Variability of Academic Emotions: A comparison between high and average-ability students

Abstract

This paper investigated the variability of academic emotion as mediator between motivational beliefs and student outcomes comparing average and high-ability students. 1355 Secondary One students from eleven schools in Singapore participated in the study. The instruments administered include the Raven's Advanced Progressive Matrices, the Attitude in Learning Math Survey and a standardized math achievement test. Participants who scored 26 on Raven's test were regarded as high-ability, otherwise average-ability. The path models include motivational beliefs were goal orientations; academic emotion which consists of interest and boredom and the affect variables were tested as mediators; finally, four student outcomes include math achievement score, persistence, effort regulation and subjective well-being. Multiple-group path analyses conducted using AMOS 7 showed differences in the relations between goal orientations and student outcomes after inserting affect mediators between high-ability and average-ability students. Each initial path model and multiple-group path model achieved the Tucker-Lewis Index (TLI), comparative fit index (CFI), root-mean-square error of approximation (RMSEA) and standardized root mean square residual (SRMR) fit indices, and these path models were further subjected to test of significance using bootstrap procedures. Findings on interest in this study corroborated with works in the literature that (a) interest does not mediate the relation between goal orientations and math achievement; (b) there were positive relations between interest and approach goals; and (c) there was negative relation between interest and avoidance goals. Moreover, the relations between approach goals and subjective well-being were statistically significant for high-ability students but not average-ability students.

It was found that the goal paths for adaptive motivational behaviours, namely persistence and effort regulation, were similar regardless of ability. Analyses showed that higher levels of approach goals increased higher level of interest which in turn increased higher levels of persistence and effort regulation; and that higher levels of approach goals decreased level of boredom which increased higher levels of persistence and effort regulation.

On the other hand, boredom demonstrated between-group variations in the meditational relations between goal orientations and student outcomes. Two distinctive relations emerged from the analyses for high-ability students. Analyses showed that higher level of mastery-approach goals decreased level of boredom which in turn increased level of math achievement; and higher levels of mastery-approach and

performance-approach goals decreased level of boredom which in turn increased level of subjective well-being.

These findings underscore the variations of mediational role of affect variables between the ability groups.

Key Words

Academic emotions, achievement motivation and learning

Paper

Do interest and boredom have implications on subjective well-being, motivation and performance of high-ability students? This question has raised considerable inconsistent findings on the psychological well-being of high-ability students in the literature due to the heterogeneous profile of high-ability students. Although the cognitive profile of high-ability students is distinctive, there is difference of opinion regarding the psychological well-being or, alternatively, the detrimental consequences of being identified as gifted. This study attempts to guide facilitative classroom practices on providing intellectual challenges for high-ability students in the learning process.

Achievement Motivation, Emotional Well-being and Giftedness

Prior to the early empirical studies conducted by Witty (1930), Hollingworth (1936) and Terman (1926), gifted children were depicted as nerd, geek, brainiac and maladjusted. These studies reported that gifted students were mentally and physically strong and healthy, well-adjusted, creative, energetic, sensitive, and imaginative. On the other hand, Betts and Neihart (Betts & Neihart, 1988; Neihart, 2010) recently updated the profiles of gifted individuals, including feelings and attitudes, behaviours, needs, adults and peers perceptions, identification, home and school support. The six types of gifted individuals are the successful, the creative, the underground, the at-risk, twice/multiple-exceptional and autonomous learner. Nevertheless, these profiles are not qualitatively unique to high-ability students. Other learners could possibly fall into one of these profiles descriptions. In another vein of research, Silverman's (1997, 2002) conception of asynchronous development of gifted individuals brought out the inner developmental variation of gifted individuals to differentiate qualitative difference between the gifted and the non-gifted. Pfeiffer and Stocking (2000) concurred that a significant number of gifted students experience painful, troubling and often debilitating psychological problems.

Several possible explanations for these contradictory findings can be proposed. Different studies employed, for instance, different definitions of who constitutes the notion of gifted learners. Terman's study included children with IQ 130 and above while other scholars defined giftedness beyond intellectual capacity. Moreover, some studies took a dichotomous approach to debunk extreme views on socioemotional characteristics of high-ability students. Yet, there were others took a person-oriented stance, such as Silverman's conception of asynchrony, as well as considering giftedness within a context, such as Neihart's profiling of giftedness. How can these inconsistencies in socioemotional well-being of high-ability student research be explained?

Building on the vast literature on risk and resilience and extant studies on resilience in gifted children, Neihart (2002) explored the use of risk and resilience as theoretical framework to address the social and emotional needs of the gifted. The list of risk factors summarised by Neihart include the lack of appropriate educational programming resulted in underachievement or emotional and social adjustment (Rogers, 2002), intensity or overexcitability, and their internal asynchronies (Silverman, 2002); the protective factors include problem-solving abilities, intellectual curiosity, concern with moral issues, sense of humour, and self-efficacy. Despite the summary list of risk and protective factor for socioemotional well-being of gifted individuals, Neihart regarded the list as incomplete and suggested the need to understand the mediating mechanisms of positive and negative outcomes for gifted individuals.

In another vein, Reis and Renzulli (2004) have called for the use of positive psychology to maximize understanding and encouragement of the talents of high potential children. Clinkenbeard (1996) suggested that research on motivational trait of the gifted is useful for understanding the nature and achievement of high-ability learners. Moreover, motivation has been a pivotal element in the conception of giftedness (Feldhusen, 1986; Gagne, 2010; Heller, 1999; Renzulli, 1986; Tannebaum, 2003). Dai and associates (1998) reviewed the social-cognitive perspective of achievement motivation and recommended researchers explore motivation as a state to address the research gap as it is useful to inform programmatic and pedagogic practices for high-ability students. Several studies have empirically indicated that intellectually gifted students, in general, tend to have higher academic intrinsic motivation than the average-ability learners (Clinkenbeard, 1996; A. E. Gottfried & Gottfried, 2004; A. W. Gottfried, Gottfried, Cook, & Morris, 2005; Vallerand, Gagné, Senecal, & Pelletier, 1994). These findings are useful in delineating

identification process, counselling services and programme design. Therefore, research on motivation as a state or outcome is most useful for instructional strategy decisions and programme evaluation design.

Interests and Giftedness

Interest, whether personal or situational, is an element of engagement and learning advocated by many researchers (Harackiewicz, Durik, Barron, Linnenbrink-Garcia, & Tauer, 2008; Hidi & Renninger, 2006). Findings indicated that interest mediates continued choice of the same course, effort regulation and persistence in learning. Scholars in the field of gifted education have long suggested that student interest should be central in determining educational programmes (e.g. Gallagher, Harradine, & Coleman, 1997; Renzulli & Reis, 1994). Gentry and Springer's (2002) initial validation study on gifted secondary student perceptions of their class activities regarding meaningfulness, challenge, choice, enjoyment and interest revealed that enjoyment and interest were highly correlated. However, the scales were collapsed and re-labelled as appeal failed to yield significant contribution to the field. Interest is a multidimensional construct which consists of cognition and affect. Moreover, interest differs from enjoyment in its stages of development such as initial, catch and hold (Hidi & Renninger, 2006). To date, the association between interest and learning involving high-ability learners is unclear.

Boredom and Giftedness

Many scholars in the field of gifted education have written much about how pedagogies, curriculum and setting in schools fail to facilitate the learning needs of high-ability learners (Gallagher, et al., 1997; Gentry & Springer, 2002). Two reasons frequently identified in these studies are boredom and lack of challenge which usually associated with gifted underachievers and non-producers. Underachieving and non-productive behaviours are frequently regarded as discrepancy between motivational trait and state. Delisle (1992) distinguished gifted non-producers from underachievers by highlighting non-producers as learners who are selective in their own learning but not psychologically at risk. Following Delisle's argument, Kanevsky & Keighley (2003) concluded that though high-ability learners underachieve in school, they could have retained higher levels of intrinsic motivation and perceived competence.

Several researchers found academically gifted students and gifted underachievers are prone to boredom due to their cognitive superiority and the need to learn at a complex level, faster pace and having control of learning (Gallagher, et al., 1997; Kanevsky & Keighley, 2003). However, Feldhusen & Kroll (1991) reported no significant statistical differences in the levels of boredom reported by 227 fourth to sixth

grader gifted who were involved in the Super Saturday programme organised by a university and 236 students who were not identified as academically talented. This finding affirmed challenging enrichment programmes decreased boredom. Using experience sampling design, Larson & Richards' (1991) used electronic pager tracked 392 fifth to ninth graders' experiences of boredom both as a state and as a trait, seven times daily for a week. Time-sampling data analyses showed that higher rates of boredom were found correlated with high ability. They concluded that although individual dispositions may contribute to boredom, schools should be structured to reduce boredom as much as possible.

The issue of boredom faced by many high-ability learners in the classrooms is further substantiated by Bouffard-Bouchard's (1993) investigation on differences in spontaneous self-regulation on a concept identification task between 23 average and 22 gifted eighth-grade students. The findings of their study suggested that self-regulation is a complex composite of cognitive, metacognitive, and motivational factors that underlie sustained efforts to achieve high performance outcomes. Adapted from Csikszentmihalyi's (1975) model of flow which was defined as the enjoyment of learning and an orientation toward task mastery, persistence, and challenge in the social context of school, Hoekman and her associates (1999) found positive correlations between intrinsic motivation and the quality of school life. The quality of school life, however, was negatively correlated with anxiety and boredom. Moreover, Goetz and his associates (2007) divided the sample into four different ability groups and found that the highest ability group experience enjoyment (situational interest) while the lowest ability group experienced anger and anxiety. The two average-ability group in the study, however, experience boredom before, during and after the test. Thus, boredom not only emerged when there is inappropriate curriculum and setting, but also as one of the outcomes of exam taking situation. These findings support the theoretical rationale underpinning the inclusion of measures of boredom.

Objectives and Research Questions

In view of the gaps in literature, this paper addressed the following research questions: (a) To what extent are goal orientations associated with student outcomes? (b) What is the role of academic emotion, interest and boredom, in mediating the relation between goal orientation and student outcomes? (c) Is there variability between high and average-ability students?

Method

Participants

1355 Secondary One students, with a mean age 13.7, from eleven schools in Singapore participated in the study. 63% of the participants were male and 52% were female. The mean achievement score[1] in the Primary School Leaving Examination (PSLE) was 239. The data set was divided into high-ability and average-ability groups at a cut-off score of 26, based on the participant's total raw score on the Advanced Progressive Matrices (APM)[2].

Instruments

Participants responded to these items on a Likert five-point scale (either 1= strongly disagree to 5= strongly agree or 1= not at all true of me to 5= very true of me).

General ability. The 36-item APM documented the overall mean score of 22.68 with a standard deviation of 5.38 and skewness of -.492; standard error of skewness at .066.

Goal Orientations. The trichotomous goal orientations (Elliot & Church, 1997; DeBacker & Crowson, 2006; Cury et. al., 2006) consist of mastery-approach goals (7 items), performance-approach goals (7 items), and performance-avoidance goals (5 items). These three factors yielded eigenvalue 6.905, 4.052 and 1.753 and the factor solution accounted for was 66.895% of the total variance.

Affect mediators. Interest (5 items) (Harackiewicz et. al., 1997) and boredom (6 items) (Pines et. al., 1981) were included as affect mediators. The eigenvalue were 3.286 and 4.039 and the factor solutions accounted for were 65.715% and 67.312%.

Persistence. There were 5 items based on work published by Elliot, McGregor and Gable (1995). Eigenvalue was 3.629 and the factor solutions accounted for was 72.579%.

Effort regulation. The scale consists of 4 items which were adapted from Elliot (1999), Pintrich, Smith, Garcia, and McKeachie (1991). The eigenvalue was 2.99 and the factor solutions accounted for was 74.748%.

Subjective well-being. All the 5 items were adapted from Diener's work (Diener, Emmons, Larsen & Griffin, 1985). The eigenvalue was 3.212 and the factor solutions accounted for was 64.239%.

---

[1] The achievement score refers to transformation score or T-score. It is a standardised score of raw scores of four subjected tested in Singapore's PSLE. It gives a relative position of a student's performance as compared to the performance of all other students in the same examination setting. T-score is an indicator for placement to secondary schools.

[2] The decision was based on the APM Set II norms for Australian Year 7 students Table, published in the Raven's Advanced Progressive Matrices Manual Section 4 (See Table APM28, J. Raven, Raven, & Court, 1998, p. APM96). The raw score of 26 is indicative of participants functioning at 94th percentile for 12 year-old potentially gifted students who participated in a Talent Search programme.

Math Achievement Score. A multiple-choice math achievement test was developed for this study because a standardized test of math achievement at Secondary One was unavailable in Singapore. There were 28 items. Each correct response was awarded one mark. The mean score was 15.1 with a standard deviation of 5.4 and skewness of .071; standard error of skewness at .066.

Procedure

Sequence of data collection. Data was collected from July to August 2007. Total time taken to complete was 1 hour and 30 minutes. The general ability test was administered first, then the Attitude in Learning Math Survey and lastly the mathematics achievement survey. The sequence of administering the instruments was to ascertain baseline general ability of the participants and warrant predictability of goal orientation to the math achievement outcome. The data was analysed using SPSS 15.0 and AMOS 7.

Model specification. Informed by the literature, the initial antecedent-mediators-outcomes path models include goal orientations (mastery-approach, performance-approach and performance-avoidance goals) and academic emotion (interest and boredom); and four student outcomes independently (math achievement score, persistence, effort regulation and subjective well-being). A total relation may be statistically significant yet one or more mediated relations may be inconsistent (MacKinnon, 2008). The use of multiple mediator path modeling allows simultaneous testing of trichotomous goal orientations and both academic emotions as mediators. Each initial path model was subjected to multiple-group path analyses to obtain fit indices, the Tucker-Lewis Index (TLI), comparative fit index (CFI), root-mean-square error of approximation (RMSEA) and standardised root mean square residual (SRMR), at the factor loading level to identify differences between the comparison groups. Finally, bootstrap procedures were implemented to test significance of the mediational relations.

Analyses and Results

Descriptive Statistics, t-tests and Zero-order Correlations

Table 1 displays the descriptive statistics by ability group. The mean for performance-approach goals, performance-avoidance goals, boredom and effort regulation were lower for the high-ability students as compared to the average-ability students. The high-ability students have higher means for the rest of the scales. Independent-samples t test was implemented to compare the means of all the variables investigated. Bonferroni adjustments at .05/10=.005 suggested each test should be assessed at p=.005. Subsequently, two

student outcomes, namely performance-approach goals and subjective well-being were not significant. Table 2 presents the zero-order correlations for all variables used as predictors in the path analyses.

Initial Path Models on Goal Orientations, Affect Variables and Student Outcomes

Goal orientations, interest and student outcomes. Table 3 showed all initial direct associations. The relation between approach goals and math achievement (β_{hal}= 1.35; β_{aal}= .93) for both high and average-ability learners was absent after interest was inserted into the path model. The relation between performance-approach goals and math achievement was negative for high-ability students (β= -.48) while the relation between performance-avoidance goals and math achievement was negative for average-ability students (β= -.58).

There were positive relations between interest and persistence (β_{hal}= .23; β_{aal}= .14); and between interest and effort regulation (β_{hal}= .26; β_{aal}= .36) for high and average-ability students. There was no direct relation between performance-avoidance and persistence. The chi-square difference for persistence was X^2(1, N=428) =.013, p<.911, TLI=1.017, CFI=1.000, RMSEA=.000 for high-ability students and X^2(1, N=927) =2.015, p<.156, TLI=.993, CFI=.999, RMSEA=.033 for average-ability students. The chi-square difference for effort regulation was X^2(0, N=428) =.000, CFI=1.000, RMSEA=.330 for high-ability students and X^2(0, N=927) =.000, CFI=1.000, RMSEA=.369 for average-ability students.

The relation between interest and subjective well-being was positive (β_{hal}= .17) for high-ability students. There was no relation between interest and subjective well-being found for average-ability learners. The chi-square difference was X^2(2, N=428) =1.849, p<.397, TLI=1.002, CFI=1.0020 RMSEA=.000 for high-ability students and X^2(2, N=927) =3.998, p<.135, TLI=.988, CFI=.998, RMSEA=.033 for average-ability students.

Goal orientations, boredom and student outcomes. There was a direct, negative relation observed between boredom and math achievement (β_{hal}= -.52; β_{aal}= -.33). The chi-square difference was X^2(1, N=428) =.523, p<.469, TLI=1.017, CFI=1.000, RMSEA=.000 for high-ability students and X^2(1, N=927) =.243, p<.622, TLI=1.010, CFI=1.000, RMSEA=.000 for average-ability students.

The relations between boredom and persistence is negative (β_{hal}= -.17; β_{aal}=- 11) for both high and average-ability students. The chi-square difference was X^2(1, N=428) =.194, p<.660, TLI=1.015, CFI=1.000, RMSEA=.000 for high-ability students and X^2(1, N=927) =2.527, p<.112, TLI=.989, CFI=.999, RMSEA=.041 for average-ability students.

The relation between boredom and effort regulation is negative (β_{hal}= -.32; β_{aal}= -.41).The chi-square difference was X^2(1, *N*=428) =2.833, *p*<.092, TLI=.962, CFI=.996, RMSEA=.066 for high-ability students and X^2(0, *N*=927) =.000, CFI=1.000, RMSEA=.378 for average-ability students.

Finally, the relations between boredom and subjective well-being were β_{hal}= -.12 and β_{aal}= -.05 respectively. The chi-square difference was X^2(2, *N*=428) =2.173, *p*<.337, TLI=.997, CFI=.999, RMSEA=.014 for high-ability students and X^2(2, *N*=927) =4.992, *p*<.082, TLI=.982, CFI=.996, RMSEA=.040 for average-ability students.

Multiple-group Path Analyses: A comparison of ability grouping with affect as mediator

Multiple group path analysis is useful to examine comparison samples with the same measurement model where different assumptions of group equality can be tested (Bollen, 1989). The model with all parameters freely estimated in the two ability groups fit the data well according to fit criteria suggested by Hu and Bentler (1999). Except for subjective well-being, there was no need to relax any path in order to obtain small chi-square with *p* that is not significant.

Multiple-group path analyses: Interest as the mediator. On math achievement, the fit indices for both ability groups were X^2=4.932, *df*= 4, *p* <.294, *TLI*=.996, *CFI*=.999, *RMSEA*= .013, *SRMR*= .0209. The fit indices were ΔX^2=4.444, Δdf= 5, *p*< .487, *TLI*=.999, *CFI*=1.000, *RMSEA*=.006 and *SRMR*= .0269. There was no relation between interest and math achievement regardless of ability.

On persistence, the fit indices for both ability groups were X^2=2.027, *df*= 2, *p* <.363, *TLI*=1.000, *CFI*=1.000, *RMSEA*= .003, *SRMR*= .0009. The fit indices were ΔX^2=9.647, Δdf= 6, *p*< .140, *TLI*=.995, *CFI*=.998, *RMSEA*=.018 and *SRMR*= .0233. There was no path between performance-avoidance and persistence.

On effort regulation, the fit indices for both ability groups were X^2=.000, *df*= 0, *p* <. nil, *TLI*=nil, *CFI*=1.000, *RMSEA*= nil, *SRMR*= nil. However, the multiple path model generated the following fit indices at the factor loading constrained level, X^2=13.278, *df*= 7, *p* <.066, *TLI*=.990, *CFI*=.996, *RMSEA*= .025. Since the unconstrained level fit indices are zero, there was no change in chi square fit indices.

The path between interest and subjective well-being had to be released to obtain the fit indices for both ability groups at X^2=4.544, *df*= 2, *p* <.103, *TLI*=.978, *CFI*=.998, *RMSEA*= .031, *SRMR*= .0135. Moreover, the path between performance-approach goals and subjective well-being was relaxed in order to

obtain the following fit indices, ΔX^2=5.943, Δdf= 5, p< .312, *TLI*=.991, *CFI*=.997, *RMSEA*=.019 and *SRMR*= .0274.

Multiple-group path analyses: Boredom as the mediator. For Math achievement, the fit indices for both ability groups were X^2=.000, *df*= 0, p < nil, *TLI*=nil, *CFI*=1.000, *RMSEA*= nil, *SRMR*= .0000. Two paths, namely, math achievement and performance-approach; and math achievement and performance-avoidance, were released for average-ability students and high-ability students respectively, to obtain the fit indices, ΔX^2=1.748, Δdf= 5, p< .883, *TLI*=1.012, *CFI*=1.000, *RMSEA*=.000 and *SRMR*= .0135.

The fit indices on persistence for both ability groups were X^2=2.720, *df*= 2, p <.257, *TLI*=.996, *CFI*=1.000, *RMSEA*= .016, *SRMR*= .0035. The fit indices were ΔX^2=3.823, Δdf= 6, p< .701, *TLI=1.002*, *CFI*=1.000, *RMSEA*=.000 and *SRMR*= .0146.

The fit indices on effort regulation for both ability groups were X^2=.000, *df*= 0, p <nil, *TLI*=nil, *CFI*=1.000, *RMSEA*= nil, *SRMR*= .0000. Two paths, between performance-approach and effort regulation; and performance-avoidance and effort regulation, were set to free loading to obtain the fit indices at ΔX^2=9.088, Δdf= 5, p< .106, *TLI*=.991, *CFI*=.998, *RMSEA*=.025 and *SRMR*= .0174.

For subjective well-being, the fit indices for both ability groups were X^2=4.502, *df*= 2, p <.105, *TLI*=.978, *CFI*=.998, *RMSEA*= .030, *SRMR*= .0139. Two paths, between performance-avoidance and subjective well-being; and between boredom and subjective well-being, had to be unconstrained to achieve the fit indices at ΔX^2=1.178, Δdf= 6, p< .460, *TLI*=1.001, *CFI*=1.000, *RMSEA*=.000 and *SRMR*= .0185. There was no path between performance-approach goals and subjective well-being. Table 4 summarised the fit indices for multiple-group analyses.

Test of Significance for the Mediated Relations

Each multiple group path model was subjected to 10,000 times of Bootstrap sampling. The relation is statistically significant when the range between upper and lower bound does not include zero.

Test of significance and interest. Results indicated that the relations between goal orientations and persistence were mediated by interest for high-ability students (IE_{hal} lower 95% CI= .143, upper 95% CI =.328) and for average-ability students (IE_{aal} lower 95% CI=.086, upper 95% CI=.197). Regardless of student's ability, higher levels of mastery-approach and performance-approach goals increased level of interest which in turn increased level of persistence. Higher level of performance-avoidance goals decreased level of interest which in turn decreased level of persistence.

The relations between goal orientations and effort regulation were mediated by interest for high-ability students (IE_{hal} lower 95% CI=.158, upper 95% CI=.357) and average-ability students (IE_{aal} lower 95% CI= .284, upper 95% Cl =.424). The relations between goal orientations and effort regulation are similarly to that of previous set of relations.

For high-ability students, all relations between subjective well-being and mastery-approach goals were significant (DE=.327, *p*=.000; IE=.088, *p*=.006; TE=.415, *p*=.000); so were the indirect relations between performance-approach goals (IE=.015, *p*=.024); and the performance-avoidance goals (IE=-.040, *p*=.005). Overall, the relations between goal orientations were mediated by interest for high-ability students (IE_{hal} lower 95% CI=.040, upper 95% CI=.281). Thus, higher levels of mastery-approach and performance-approach goals increased level of interest which in turn increased level of subjective well-being for high-ability students. Interest, however, did not mediate the relation (IE_{aal} lower 95% CI= -.036, upper 95% CI =.108) for average-ability students though the direct and total relations between subjective well-being and mastery-approach (DE=.283, *p*=.000; TE=.304, *p*=.000) and performance-avoidance were significant (DE=-.075, *p*=.023; TE=-.080, *p*=.014).

Test of significance and boredom. All relations between math achievement and mastery-approach goals were significant for high-ability students (DE_{hal}=.995, *p*=.002; IE_{hal}=.140, *p*=.037; TE_{hal}=1.267, *p*=.000), so were the direct and indirect relations between math achievement and performance-approach goals (DE= -.445, *p*=.034; IE=.036, *p*=.025). The relation between goal orientations and math achievement were mediated by boredom (IE_{hal} lower 95% CI= -.940, upper 95% CI= -.017). Thus, higher levels of mastery-approach and performance-approach goals decreased level of boredom which in turn increased level of math achievement. As for average-ability students, test of significance showed that boredom did not mediate the relation between goal orientations and math achievement for average-ability students (IE_{aal} lower 95% CI= -.653, upper 95% Cl =.017) though all the relations between performance-avoidance and math achievement were significant (DE= -.547, *p*=.001; IE=.000, *p*=.046; TE= -.618, *p*=.000). The indirect relation between math achievement and mastery-approach (IE=.000, *p*=.056); and the total relation with performance-approach goals (TE=.122, *p*=.513) were not significant.

The relations between goal orientations and persistence which were mediated by boredom were similar between high and average-ability students and both were statistically significant (IE_{hal} lower 95% CI=

-.244, upper 95% CI= -.092; IE_{aal} lower 95% CI= -.165, upper 95% Cl = -.063). All the relations between mastery-approach, performance-approach goals and persistence were significant for high and average-ability students. As for the relation between performance-avoidance goals and persistence, only indirect relation is significant (IE_{hal}= -.037, *p*=.000; IE_{aal}= -.025, *p*=.000). Thus, regardless of student's ability, higher levels of mastery-approach and performance-approach goals decreased level of boredom which in turn increased level of persistence; in contrast, higher level of performance-avoidance goals increased level of boredom which in turn decreased level of persistence.

The relations between goal orientations and effort regulation were mediated by boredom for high-ability students (IE_{hal} lower 95% CI= -.405, upper 95% CI= -.217) and average-ability students (IE_{aal} lower 95% CI= -.474, upper 95% CI= -.351). Regardless of ability, higher levels of mastery-approach and performance-approach goals decreased level of boredom which in turn increased level of effort regulation; in contrast, higher level of performance-avoidance goals increased level of boredom which in turn decreased level of effort regulation.

The relations between goal orientations and subjective well-being were mediated by boredom for high-ability students (IE_{hal} lower 95% CI= -.219, upper 95% CI=.000) but not for average-ability students (IE_{aal} lower 95% CI= -.109, upper 95% Cl =.018). All the between subjective well-being and mastery-approach goals were significant (DE=.352, *p*=.000; IE=.064, *p*=.043*;* TE=.416, *p*=.000); so were the indirect relation between subjective well-being and performance-approach goals (IE=.013, *p*=.028). Thus, higher levels of mastery-approach and performance-approach goals decreased level of boredom which in turn increased level of subjective well-being. Table 5 summarised the findings of this study.

Discussion

The purpose of this study was to investigate whether the mediational roles of interest and boredom on performance, motivation and subjective well-being demonstrate different patterns, as well as the difference between high and average-ability students. Specifically, the study used mediational analyses to delineate the complex relations between goal orientations and student outcomes.

Direct Associations between Goal Orientations and Student Outcomes

Analyses showed that mastery-approach and performance-approach goals and all student outcomes had positive relations for both high and average-ability students when interest was the mediator. These

findings corroborated Harackiewicz and associates' (2008) findings with undergraduate sample. The relations displayed different patterns when boredom was introduced as mediator. Mastery-approach goals maintained positive relations with all student outcomes whereas the relation between performance-approach goals and student outcomes became inconsistent. There was no relation between performance-approach and math achievement for average-ability students; and performance-approach and subjective well-being, for all students. There was also no relation between performance-avoidance goals and persistence for all. Performance-avoidance goals were negative predictors for effort regulation and subjective well-being. And it did not predict math achievement for high-ability students. These findings deepened our understanding of different associations between goal orientations and boredom between high and average-ability students.

Mediational Relations between Goal Orientations and Student Outcomes

Previous studies have shown inconsistent results on interest. Some studies yielded null association between mastery-approach and math achievement (Barron & Harackiewicz, 2001; Elliot & Church, 1997; Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000) ; while some studies shown mastery-approach goals predicted interest directly (e.g. Harackiewicz, Barron, Elliot, Carter, & Lehto, 1997). Since situational interest is developmental by nature (Hidi & Renninger, 2006) and Harackiewicz and associates (2008) had empirically demonstrated the state of catch and hold, this study pursued interest as a mediator instead of an outcome. It was found that interest did not mediate between goal orientations and math achievement score regardless of student ability. Rather, higher level of mastery-approach and performance-approach goals increased level of interest which in turn increased levels of persistence and effort regulation. In contrast, higher level of approach goals decreased level of boredom which in turn increased levels of persistence and effort regulation which is consistent with (Pekrun, Elliot, & Maier, 2009). These findings, in conjunction with those presented by Elliot's study clearly attest to the stability and validity of positive associations of approach goals with persistence and effort as behavioural student outcomes and the significant role of emotions in achievement motivation.

For high-ability learners, mastery-approach and performance-approach goals were found to increase the level of interest and decrease the level of boredom which in turn increased the level of subjective well-being. This finding corresponds with Elliot and Thrash's (Elliot & Thrash, 2002, study 5) results that positive emotionality predicted mastery goals. However, unlike Elliot and Thrash's study, there

was no association between avoidance goals and subjective well-being for high-ability students. In addition, neither interest nor boredom mediated subjective well-being for the average-ability students. These significant differences indicate the priority differences between the groups when it comes to learning.

Boredom mediated achievement, persistence, effort regulation and subjective well-being negatively for high-ability students in this study. Boredom is not a mediator for subjective well-being for average-ability students. Moreover, consistent with Larson and Richard's study (1991), boredom is more detrimental to high-ability students in all four variables studied than the average-ability learners. These findings illustrate that the relations between cognitive resources which are the goal orientations and learning outcomes can be mediated by positive and negative affect variables such as interest and boredom.

The study pursued individual differences signalled the vital role of affect mediators to high-ability students on math performance and subjective well-being and contributed to our understanding of psychological needs of high-ability students (Csikszentmihalyi, 1997; Hoekman, McCormick, & Barnett, 2005). As for average-ability students, higher level of approach goals increased level of interest and decreased level of boredom which in turn increased level of adaptive motivational behaviours, such as persistence and effort regulation. These findings associated with affect variables deepened our understanding of individual differences in learning as pointed out by many scholars (Linnenbrink, 2007; Turner, Thorpe, & Meyer, 1998).

Implications for Theoretical and Classroom Practices

Findings revealed in this study such as interest mediated adaptive motivational behaviours regardless of students' ability has provided initial empirical evidence to support Linnenbrink's (2007) hypotheses that affect variables could mediate achievement motivation and may have implications on student outcomes. It is noteworthy that avoidance goals are likely to give rise to unfavourable student outcomes such as lower levels of math achievement, persistence and effort regulation for average-ability students only. These findings indicated that educators should help average-ability students to avoid adopting performance-avoidance goals through good classroom practices such as providing appropriately challenging materials, using appropriate scaffolding for deep understanding, and increasing the frequency of small successes to build confidence.

Next, boredom is found to be more likely to hinder high-ability students in the course of intellectual pursuit. Exposure to boredom is doing more harm to the level of motivation among high-ability students as compared to average-ability students. Educational practices such as differentiated curriculum, enrichment and accelerated educational programmes are, in fact, the keystones in promoting learning among the high-ability learners (Rogers, 1991, 2002, 2007). To decrease the level of boredom in the classroom, Middleton, Littlefield, & Lehrer (1992) presented a model of academic fun which includes intrinsically interesting tasks, novelty arousal and control which provide choices and challenging task.

The variability of the role of affect mediators between the ability groups exposed the deficiencies in practising one-size-fits-all teaching method and underscore the need for differentiated instruction in all classrooms (Borland, 2003; Tomlinson, 2005) which has to begin with teacher education and professional development programmes.

(6021 words, excluding abstract and tables)

REFERENCES

Barron, K. E., & Harackiewicz, J. M. (2001). Achievement goals and optimal motivation: Testing multiple goal models. *Journal of Personality & Social Psychology, 80*(5), 706-722.

Betts, G. T., & Neihart, F. M. (1988). Profiles of the gifted and talented. *Gifted Child Quarterly, 32*(2), 248-253. doi: 10.1177/001698628803200202

Bollen, K. A. (1989). *Structural equations with latent variables*. New York: John Wiley & Sons.

Borland, J. H. (2003). *Rethinking gifted education*: Teachers College Press.

Bouffard-Bouchard, T. (1993). Self-Regulation on a Concept-Formation Task among Average and Gifted Students. *Journal of Experimental Child Psychology, 56*(1), 115-134.

Clinkenbeard, P. R. (1996). Research on motivation and the gifted: Implications for identification, programming, and evaluation. *Gifted Child Quarterly, 40*(4), 220.

Csikszentmihalyi, M. (1975). Play and intrinsic rewards. *Journal of Humanistic Psychology, 15*, 41-63.

Csikszentmihalyi, M. (1997). *Finding flow*. New York: Basic Books.

Dai, D. Y., Moon, S. M., & Feldhusen, J. F. (1998). Achievement motivation and gifted students: A social cognitive perspective. *Educational Psychologist, 33*(2/3), 45-63.

Delisle, J. (1992). *Guiding the social and emotional development of gifted youth: A practical guide for educators and counselors*. New York: Longman.

Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology, 72*(1), 218-232.

Elliot, A. J., & Thrash, T. M. (2002). Approach-avoidance motivation in personality: Approach and avoidance temperaments and goals. *Journal of Personality & Social Psychology, 82*, 804-818.

Feldhusen, J. F. (1986). A conception of giftedness. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of giftedness* (pp. 112-127). New York: Cambridge University Press.

Feldhusen, J. F., & Kroll, M. D. (1991). Boredom or Challenge for the Academically Talented in School. *Gifted Education International, 7*(2), 80-81.

Gagne, F. (2010). Motivation within the DMGT 2.0 framework. [Article]. *High Ability Studies, 21*(2), 81-99. doi: 10.1080/13598139.2010.525341

Gallagher, J., Harradine, C. C., & Coleman, M. R. (1997). Challenge or boredom? Gifted students' views on their schooling. *Roeper Review, 19*(3), 132-136.

Gentry, M., & Springer, P. M. (2002). Secondary student perceptions of their class activities regarding meaningfulness, challenge, choice, and appeal: An initial validation study. *Journal of Secondary Gifted Education, 13*(4), 192-204.

Goetz, T., Preckel, F., Pekrun, R., & Hall, N. C. (2007). Emotional experiences during test taking: Does cognitive ability make a difference? *Learning & Individual Differences, 17*(1), 3-16.

Gottfried, A. E., & Gottfried, A. W. (2004). Toward the development of a conceptualisation of gifted motivation. *Gifted Child Quarterly, 48*(2), 121-132.

Gottfried, A. W., Gottfried, A. E., Cook, R., & Morris, E. (2005). Educational characteristics of adolescents with gifted academic intrinsic motivation: A longitudinal investigation from school entry through early adulthood. *Gifted Child Quarterly, 49*(2), 172-186.

Harackiewicz, J. M., Barron, K. E., Elliot, A. J., Carter, S. M., & Lehto, A. T. (1997). Predictors and consequences of achievement goals in the college classroom: Maintaining interest and making the grade. *Journal of Personality & Social Psychology, 73*(6), 1284-1295.

Harackiewicz, J. M., Barron, K. E., Tauer, J. M., Carter, S. M., & Elliot, A. J. (2000). Short-term and long-term consequences of achievement goals: Predicting interest and performance over time. *Journal of Educational Psychology, 92*(2), 316-330.

Harackiewicz, J. M., Durik, A. M., Barron, K. E., Linnenbrink-Garcia, L., & Tauer, J. M. (2008). The role of achievement goals in the development of interest: Reciprocal relations between achievement goals, interest, and performance. *Journal of Educational Psychology, 100*(1), 105-122.

Heller, K. A. (1999). Individual (Learning and motivation) needs versus instructional conditions of gifted education. *High Ability Studies, 10*(1), 9-21.

Hidi, S., & Renninger, K. (2006). The Four-Phase Model of Interest Development. *Educational Psychologist, 41*(2), 17.

Hoekman, K., McCormick, J., & Barnett, K. (2005). The important role of optimism in a motivational investigation of the education of gifted adolescents. *Gifted Child Quarterly, 49*(2), 99.

Hoekman, K., McCormick, J., & Gross, M. U. M. (1999). The optimal context for gifted students: A preliminary exploration of motivational and affective considerations. *Gifted Child Quarterly, 43*(3), 170.

Hollingworth, L. S. (1936). The development of personality in highly intelligent children. *National Elementary Principal, 15*, 272-281.

Kanevsky, L., & Keighley, T. (2003). To Produce or Not to Produce? Understanding Boredom and the Honor in Underachievement. *Roeper Review, 26*(1), 20-29.

Larson, R. W., & Richards, M. H. (1991). Boredom in the middle school years: Blaming schools versus blaming students. *American Journal of Education*, 418-443.

Linnenbrink, E. A. (2007). The role of affect in student learning: A multi-dimensional approach to considering the interaction of affect, motivation, and engagement. In P. A. Schutz & R. Pekrun (Eds.), *Emotion in education* (pp. 107-124). Burlington, MA: Academic Press.

MacKinnon, D. P. (2008). *Introduction to statistical mediation analysis*. New York, NY: Lawrence Erlbaum Associates.

Middleton, J. A., Littlefield, J., & Lehrer, R. (1992). Gifted students' conceptions of academic fun: An examination of a critical construct for gifted education. *Gifted Child Quarterly, 36*, 38-44.

Neihart, F. M. (2002). Risk and resilience in gifted children: A conceptual framework. In F. M. Neihart, S. M. Reis, N. M. Robinson & S. M. Moon (Eds.), *The social and emotional development of gifted children: What do we know?* (pp. 113-122). Waco, Texas: Prufrock Press, Inc.

Neihart, F. M. (2010). The revised profiles of the gifted and talented: A research-based approach. *Keynote Address at 11th Asia Pacific Conference on Giftedness*. Sydney, Australia.

Pekrun, R., Elliot, A. J., & Maier, M. A. (2009). Achievement goals and achievement emotions: Testing a model of their joint relations with academic performance. *Journal of Educational Psychology, 101*(1), 115-135.

Pfeiffer, S. I., & Stocking, V. B. (2000). Vulnerabilities of Academically Gifted Students. [Article]. *Special Services in the Schools, 16*(1/2), 83.

Reis, S. M., & Renzulli, J. S. (2004). Current research on the social and emotional development of gifted and talented students: Good news and future possibilities. *Psychology in the Schools, 41*(1), 119-130.

Renzulli, J. S. (1986). The three-ring conception of giftedness: A developmental model for creative productivity. In R. J. Sternberg & J. E. Davidson (Eds.), *Conceptions of Giftedness* (pp. 53-92). Cambridge, MA: Cambridge University.

Renzulli, J. S., & Reis, S. M. (1994). Research related to the schoolwide enrichment triad model. *Gifted Child Quarterly, 38*(1), 7-20.

Rogers, K. B. (1991). The relationship of grouping practices to the education of the gifted and talented learner: Research-based decision making series. Storrs, CT: National Research Center on the Gifted and Talented.

Rogers, K. B. (2002). Effects of acceleration on gifted learners. In F. M. Neihart, S. M. Reis, N. M. Robinson & S. M. Moon (Eds.), *The social and emotional development of gifted children: What do we know?* Waco, Texas: Prufrock Press, Inc.

Rogers, K. B. (2007). Lessons learned about educating the gifted and talented: A synthesis of the research on educational practice. *Gifted Child Quarterly, 51*(4), 382-396.

Silverman, L. K. (1997). The construct of asynchronous development. *Peabody Journal of Education, 72*(3), 36-58.

Silverman, L. K. (2002). Asynchronous development. In F. M. Neihart, S. M. Reis, N. M. Robinson & S. M. Moon (Eds.), *The social and emotional development of gifted children: What do we know?* (pp. 31-37). Waco, Texas: Prufrock Press, Inc.

Tannebaum, A. J. (2003). Nature and nurture of giftedness. In N. Colangelo & G. A. Davis (Eds.), *Handbook of gifted education* (3rd ed., pp. 45-59). Boston: Allyn & Bacon.

Terman, L. M. (1926). *Genetic Studies of Genius*. Stanford, CA: Stanford University Press.

Tomlinson, C. A. (2005). *The differentiated curriculum: Responding to the needs of all learners* (Special Edition ed.). Upper Saddle River, NJ: Pearson/Merrill Prentice Hall.

Turner, J. C., Thorpe, R. K., & Meyer, D. K. (1998). Students' reports of motivation and negative affect: A theoretical and empirical analysis. *Journal of Educational Psychology, 90*(4), 758-771.

Vallerand, R. J., Gagné, F., Senecal, C., & Pelletier, L. G. (1994). A comparison of the school intrinsic motivation and perceived competence of gifted and regular students. *Gifted Child Quarterly, 38*, 172-175.

Witty, P. A. (1930). A study of one hundred gifted children. *Bulletin of Education, 2*(7), 3-44.