract reasoning by Gustafsson, and a measure of speed of neural processing by Reed and Jensen (Neisser *et al.*, 1996).

1.2 INVENTION OF INTELLIGENCE QUOTIENT TEST

A French psychologist, Alfred Binet under the assistance of Theophile Simon in 1905, developed the first standardized cognitive intelligence test. The purpose of the test was to identify children who needed special education and sent to special school, in order to avoid disruption to the education of normal children. When a child grows older or the increase in Chronological Age, his mental capability or Mental Age should increase too. Thus, the Binet test was based on Binet scale at which typical items were set for typical age. For an example, a 5-year-old should be able to copy a

square and a 15-year-old should be able to interpret given facts (Jensen, 1981). If a 13-year-old is able to pass the items until age 15, then he is said to be able to perform as well as a 15-year-old. This implies that he is having a mental age of 15.

The test score for the Binet test is in term of mental age. A German psychologist, William Stern, changed it to "Mental Quotient". The term later changed by an America psychologist, Lewis M. Terman to today's "Intelligent Quotient". He was the one who modified the items in Binet scale after a series of validity experiments. The definition of Intelligent Quotient (IQ) proposed by William Stern is the division of Mental Age (MA) by Chronological Age (CA) times 100 to remove decimal points (Jensen, 1981).

$$IQ = \frac{MA}{CA} \times 100 \tag{1.1}$$

However, knowledge and experience will continue to increase but not intelligence. Unlike the steadily grow before age of 16, intelligence will only increase slightly after age of 16 and stop until early of twenties (Jensen, 1981). Hence, the equation (1.1) is no longer meaningful beyond the age of 16. For those aged beyond 16, their Chronological Age in the formula will remain as 16 (Jensen, 1980).

1.3 DISTRIBUTION OF INTELLIGENCE QUOTIENT

According to Jensen (1980), a test will inevitably yield a normal distribution if the below conditions are fulfilled in the test:

i. A large number of tested items

ii. A wide range of difficulties in tested items

iii. No significant level of differences in these difficulties

iv. A variety of contents or forms for the same tested item

v. Score of tested items have a significant correlation with the sum of all others item scores

Hence, it can be clearly seen that IQ has fulfilled the conditions, and indeed IQ score is proved to be normally distributing. It can be represented by a bell curve or normal curve with the mean and standard deviation IQ are 100 and 15 respectively as in Figure 1.1 below.

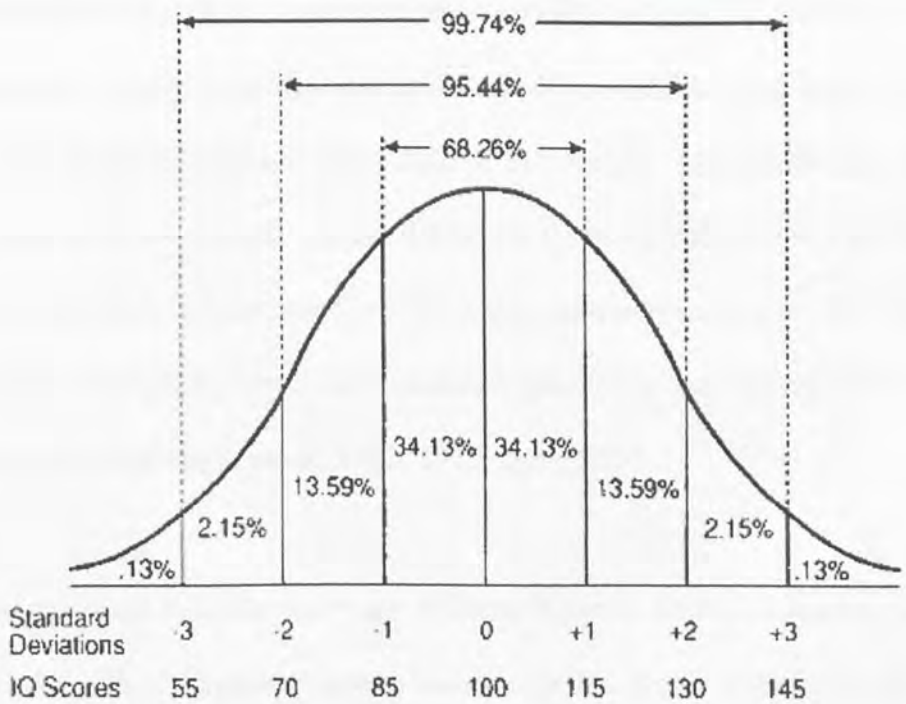

Figure 1.1 The distribution of IQ score.

Thresholds at IQ 70 or below will have difficulty in education and work. For those with IQ 50 or below, they will have problem in attending regular school where they need to be sent into special school. The educability for thresholds with IQ of 50 to 70 is said to be until elementary school only. Thus, they can only take on simple task and need close supervision. Furthermore, they will need also assistance from families or friends in handling daily life affairs such as financial affairs. About 13.59% of population is possessing IQ range from 70 to 85. Thresholds of this range are at the borderline of retardation. They can only be unskilled labourers such as repair furniture. They have a higher possibility to drop out of high school. For thresholds with IQ in the range of 85-110, they can occupy semi-skilled jobs such as typists and assembly line workers. Those with IQ in the range of 85 to 95 are always the slow learners in school while for those with IQ in the range of 95 to 110 usually cannot complete the college preparatory course in high school. Thresholds of IQ 110 to 130 tend to involve in skilled and professional occupations. For thresholds of IQ 110 to 120, they can graduate from college but usually with grades that will not qualify them to enter graduate school. Whilst for those with IQ 120 to 130, they tend to do well in schools. Moreover, IQ of 130 is the mean of receiving Ph. D. Thresholds of IQ above 130 are described as intellectual giftedness and usually will not have limitations in educability (Jensen, 1980, 1981; Seitz, 2006).

As there are different scales for different IQ tests, there is a method using the statistical features of Normal curve to standardize the scales – the standard normal distribution. Assume raw score X of a test with mean of $\overline{X}$ and standard deviation of s. It can be converted to a standard normal distribution score or Z-score that has a mean of 0 and standard deviation of 1 through equation below:

$$Z = \frac{\left(X - \overline{X}\right)}{s}$$

Thus, the raw score of one scale can then be transformed to another scale for comparison, which with mean, μ and standard deviation, σ, through standard normal distribution:

$$IQ = \sigma Z + \mu$$

In addition, it is hard to compare over ages when IQ of a person might different even for the same test. Thus, standard normal distribution can also be used to convert raw score of every test for every age group into a standardized score. With IQ at each age distributes with mean of 100 and standard deviation of 15, the standardized IQ score is (Jensen, 1980):

$$IQ = 15Z + 100$$

1.4 EMOTIONAL INTELLIGENCE

In 1920, Thorndike built up the concept of emotional intelligence at which he used the term 'social intelligence'. He defined it as the ability in dealing with human relations (Petrides *et al.*, 2004; Wikimedia, 2006). But Salovey and Mayer were the one who first used the term 'Emotional Intelligence (EI)' in 1990. They defined EI as the ability to recognize and monitor owns and others emotions, to discriminate the various emotions, and utilize this information to guide one's thinking and action (Levinson *et*

al., 1999). In 1997, Salovey and Mayer refined their definition of EI. There are four branches, which are the ability to appraise and express emotions, to access and generate feelings, to understand and utilize emotional knowledge, and to regulate emotions (Levinson *et al.*, 1999; Chan, 2003).

EI is conceptualized into two models: pure model that relies on Ability EI (or information-processing EI) and mixed model that relies on Trait EI. These two models are measured through two different methods. The result from a large-scale study on EI conducted by Davies *et al.* (1998) indirectly showed that Ability EI and Trait EI were not related to each other. This was supported by a more recent study of Brackett and Mayer in 2003 (Stys & Brown, 2004).

Ability EI refers to one's real ability in recognizing, processing, and utilizing the information from emotions of oneself and other people. The scale of Ability EI consists items that can be objectively marked as correct or incorrect. The four branches model of Salovey and Mayer is one of the pure models. Meanwhile, Trait EI is related to behavioral dispositions and self-perceptions on own ability to recognize, discriminate, and utilize emotions, which usually tends to correlate with personality. It is usually measured through self-report questionnaires (Petrides & Furnham, 2000; Petrides *et al.*, 2004). One of the mixed models is the model of Reuven Bar-On. He divided EI into five components, which are intrapersonal, interpersonal, adaptability, stress management, and general mood. The subcomponents are shown in Table 1.1 (Stys & Brown, 2004).

Table 1.1 The components and subcomponents of Bar-On's model.

Components	Sub-Components
Intrapersonal	Self Regard
	Emotional Self-Awareness
	Assertiveness
	Independence
	Self-Actualization
Interpersonal	Empathy
	Social Responsibility
	Interpersonal Relationship
Adaptability	Reality Testing
	Flexibility
	Problem Solving
Stress Management	Stress Tolerance
	Impulse Control
General Mood Components	Optimism
	Happiness

1.5 OBJECTIVES OF DISSERTATION

The main objective of this dissertation is to analyze the relationship between academic achievement with IQ and EI. There are several sub-objectives:

i. To examine the linear relationship between academic achievement with IQ, EI, and gender.

ii. To determine the best-fit model for CGPA of the first and second semester.

iii. To examine the contribution of interaction of independent variables to CGPA.

iv. To examine the robustness of the best-fit model obtained.

1.6 SCOPE OF DISSERTATION

This dissertation is meant to analyze the IQ test held by MENSA and the EI test in Universiti Malaysia Sabah (UMS) on 12 March 2006. This analysis will focus only on undergraduates from UMS who sat for the tests.

CHAPTER 2

LITERATURE REVIEW

2.1 INTELLIGENCE QUOTIENT AND ACADEMIC ACHIEVEMENT

The invention of IQ test was applied in education field in order to identify children who are intellectually inferior. The later developed IQ tests were applied in education field too but with different purpose: to measure the potential of children in educational attainments. As children are future human capitals to a society and still can be shaped, thus until today IQ tests is still focusing on measuring the potential of children in education field. Hence, a close relationship between learning ability and IQ tests might exist.

According to Jensen (1980), the correlation of IQ and learning ability can be increased if the characteristics below are fulfilled in the tasks tested:

i. Thinking skills

The higher the level of thinking skills that a task requires, the higher the correlation between IQ and learning ability of the task.

ii. Hierarchical

The more a task requires mastery of earlier elements in learning later elements, the

higher the correlation between IQ and learning ability of the tasks.

iii. Meaningful

The learning of a task that makes sense, where it relates to knowledge or experience possessed by learners, is more highly correlated with IQ.

iv. Transfer of past learning

The learning of a task is more highly correlated with IQ if it different but related to past learning of learners.

v. Insightful

The more a task involves "catching on" or "getting the idea", the higher the correlation between IQ and learning ability of the tasks. Two contradict examples are memorizing capital cities of states and proving the Pythagorean theorem.

vi. Complexity

The more complex a task is, the higher the correlation between IQ and learning ability of the tasks. However, the level of difficulty or complexity of the task must be appropriate.

vii. Limited time

If a task is given fixed time to learn, it will more highly correlate with IQ.

viii. Readiness

The learning of certain tasks might be age related, as the mind maturity is different over ages. If a task is more age related, it will more highly correlate with IQ where IQ is predicting the progress rate of certain kinds of learning.

ix. New task

IQ is highly correlated with a new task, especially in the early stage of the task. In addition, practices will lower the correlation of IQ and the task.

It is noticeable that the characteristics listed above are most of the conditions in school learning. Thus, this is the reason that the correlation between IQ and academic achievement in school had drawn so much attention of researchers, where the correlation implies learning potential. In most studies, IQ always correlates with academic achievement around 0.50 to 0.80 (e.g., Deary *et al.*, 2006). However, correlation does not imply causal relationship – current achievement might influence future IQ through the process of knowledge acquisition, or vice versa (Watkins *et al.*, 2006). From the Straight Talk about Mental Test of Jensen in 1981, " no other items … will predict his [a child's] overall learning ability and academic achievement in school better than do scores on a recently administered IQ test … because the IQ test … measure a general cognitive ability that plays a more important part in scholastic progress than any other trait". This implies that IQ might cause later academic achievement and not the other way round.

In 1972, a longitudinal design to test the causal relationship between IQ and academic achievement was conducted by Crano, Kenny, and Campbell. They tested both IQ and achievement tests on 5495 fourth grade Milwaukee students. They repeated the tests when the participants attended sixth grade. The coefficients for relationship between IQ at time 1 and achievement at time 2 is statistically significantly larger. Thus, they concluded that it is the IQ that predicts later achievement but not vice versa (Jensen, 1980; Watkins *et al.*, 2006).

Another supporting evidence is the study of Watkins *et al.* (2006). This study was applying cross-lagged panel analysis on participants in special education triennial re-evaluations with Wechsler Intelligence Scale for Children-Third Edition (WISC-

III). It was aimed to determine the IQ and a combination of five tests to determine the academic achievement. The mean age of students in the first testing was 9.25 years while the mean age for second testing was 12.08. The result showed that the optimal model reflected the causal precedence of IQ on achievement.

Terman's study on genius can be described as the best-known study in analyzing the predictive power of IQ. In 1921, He launched the Stanford-Binet IQ test, the Terman Group Test, the Army Alpha Test, and the National Intelligence Test in school population of urban areas to identify high IQ subjects whose IQ were above 135. There were three experiment groups where they were surveyed and tested every seven years to keep track of their achievement. In 1922, subjects from the Main Experimental Group were tested with Stanford Achievement Test and information tests. The tests scores were expressed in term of educational age (similar to the mental age in IQ) and achievement quotients (AQ). The average AQ for subjects of this group was 144, which means that the educational age was 44 percent above the chronological age. In other words, their knowledge was equal to those whose ages were 44 percent greater. The group's superiority was most marked in subjects such as reading, language usage, and arithmetic reasoning. Meanwhile, their superiority was less marked in spelling and factual information. The result shown was consistent with several characteristics to increase correlation of IQ and learning ability as mentioned above. Thus, the correlation between IQ and academic achievement might be higher if the above characteristics are fulfilled (Terman & Oden, 1959).

In 2004, Mensa had launched a Mensa Admission Test (MAT) in UMS. It is an association for those with IQ above 148 where it is 2 percent of the worldwide

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