The Direct and Indirect Effects of the Achievement Motivation on Nurturing Intellectual Giftedness

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Abstract—Achievement motivation is believed to promote giftedness attracting people to invest in many programs to adopt gifted students providing them with challenging activities. Intellectual giftedness is founded on the fluid intelligence and extends to more specific abilities through the growth and inputs from the achievement motivation. Acknowledging the roles played by the motivation in the development of giftedness leads to an effective nurturing of gifted individuals. However, no study has investigated the direct and indirect effects of the achievement motivation and fluid intelligence on intellectual giftedness. Thus, this study investigated the contribution of motivation factors to giftedness development by conducting tests of fluid intelligence using Cattell Culture Fair Test (CCFT) and analytical abilities using culture reduced test items covering problem solving, pattern recognition, audio-logic, audio-matrices, and artificial language, and self report questionnaire for the motivational factors. A number of 180 high-scoring students were selected using CCFT from a leading university in Malaysia. Structural equation modeling was employed using Amos V.16 to determine the direct and indirect effects of achievement motivation factors (self confidence, success, perseverance, competition, autonomy, responsibility, ambition, and locus of control) on the intellectual giftedness. The findings showed that the hypothesized model fitted the data, supporting the model postulates and showed significant and strong direct and indirect effects of the motivation and fluid intelligence on the intellectual giftedness.

Keywords—Achievement motivation, Intellectual Giftedness, Fluid Intelligence, Analytical Giftedness, CCFT, Structural Equation Modeling.

I. INTRODUCTION

THERE are important components in the development of expertise such as individual's motivation and desire to give the required time and effort to an activity as well as the support received from family, peers, and instructors [1]; [2]; [3]. Therefore, motivation is one of the major personality characteristics concerned in [4] conceptions of creativity. According to Amabile [4], motivation includes the individual's motivation for undertaking the task and his/ her perception of this motivation. Tannenbaum [5] also emphasized that

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"without the support of non-intellective traits, such as the capacity and willingness to work hard in achieving excellence, it is impossible to rise above mediocrity" (p. 31). Renzulli [6] stated similar views. Thus, he included "task commitment" in his conception of giftedness emphasizing on including this non-intellective group of traits in a definition of giftedness.

Moreover, Heller [7] emphasized on the personality traits of gifted individuals which are frequently mentioned in the literature, e.g. intrinsic achievement motivation, tolerance of ambiguity, goal orientation and persistence at tasks, uncertainty and complexity, clear interests, and nonconformity. Gifted adults demonstrate self-confidence, autonomy, preference for working alone; hard work, perseverance, endurance, persistence in the accomplishment of ends, integration towards a goal; determination, industry; belief in one's ability to achieve important work; highly developed feeling for justice; ambition, determining toward success; well developed self-regulation; positive self-concept, high self-esteem; internal locus of control; high self-criticism; and self-sufficiency [8].

Individuals also are expecting something in return for devotion to their activities. Thus, perceived intrinsic or extrinsic rewards are significant elements in individual's readiness to persevere in their work [2]. Moreover, extrinsic rewards include recognition, and praise gained through individual's participation, whereas intrinsic rewards include the enjoyment and innate contentment that individuals feel through their efforts and achievements. Therefore, individuals may not dedicate the time and effort necessary to develop expertise, unless they are motivated to participate in an activity through internal or external rewards.

Motivation can be one of the most important factors on enhancing achievement. Moreover, achievement motivation is an important predictor of both academic and job outcomes [9]. It is indicated that a strong sense of motivation, typically in combination with ability factors such as aptitudes or individual personality traits, can be a powerful predictor of academic success [10]. Motivation is defined in terms of general energizing process that triggers responses in individuals; this term is used exchangeable with Renzulli's "task commitment" as perseverance, hard work, endurance [6].

Achievement motivation is defined as "the striving tendency towards success with the associated positive effects and towards the avoidance of failure and the associated negative effects" ([11], p. 1058). Elliot [12] defined it as the energizing and direction of competence-based affect,

cognition, and behavior. Therefore, when defining achievement motivation as an individual difference, can be described as an individual's tendency to desire and work toward accomplishing challenging personal and professional goals. However, the relationships between achievement motivation and many key construct (e.g., performance and learning) remain unclear [13].

The conceptualization and measurement of achievement motivation has widely varied. Some have presented it as an explicit motive or a trait and can be measured more directly such as a facet of conscientiousness in the big five personality framework [14] or as a motivational trait in broad inventories such as Edwards Personal Preference Schedule [15] or the Personality Research Form [16]. Whereas, others have viewed it as an implicit motive that must be assessed by indirect techniques, such as the Thematic Apperception Test (TAT; [17].

More recently, multidimensional measures of achievement motivation have initiated as a separated trait. Such measures include the Work Preference Inventory [18], the Motivational Trait Questionnaire [19], and the Achievement Motivation Inventory [20]. However, it appears that none has been specified for use cross-culturally, nor have any been widely accepted as a comprehensive instrument for measuring the multi-faceted construct of achievement motivation.

Motivation supports the gifted to attain high production and performance goals, provides clear and strong self-concepts [5] and in general, they are highly motivated [21]. Furthermore, achievement motivation is considered to play essential role on giftedness appearance and development. In addition, other personality traits are linked to giftedness such as intrinsic motivation increase the levels of selective attention to specific tasks (e.g. sounds, visions) or specific activities for individuals (e.g. intellectual, artistic, physical), which is accompanied by perseverance, hard word, dedication, high tolerance, preference for ambiguous, and a need for challenge [22].

Urdan, Kneisel, and Mason [23] identified two categories of motivation research in giftedness: one emphasized on motivation as an environmentally induced temporary state, and the other emphasized on motivation as a stable personality trait. Moreover, Dai, Moon, and Feldhusen [24] demonstrated that research on achievement motivation of gifted students has reflected a move to an emphasis on intellectual and affective processes underlying achievement behaviors rather than the trait approach.

Researchers found that talented individuals typically tend to be devoted about their activities. They do not need even persuade to practice, but rather have a great desire to achieve in their domains [3]. Talented individuals set up their personal goals and observe their own development, which actively control their own experiences [25]. In addition, talented individuals do not avoid challenges in their activities, but they are high persistent and possess a great amount of focus and energy [2]; [3].

II. Intellectual giftedness

Sternberg [26] identifies three kinds of giftedness including analytic, synthetic and practical giftedness. The identification includes assessment through observation of a student's ability in these three areas. Teachers may then design opportunities for students demonstrating analytical, synthetical and/or practical abilities. According to Sternberg [26], people with analytical giftedness can analyze and understand problem elements, and this kind of giftedness might be tested by traditional tests for intelligence, such as testing analogies, synonyms and matrix problems. The second type is synthetic giftedness, which might be noted on the people who are creative or tend to deal with discovering and inventing. Unlike the first kind of giftedness, this kind might not be measured by the traditional tests of intelligence. The third type of giftedness is practical giftedness, people who are practitioners have a propensity to apply and implement what have been analyzed or synthesized, with an investment of environment situations

Gagne [27] distinguishes between giftedness as inborn abilities, which develop over time and talent as skills that have been highly developed through training, learning and practice. He used gifts as potentials for talents in his Differential Model of Giftedness and Talent (DMGT) and addressed talents as skills in a particular field that can be learnt by developing (giftedness aptitudes) with getting use of supportive factors (catalysts) around the individual (e. g. environment, motivation). According to Gagne [27], giftedness is related to high level of general aptitudes and talents are related to high level of specific performance. The intellectual giftedness in (DMGT) includes induction, deduction reasoning, memory, and metacognitive. The analytical abilities were investigated in this study by measuring the effects of general abilities g and the motivational factors on this element of intellectual giftedness.

A. Artificial Language (AL)

Artificial language (AL) is a set of sentences often constructed from nonsense syllables, which has some property of interest to researchers [28]. It is systems usually consisted of a circumscribed set of nonce word vocabulary items combined in a limited number of legal ways according to an underlying grammar [29]. Artificial language is one of the best examples of the abstract reasoning. Syllogisms are being used in two or more premises to build a conclusion. Abstraction moves beyond the details of a situation [30], it is less constraining than concrete thinking. Abstract thinking by using sounds involves generalization, which allows for more flexibility. Further, nonsense syllables are being used in the first premise to represent abstractly deferent concepts (e.g. a bird, street, door, etc.), also another nonsense syllables in the second premise to represent subcategories or sub features belonging to the preceded premise, in other words, a common logical relations control the linkage between the premises. Individual must recognize the nonsense syllables construct, sound, and order, and then follow that order in each premise to come up eventually with the right conclusion.

B. *Audio-logical abilities*

Acoustic abilities allow individuals to create, communicate, and understand meanings made out of sound, vibration, and patterns. It involves thinking and expressing oneself through sounds and rhythmic movements, or composing, playing music. This also includes finding patterns in all surrounded sounds, and identification with patterns as an expression of experience. Individuals with strengths in these abilities have a heightened listening ability and are often sensitive to slight changes in sounds and sound patterns.

Logical reasoning and syllogisms are not confide to visual contents only, but extend to include other sensory channels, crucially important as the acoustic. Likewise the spatial relations, not only visually but include acoustic ones also. Though, spatial relations in certain situations can be inferred acoustically not only visually, or by using both. Therefore, the acoustic system for beings is considered to be integrated construct, starting from sounds perceptions, recognition, processing and lasting in the working memory, making matching and associations with the construct in the long term memory, and the other multiple processes could be involved. Before demonstrating the acoustic syllogisms, sound perception, recognition, manipulation and other features should be taken into account such as similarity, proximity, symmetry and closure [31], and processing by using the time duration and the sound pitch. As in the artificial language, acoustic syllogisms involve premises to induct conclusions. Premises may involve recognized syllables of sounds or nonsense, in the both cases a logical relations link the premises with a multiple levels of complexity.

C. *Problem Solving:*

Problem solving is defined as a set of mental operations to adapt either demands or internal and external challenges [32]. Sternberg and Davidson [33] presented three main cognitive components for the solutions of insight problems by the gifted; encoding, combination, and comparison. Encoding refers to the extracting of information from a given problem to the solver. Gifted was found to disregard irrelevant features in the problem and to encode deep-structure relations of it. Then, a problem solver combines encoded information, its semantic interpretation, and evoked procedural knowledge into a solution structure.

According to Sternberg and Davidson [33], gifted students were found to be highly selective when they combine the encoded information. Comparison allows the solver to search for a pattern that may lead to a solution. When the problems were different on the surface, gifted student was found to see the parity of two problems at their deep structure level. Interestingly, gifted students are possessing high ability, high motivation and high creativity when they deal with problem solving [34]. Gifted and talented students usually have advanced problem solving skills [35]. They use higher level thinking than their age peers. This helps them to produce new ideas and responses to situations, or problems to come up with many alternatives and approaches to problem solving. They are able to make associations and connections between apparently unconnected ideas and situations [36].

III. METHODS

A. *Participants*

The study involved one hundred and eighty students (age ≈ 19-20) in the schools of Mathematics and Computer Science at a leading university in Malaysia. Students were selected through lecturers' nominations and exceeding the cut-off point of 35 of the raw scores of CCFT. A total of 210 students were nominated by their lecturers as good to excellent first-year students at these schools. The Cattell Culture Fair Test (CCFT) was then administered to identify the potentially gifted students. Since CCFT can be administered by groups, the nominated students (210) were divided into five groups and tested according to the test manual. Out of the 210 students, only 180 exceeded the 35 cut-off point of CCFT raw scores and were chosen for the study. The analytical test was administered the following week through two sessions with a refreshment break. The motivation questionnaire was administered immediately after the students had completed the analytical test.

B. *Cattell Culture Fair Intelligence Test (CCFT)*

The test consisted of four types of spatial problems administered according to a set time. All four subtests of geometric figures are intended to give the widest range of perceptual relation-educing operations possible. Each subtest begins with three practice items. Test items are graded in order of increasing difficulty following an "easy-to-grasp" item to start off with [37]. To score performance on the test, one point is given for each correct item. A total score out of 46 is calculated. The test can be given either as a group test or as an individual test using exactly the same instructions and time limits. The test is considered to have low knowledge dependence, thereby making it a reliable test for measuring general intelligence g despite socioeconomic status, educational background, and cultural upbringing of any participant.

C. *Analytical Abilities Measure*

To measure the analytical abilities 30 items were developed and validated prior to the time of conducting this study. These items were subjected to factor analysis which revealed five factors with Eigen values greater or equal to one while three items were dropped due to cross loadings (> 0.30). Further the items were subjected to reliability scale to calculate the internal consistency; Spearman-Brown technique was used to calculate the reliability coefficient for the analytical abilities items. The internal consistency measuring the reliability of the analytical abilities measure using Spearman-Brown was ranging from 0.70 to 0.79 and the overall coefficient for the scale was 0.73. These values show high reliability indices which support the appropriateness of the instrument as shown in Table 1. According to Nunnaly [38], a value above .70 is considered as highly reliable.

TABLE I
SUMMARY OF INTERNAL CONSISTENCY INDICES FOR THE TEN
FACTORS OF THE ANALYTICAL ABILITIES

Factor	Valid Items	Spearman-Brown
Problem Solving	7	0.74
Pattern Recognition	7	0.72
Artificial Language	4	0.79
Audio-Logic	5	0.70
Audio-Matrix	4	0.77
Total	27	0.72

o *Problem Solving*

This section is composed of seven items. Items number one, two, three, and four have primitive indices followed by dilemmas, however, the solutions for the proposed problems was covered by irrelevant remarks. Respondents have to go backward and forward through the primitive indices for the situations connecting the relative indices and eliminating the irrelevant ones seeking for the correct solutions. The correct answers or choices were attached to each item. Items number five and six have weight measurement contained grading system on each side of the scale. The weight was known but the concentration or scaling point to figure out the needed weight on the other side of the scale to achieve balance. Items number seven and eight include two maps, on the right side; they contain an indicator for the direction along with four symbols. The directions and symbols are [a star; indicates the east, triangle; indicates the north, square; indicates the south, and a circle and triangle indicate to the north-west direction]. Respondents were given instructions in each question to move according to the provided symbols. Each move was designed for one intersection included in the map. Respondents were required to identify the place that the symbol indicates on the map. The symbol indicated the correct given place in the choices attached to the items within a number of other places symbolized on the map.

o *Audio Matrices*

This section consisted of four items; each item has a series of sounds presented in a progressive form. Sounds were manipulated professionally using computer sounds application (Sound Forge V.8) to be varied in their pitch. Respondents were asked to choose from the given options the correct sound that should be added to complete the matrix.

o *Audio-Logic*

The audio-logic items require the use of the deductive logic which involves drawing conclusions based on sets of premises that are assumed to be true. Deductive reasoning involves the use of two or more premises, which may be rules, laws, principles, or generalizations, and forms a conclusion based upon them. In order to be valid, a deductive argument must have premises that are true and a conclusion that logically follows from those premises, without trying to go beyond them. When individuals understand how these arguments work, they will know how to construct their own strong arguments. This section consisted of five items, each item introduced premises represented by sounds, respondents are asked to draw a correct conclusion by getting use of the provided premises from the sounds, and the correct conclusion

(answer) was given in item answer options. The following is an example of audio-logic items:

Premise (1): If North-East is represented by the sound (A)
Premise (2): North-West is represented by the sound (B)
Premise (3): South-East is represented by the sound (C)
What sound could indicate to South-West?

Sound A in the first premise consisted of two distinct musical notes (X: indicates North, Y: indicates East). In the second premise, sound B also is composed of two distinct musical notes, namely, X that indicates North, and a new note Z that indicates West. In the third premise, sound C is composed of another pair of notes, i.e., W that indicates to South and Y that indicates East). Thus the sound which indicates South-West must be W & Z the pair of notes. In order to solve such a problem, a high level of sound recognition, an ability to keep holding the various notes for a long time in the working memory, and the abilities to build logical linkages and connections among the premises to draw the conclusion are required.

o *Artificial Language*

This section consisted of six items. It was developed to measure the qualitative reasoning into two different levels (average and advanced). The average level includes two logical introductions (premises) require from respondents to find out the result (conclusion) following the logical indicators of the premises. The advanced level involves three logical premises require from the respondent to find out the possible conclusion from the given six multiple choices attached to each item.

o *Pattern Recognition*

This section contained two parts. The first part is composed of two items require from the respondents to recognize a shape given on the top of the questions within a list of choices attached to the questions. The shapes are similar to the required shape but only one accurate shape matches the given shape that is needed to be identified out of the given choices. Item number three of the test was conducted through computer flash application. A shape was given to be identified out of a number of shapes. When identifying the correct choice of the shape, it will be removed from the arranged given shapes. Then another shape was given and so on. All the given shapes were constituted of geometrical figures ordered from easy to difficult. The second part of this test consisted of four items with auditory contents. Respondents were asked to hear a musical sound then to match it to the similar sound form the given options. All sounds have the same rhythm but differed in their pitch.

D. *Achievement motivation measure*

A number of 32 items were developed and validated to measure students' motivational traits in specific domains, namely, self confidence, success, perseverance, competition, autonomy, responsibility, ambition, and locus of control. This included developing a day life situations (i.e. at home, school) for each item with three possible choices representing the

considered domain (in terms of the responses) positively, neutral, and negatively. As each item has three choices, the positive response was given three marks, the neutral two, and the negative was given one mark. The following is an example of the locus of control domain:

Item #: When I study a difficult course I feel:

o It is difficult and not understandable (negative response: extrinsically motivated)

o It is easy because the teacher explains it completely (neutral response)

o The easiness of subject depends mainly on my effort to understand it (positive response: intrinsically motivated)

These items were subjected to factor analysis which revealed eight factors with Eigen values greater or equal to one while three items were dropped due to cross loadings (> 0.30) and (29) items were retained. The research about questionnaire development determines what survey formats would be most effective for this population and for the information to be collected. However, items development was guided by the research of various concerns about students' achievement motivation (e.g. [39]; [40]; [41]; [42]; [43]). The internal consistency measuring the reliability of the achievement motivation factors using Cronbach's Alpha was ranging from 0.77 to 0.87 and the overall coefficient for the questionnaire was 0.85. These values had shown high reliability indices which support the appropriateness of the instrument as shown in Table 2.

TABLE II
SUMMARY OF INTERNAL CONSISTENCY COEFFICIENTS FOE THE ACHIEVEMENT MOTIVATION FACTORS

Factor	Valid Items	Chronbach Alpha
Locus of control	3	0.87
Ambition	3	0.78
Bearing responsibility	3	0.81
Competition	4	0.83
Perseverance	3	0.82
Autonomy	4	0.77
Seeking for success	4	0.82
Self confidence	4	0.79
Total	28	0.85

IV. RESULTS

A. Evaluation of SEM Assumptions

Multicollinearity refers to a high correlation among a set of variables within a specific construct. Hair et al. [44] suggest that the value greater than 0.9 of correlation coefficient creates multicollinearity problem. Although some of the variables for this research are highly correlated, they fell within the acceptable range (< 0.9) suggested by [44] as shown in Table 3. There was no evidence of multicollinearity of the variables so all these variables were used for further analysis. Prior to the SEM analysis, the assumptions for SEM were evaluated. Reliability coefficients (Cronbach's alpha) were computed to access the reliability of the indicators for all observed variables. The results showed that the measures used for the current study had adequate to excellent internal reliability. The sample covariance matrix value was evaluated to confirm

multicollinearity and to determine if singularity problems existed. A high value of determinant on the sample covariance matrix (2.035) was found in the Sample Moments section and it was larger than zero. Therefore, there was no singularity problem among the tested variables. No further rescaling was required for the current data. A skewness range from -0.351 to 0.512 was well below the suggested level of the absolute value of 3.0. In addition, a kurtosis range from -0.275 to.834 revealed that the variables are not overly peaked and well below the absolute value of 10.0 as suggested by [45]. Thus the presented values reveal that the variables are normally distributed and have met the criteria for the SEM analysis.

B. Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis CFA was carried out to determine the adequacy of the factor loadings and the standardized residuals and explained variances for the measurement variables. Fig. 1 presents the measurement model for the variables. For this constructed measurement model, all factor loadings were freed (i.e., estimated); items were allowed to load on only one construct (i.e., no cross loading); and latent constructs were allowed to correlate (equivalent to oblique rotation in exploratory factor analysis EFA).
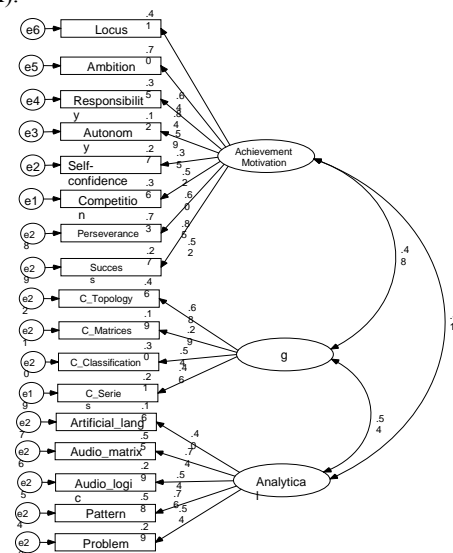

Fig. 1 The Measurement Model with the Factor Loadings

Table 3 shows the elaborated evaluation of the measurement model parameters. All standardized regression weights were significant with CR > ± 1.96, p < 0.05 and all the error variance were < 1.0 indicating that there was no violation of estimates revealed. The standardized regression weights range from 0.294 to 0.854. These values indicate that the measurement variables are significantly represented by their respective latent constructs. The explained variances for these variables are represented by their squared multiple correlations (SMC), the higher the value of the squared multiple correlation, the greater the explanatory power of the regression model. The percentage of variance explained range from 0.123 or 12.3 % (Autonomy) to 0.730 or 73.0 %

(Perseverance) as shown in Table 3. SMC results indicate a strong relationship between the constructs and their factors and demonstrate the greater explanatory power of these factors in predicting these compounds.

Examination of the Modification indices MI did not give any suggestions to modify the measurement model. As the adequacy of the measurement model was supported by parameters estimates, the directions of the estimates were theoretically justifiable. In other words, the three latent variables in the measurement model, namely, g, analytical, and achievement motivation are theoretically represented by their constructs. Many scholars such as [37] identify the components of the fluid intelligence as the ability of classification, deductive reasoning, inductive reasoning, and manipulate conditions (topology).

Further, Carroll's [46] conception of high order intellectual abilities (stratum II) are consisted of the sequential reasoning (premises or conditions to conduct one or more steps of reasoning to draw a conclusion), induction (to find out the rules that direct the similarities or contrasts), quantitative reasoning (using concepts including mathematical relations to reach a correct conclusion), Piagetian reasoning (abstraction), visualisation (to manipulate visual patterns), and originality/creativity (original verbal/ ideational responses). And for the achievement motivation, numerous scholars (e.g. [1]; [2]; [3]; [47]) define achievement motivation in terms of self confidence, success, perseverance, competition,

TABLE III
MAXIMUM LIKELIHOOD PARAMETER ESTIMATES OF THE STANDARDIZED FACTOR LOADINGS, STANDARD ERROR, CRITICAL RATIO, AND SQUARED MULTIPLE CORRELATION FOR THE MEASUREMENT MODEL

Parameters	Estimate	S.E.	C.R.	SMC
Competition	1.000	-	-	0.358
Self confidence	0.518	0.149	5.938	0.268
Autonomy	0.351	0.113	4.189	0.123
Responsibility	0.588	0.086	6.480	0.346
Ambition	0.836	0.107	8.207	0.700
Locus of Control	0.639	0.101	6.979	0.409
CCFT Series	1.000	-	-	0.207
CCFT Classification	0.544	0.312	4.250	0.296
CCFT Matrices	0.294	0.284	2.713	0.187
CCFT Topology	0.681	0.372	4.216	0.464
Problem	1.000	-	-	0.288
Pattern Recognition	0.762	0.211	6.125	0.580
Audio-logic	0.539	0.135	5.324	0.290
Audio-matrix	0.741	0.206	6.170	0.550
Artificial language	0.401	0.112	4.235	0.161
Perseverance	0.854	0.105	8.269	0.730
Success	0.515	0.126	5.877	0.266
Covariances				
Motivation ←→ g	0.274	0.083	3.297	
g ←→ Analytical	0.285	0.087	3.285	
Motivation←→Analytical	0.284	0.083	3.428	
Correlations				
Motivation ←→ g	0.476			
g ←→ Analytical	0.538			
Motivation←→Analytical	0.408			

autonomy, responsibility, ambition, and locus of control which was confirmed in the measurement model as one latent variable named "Achievement Motivation".

C. The Competing Model

Assessment of Model Adequacy for the Competing Model The competing model has been analyzed using Amos V.16 with Maximum Likelihood Estimation (MLE) as shown in Fig. 2. Table 4 shows the results for Goodness-of-Fit Indices (GFI) for the competing model.

TABLE IV
RESULTS OF GOODNESS-OF-FIT INDICES OF THE COMPETING MODEL

Goodness of fit indexes	Recommended value	Model
X^2	-	159.99
df	-	116
X^2/df (CMIN/df)	< 3.0	1.379
p	>.05	0.103
CFI	> .90	0.943
GFI	> .90	0.907
TLI	> .90	0.933
RMSEA	< .08	0.046

The model adequacy has indicated that a statistically fit structured model with root mean square error of approximation (RMSEA) = .046 (<.08), comparative fit index (CFI) = .943 (> .90), Tucker-Lewis index (TLI) = .933 (> .90) and the overall good fit index (GFI) = .907. Moreover, the chi-square statistics of (X^2= 159.99, df = 116, P = .103) and relative chi-square (CMIN/df = 1.379) which fell below the threshold point of 3.000 as suggested by [48].
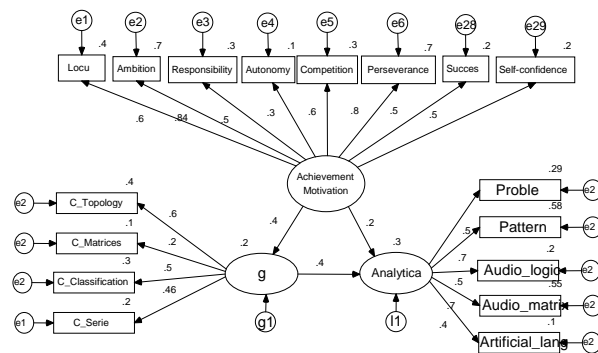

Fig. 2 The Competing Model with the Factor Loadings

Table 5 shows the elaborated evaluation of the competing model parameters. All factor loadings were significant with CR > ± 1.96 and all the error variance were < 1.0 indicating that there was no violation of estimates revealed. The direct effect of the achievement motivation on g was 0.476 and on analytical abilities was 0.408, while g on the analytical abilities was 0.444. All direct effects were significant paths (CR > ± 1.96).

As the paths coefficients > 0.20, the effects of the achievement motivation are considered important to the

analytical abilities. On the other hand, the indirect effect of the achievement motivation on the analytical abilities through the g was 0.211. The total standardized effects for the achievement motivation on the analytical abilities was 0.408 and on g was 0.476, the total standardized effects for g on the analytical abilities was 0.444.

TABLE V
SUMMARY OF THE DIRECT AND INDIRECT EFFECTS, TOTAL EFFECTS, STANDARDIZED ERROR, AND CRITICAL RATIO OF THE COMPETING MODEL

Standardized Total Effects			Estimates	S.E.	C.R.
Motivation	→	g	0.476	0.145	3.553
Motivation	→	Analytical	0.408	0.145	1.774
g	→	Analytical	0.444	0.188	2.852
Standardized Direct Effects					
Motivation	→	g	0.476		
Motivation	→	Analytical	0.197		
g	→	Analytical	0.444		
Standardized Indirect Effects					
Motivation	→	Analytical	0.211		

These results indicated that the internal nurturing factors embodied in the achievement motivation had strong effects on the analytical elements of the intellectual giftedness. The percentage of variance (SMC) explained range from 0.123 or 12.3 % (Autonomy) to 0.730 or 73.0 % (Perseverance). The amount of variance associated with g accounted for 0.227 or 22.7 % by its predictors, namely, CCFT series, CCFT matrices, and CCFT topology. The amount of variance associated with the analytical abilities accounted for 0.319 or 31.9 % by its predictors, namely, problem solving, pattern recognition, audio-logic, artificial language, and audio-matrices as shown in Table 6. SMC results indicated a strong relationship between the variables' constructs and their factors and demonstrate the greater explanatory power of these factors in predicting the intellectual giftedness. Examination of the Modification indices MI did not give any suggestions to modify the competing model. As the adequacy of the competing model was supported by parameters estimates, the directions of the estimates were theoretically justifiable.

By examining paths coefficients among the latent variables in the competing model, a strong connection revealed among them, namely, achievement motivation, g, and analytical abilities. This connection was supported by calculating the direct and indirect effects among these variables. The rising of this connection was due to the crucial roles are played by the achievement motivation to crystallize these constructs (g and analytical abilities). This role is mediating by g as a platform that supports the analytical abilities to be maximized.

V. DISCUSSION AND CONCLUSION

Achievement motivation as a nurturing tool, plays a crucial role in the development of giftedness to become a distinguished talent, this is consistent with Renzulli's Three Ring Model [6] who included "task commitment" in his conception of giftedness emphasizing on including this non-

TABLE VI
MAXIMUM LIKELIHOOD PARAMETER ESTIMATES OF THE STANDARDIZED FACTOR LOADINGS, STANDARD ERROR, CRITICAL RATIO, AND SQUARED MULTIPLE CORRELATION FOR THE COMPETING MODEL

Parameters	Estimate	S.E.	C.R.	SMC
CCFT Series	1.000	-	-	0.207
CCFT Classification	1.324	0.312	4.250	0.296
CCFT Matrices	0.769	0.284	2.713	0.187
CCFT Topology	1.567	0.372	4.216	0.464
Problem Solving	1.000	-	-	0.288
Pattern Recognition	1.290	0.211	6.125	0.580
Audio-logic	0.716	0.135	5.324	0.290
Audio-matrix	1.268	0.206	6.170	0.550
Artificial language	0.476	0.112	4.235	0.161
Competition	1.419	0.203	6.979	0.358
Perseverance	1.235	0.136	9.055	0.730
Success	1.048	0.172	6.074	0.266
Self-confidence	1.256	0.205	6.115	0.268
Autonomy	0.674	0.156	4.319	0.123
Responsibility	0.792	0.116	6.825	0.346
Ambition	1.241	0.141	8.774	0.700
Locus of Control	1.000	-	-	0.409
Analytical	0.444	0.188	2.852	0.319
g	0.476	0.514	3.553	0.227

intellective group of traits in defining giftedness. The evaluation of the competing model parameters gave significant direct effects of the achievement motivation on g and analytical abilities. All achievement motivation factors, namely, locus of control, perseverance, ambition, competition, bearing responsibility, seeking for success, self-confidence, and autonomy reported significant factor loadings in the structural model (CR > ± 1.96, p < 0.05).

These results are consistent with many studies in the literature of achievement motivation and giftedness development. Shavinina and Ferrari [8] state that gifted adults demonstrate self-confidence, autonomy, preference for working alone, hard work, perseverance, endurance, persistence in the accomplishment of ends, integration towards a goal, determination, industry, belief in one's ability to achieve important work; highly developed feeling for justice, ambition, determining toward success, well developed self-regulation, positive self-concept, high self-esteem, internal locus of control, high self-criticism, self-sufficiency. Also findings are consistent with [2] and [3], as they found that talented individuals do not avoid challenges in their activities, but they are high persistent and possess a great amount of focus and energy.

The findings also are consistent with [49] in their study of giftedness and motivation, where found that the length of time children keen to work on a similar situation, influence the duration of an adult model's persistence on a task significantly. Further the findings are consistent with [7] in his study of the personality traits of gifted individuals such as intrinsic achievement motivation, tolerance of ambiguity, goal orientation and persistence at tasks, uncertainty and complexity, clear interests, and nonconformity. Also are consistent with [3], as talented individuals typically tend to be

devoted about their activities and have a great desire to achieve in their domains. They are also consistent with [25], where talented individuals set up their personal goals and observe their own development, which actively control their own experiences.

Achievement motivation supports the gifted individuals to attain high production and performance goals in specific fields which is consistent with [5]. Further, achievement motivation is linked to giftedness construction and it helps and supports a specific and fine abilities to be strongly grouped and maximized, for example, intrinsic motivation, perseverance, hard word, dedication, high tolerance, preference for ambiguous, and a need for challenge increase the levels of selective attention to specific tasks (e.g. sounds, visions) or activities for individuals (e.g. intellectual, artistic, physical) [22]. Eventually, achievement motivation functions as a nurturing tool helps individuals' aptitude to be maximized and manifested in a specific talent. This notion was revealed implicitly in many studies indicating that achievement motivation is a significant factor to predict academic success [10]; [11].

A multivariate analysis employing the structural equation modelling (SEM) to explore the simultaneous interconnections and relationships between fluid intelligence, analytical abilities, and achievement motivation was used in this study. The main focus was to investigate how these factors interacted so that the administration of the gifted and talented education and the role of parents and other motivational factors can be enhanced. The findings of this study indicated that the availability of the achievement motivation promoted higher analytical abilities and suggested that motivational factors were integral and significant variables in the further development of gifts and talent. Thus, these findings provide support for the belief that with proper achievement motivation scaffolding "everyone can be talented" and these findings can be helpful for planning and conducting the identification and nurturing processes of gifted and talented individuals. However, more studies that explore the roles of the achievement motivation in promoting other intellectual, emotional, and psychomotor intelligences are recommended.

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