Socio-cognitive correlates of achievement motivation among Engineering students

Kiranjeet Kaur
S.B.S. State Technical Campus, Ferozepur, Punjab, India
Email: kirankiran2@rediffmail.com

Structured abstract

CONTEXT
The modern society places an extra- ordinary emphasis on achievement, competition, and success. The two important indicators of achievement are the amount of education a person has completed and the job he or she holds. In the era of globalization, with the advent of multinational companies, these days, students display strong preferences or demand for higher education that makes them employable. This perspective of viewing education as a medium for getting better employment opportunities has resulted in more emphasis on professional education. The engineering institutions have come to constitute a major proportion of these professional institutions in India. In the state of Punjab (India), there has been a ten-fold, increase in the number of students in engineering courses, in the post-liberalization period. The achievement-related decisions, such as the decision to enrol in any academic course, are also made within the context of a complex social reality that presents each individual with a wide variety of choice. Given high likelihood of success, people will then choose those tasks or behaviours that have relatively higher personal value. Eccles et al. (1983) in their expectancy-value model of achievement motivation proposed that expectancies and values are assumed to directly influence achievement choices. They also influence performance, effort, and persistence. The theory posits that expectancies and values are assumed to be influenced by social-cognitive variables such as task-specific ability beliefs, the perceived difficulty of different tasks and individuals' goals, self-schema and affective memories.

PURPOSE OR GOAL
The present study aimed at studying the role of various socio-cognitive variables such as self-efficacy, perceived competence and attitude towards the area of study in relation to achievement motivation among engineering.

APPROACH
A sample of 559 (305Boys; 254Girls) engineering students responded to all psychological measures used in the study. Pearson Product Moment correlation was applied to find out which variables correlate significantly with achievement motivation among the sample under study.

ACTUAL OUTCOMES
The results of the study revealed that, in case of boys, out of three dimensions of self-efficacy i.e. academic self-efficacy, social efficacy and emotional efficacy; academic and social efficacy correlated positively with their achievement motivation, whereas, in case of girls all the three dimensions of self-efficacy were positively related to their need for achievement. Further, perceived competence and attitude towards the area of study correlated positively with high achievement motivation among both male and female engineering students.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY
Overall, the results indicate that the self beliefs play significant role in influencing the achievement motivation among engineering students. Further, positive attitude towards engineering, in terms of perceiving value in pursuing it, positive feelings for this course and cognitive ability to learn it, correlate positively with achievement motivation among these students.

KEYWORDS
Expectancy-value, achievement motivation, socio-cognitive variables

Introduction

Expectancy–value theorists argue that motivation is primarily a result of individuals' beliefs about the likely outcomes of their actions and of the incentive value they place on those outcomes (Atkinson, 1957; Eccles et al., 1983). According to the model proposed by Eccles et al. (1983), expectancies and values are assumed to directly influence achievement choices, performance, effort and persistence. The expectancies for success are defined as beliefs about, how well one will do on upcoming tasks, either in the immediate or long-term future. Further, the model defines different components of achievement values such as attainment value, intrinsic value and utility value. The third motivational component concerns ones' affective reactions to the task. Studies with the expectancy-value paradigm report evidence of the critical role these constructs play in initiating and sustaining students' achievement motivation and action (Meece et al., 1990; Ethington, 1991).

Different researchers have analyzed that relationship between expectancy components, which include students' beliefs such as self-efficacy and perceived competence to perform a task and their achievement motivation in academic settings. In this regard, it had been found that the students who believed that they could succeed academically tended to show greater interest in academic work, set higher goals, put forth greater effort, and showed more resilience, when they encountered difficulties (Bandura, 1997). Zimmerman (2000) highlighted that, in the past two decades, self-efficacy had emerged as a highly effective predictor of students' motivation and learning, students' activity choices, effort, persistence, and emotional reactions. Pajares and Schunk (2005) reported that students' self-efficacy beliefs played an integral role in their academic motivation, learning, and achievement. It has also been emphasized that, in order to understand relationship between abilities and achievement motivation, along with self-efficacy beliefs, it is important to study perceived competence of the students. Bandura (1986) argued that reasonably precise judgments of capability, matched to a specific outcome, afforded the greatest prediction and offered the best explanations of behavioral outcomes. Valkyrie (2006) concluded that academic self-efficacy was positively related to achievement. Hsieh and Schallert (2008) concluded that self-efficacy was the strongest predictor of achievement supplemented by ability attributions. Students, who attributed, failure to lack of effort had higher self-efficacy than students not making effort attributions. Fast et al. (2010) revealed that higher levels of math self-efficacy positively predicted math performance.

While analysing the relationship between self-efficacy and achievement motivation, the researchers have also investigated the gender differences existing in such relationship. It had been found that girls exhibited lower academic self-efficacy than boys, particularly in mathematics, a finding consistent for children from diverse ethnic backgrounds (Middleton and Midgley, 1997). Zeldin et al. (2008) analyzed the ways in which the self-efficacy beliefs were created of men and women, who selected careers in science, technology, engineering or mathematics (STEM) and subsequently influenced their academic and career choices. The analysis revealed that mastery experience was the primary source of the men's self-efficacy beliefs, whereas, in case of women, social persuasions and vicarious experiences were the primary sources of self-efficacy beliefs. Therefore, these findings suggested that different sources were predominant in the creation and development of the self-efficacy beliefs of men and women who pursued STEM careers.

On the other hand, some studies have brought into fore the conclusion that there exists no relationship between self-efficacy and achievement. Lodewyk and Winne (2005) reported that self-efficacy was a negligible predictor of achievement. Legault et al. (2006) highlighted that the ability beliefs, effort beliefs, characteristics of the task, and value placed on the task were responsible for academic amotivation. In their study, Vancouver and Kendall (2006) concluded that self-efficacy was negatively related to achievement motivation.

Overall, these research studies highlight that self- beliefs play a significant role in determining the effort and persistence required by a student to achieve high in academic

setting. In addition, the stronger the self-efficacy, harder the individuals will try to accomplish a task. Thus, self-beliefs specific to one's perceived competence, or expectancy beliefs, are important in the study of achievement motivation in academic context.

The value component of expectancy-value model includes students' goals and beliefs about the importance and interest in the task. These beliefs are related to the attitudes that are commonly assumed to be associated with achievement related activities (Eccles et al. 1998). Actually, attitude refers to the evaluation which people make of objects or representatives thereof. Thus, one may be favorable or unfavorable in his/her evaluation. Various researchers have explored the relationship between attitude of the students towards their area of study and its impact on their achievement motivation. Ma (2001) highlighted that mathematics achievement and attitude toward mathematics were the most important factors affecting participation in advanced mathematics. Miller and Byrnes (2001) reported that adolescents' valuing of academic goals was the best predictor of their achievement behaviour.Greene et al. (2004) pointed out that when students perceived a subject to be of value for their future goals, they were willing to study hard to master and developed competence in the subject . On the basis of expectancy-value theory, Cole et al. (2008) indicated that if students did not perceive importance or usefulness of an exam, their effort suffered and so did their test scores. Thus, it is concluded that for the comprehensive understanding of classroom achievement behavior requires consideration of how classroom performance may be perceived as instrumental to the attainment of valued life goals.

Besides, another important component of expectancy model is affective component, which includes students' emotional reactions to the task. In academic settings, affect refers to the pleasant and unpleasant emotions experienced by the students' while learning a particular course. It had been found that pleasant emotions such as enjoyment to predict high achievement and unpleasant emotions such as test anxiety and boredom to predict low achievement (Pekrun, et al., 2002). Goetz et al. (2007) also reported that enjoyment of mathematics had been found to be positively correlated with mathematics grades. Perkrun (2006) proposed that value was one of the key predictors of enjoyment. Hence, the students, who saw personal value in pursuing a specific academic program, experienced enjoyment in learning that course and took interest in learning more about specific topics. Ainley and Ainley (2011) highlighted that personal meaning and relevance was an important factor in students' enjoying science and focusing their attention to expand their knowledge and understanding. Working together, these factors were associated with higher levels of expressed intention to engage further with science content. Durik et al. (2006) examined how competence beliefs and task values predicted high school achievement choices related to literacy. Results of their study indicated that ability beliefs and importance positively predicted career aspirations and course choices, and intrinsic value predicted leisure time reading and high school courses. However, Nwagbo (2006) reported that results on the relationship between attitude and achievement in science (biology), among different ability level groups, had not been consistent.

Thus the expectancy-value model posits that expectancies and values are assumed to be influenced by social- cognitive variables such as task-specific ability beliefs, the perceived difficulty of different tasks and individuals' goals, self-schema and affective memories.

Present work

It is generally acknowledged that globalization has created tremendous impacts on higher education in this first decade of twenty-first century. In the present scenario, viewing education as a medium for getting better employment opportunities has resulted in more emphasis on professional education. In this context, there is massive growth of engineering institutions, especially in Punjab (India). Now the question arises whether the students are entering these institutions only on the basis of prevalent job-market trends or on the basis of their own capabilities, interest and liking for such courses? Thus, it is quite significant to study achievement motivation among engineering students in relation to their socio-cognitive

variables such as self-efficacy, perceived competence and attitude towards the area of study in relation to their achievement motivation.

Objectives

1. To study the relationship between Self-efficacy and Achievement Motivation.
2. To study the relationship between Perceived Competence and Achievement Motivation.
3. To study the relationship between Attitude towards Engineering and Achievement Motivation.

Research methodology

Subjects

In the present study, the total sample consisted of 559 engineering students (305 boys and 254 girls). The sample was taken from various engineering colleges of Punjab (India). Care was taken that the colleges so chosen were more or less homogenous with regard to socio-economic, cultural background and academic milieu.

Psychological Measures

The following tests were used to achieve the objectives of the present study.

i) Deo-Mohan Achievement Motivation (n-Ach) Scale – (Deo and Mohan, 1985)

This is a self- rating type scale which is used to measure achievement motivation. The scale consists of 50 items, which are based on three factors i.e. academic factors, factors of general interest and factors of social interest. The scale is a reliable and valid one. The authors reported reliability coefficient 0.69 for mixed group, 0.67 for males and 0.78 for females' sample. As far as the validity of the scale is concerned, coefficient was 0.75.

ii) Self Efficacy Questionnaire – (Muris, 2001)

Self-Efficacy Questionnaire, composed of 24 items, is a self-reporting scale that purports to measure adolescents' beliefs about their competencies in academic, social and emotional domains. *Academic Self-efficacy* refers to beliefs regarding ability to succeed in academics and display appropriate learning behaviours. *Social Self-efficacy* involves beliefs regarding competence in developing and maintaining social relationships. *Emotional Self-efficacy* refers beliefs regarding competence in controlling negative emotions. The internal consistency reliability of the questionnaire appeared to be satisfactory as the author reported Cronbach's alpha 0.88 for the total self-efficacy score and between 0.85 and 0.88 for the subscale scores.

iii) Perceived Competence Scale – (Pintrich and De Groot, 1990)

Perceived Competence Questionnaire is an 8-item scale adapted from a subscale in the Motivated Learning Strategy Questionnaire (MSLQ) (Pintrich and De Groot, 1990). This Questionnaire assesses student perception of their ability of learning in the particular course they have taken up. The items comprising this scale assess expectancy for success and self-efficacy. Expectancy for success refers to performance expectations, and relates specifically to task performance. The reliability coefficient of Perceived Competence Questionnaire has been reported to be 0.93.

iv) Survey on Attitude towards Engineering (Adapted from Schau et al., 1995)

Schau et al. (1995) developed the Survey of Attitudes towards Statistics (SATS), for measuring four aspects of students' statistics attitudes. In the present study, "Post" form of SATS has been used to assess students' attitude towards engineering. The adaptation of the SATS inventory was done by replacing the subject name 'Statistics' by 'Engineering'. Out of 28 items of SATS, only 25 items were adapted for the study, keeping in mind the relevance of the statements for the sample understudy.

The scale consists of four subscales i.e. Affect, Cognitive Competence, Value, and Difficulty. *Affect* refers to students' positive and negative feelings concerning engineering. *Cognitive Competence* refers to students' attitudes about their intellectual knowledge and

skills when applied to engineering. *Value* refers to students' attitudes about the usefulness, relevance, and worth of engineering in personal and professional life. *Difficulty* refers to students' attitudes about the difficulty of engineering as a subject.

Schau et al. (1995) reported a range for reliability coefficients for these variables from .64 to .85.The internal consistency of each of the scales ranges from above 0.6 to above 0.8.

Statistical Analysis

Pearson Product Moment Correlation was applied to find out the relationship between variables under study and Achievement motivation among engineering students.

Results and discussion

The present work aimed at studying the relationship between socio- cognitive variables ie self-efficacy and perceived competence, attitude towards the area of study and achievement motivation among engineering students. But before administering these abovementioned psychological measures, test-retest method was used to estimate the reliability of the psychological measures. The retesting was done after fifteen days of first testing. For this purpose a mixed sample (both boys and girls) size (N) of 30 students was taken. The reliability coefficients of all the measures are given below in Table 1.

Table 1: Showing the Test-retest reliabilities for various variables under study.

S. No.	Variables	Test-Retest Reliability
1	Achievement Motivation Score	0.84**
2	Academic Self-Efficacy	0.69**
3	Social Self-Efficacy	0.75**
4	Emotional Self-Efficacy	0.69**
5	Perceived Competence	0.72**
6	Affect	0.78**
7	Value	0.82**
8	Competence	0.79**
9	Difficulty	0.73**

****Significant at .01 level**

The Table 1 shows that the reliability coefficient of achievement score is 0.84, thus indicating good reliability. Self-efficacy Questionnaire indicates high test-retest reliability as reliability coefficients of its dimensions range from 0.69 to 0.75. Perceived Competence Scale also shows high test–retest reliability as its reliability coefficient is 0.72. Further, Survey on Attitude towards Engineering also reveals high reliability as the reliability coefficients of all the four dimensions range from 0.73 to 0.82. Hence, we can say that all the instruments are psychometrically sound enough to be used for research purpose.

Further, Means, Standard Deviations, Skewness and Kurtosis of all the measured variables were calculated and have been reported in Table 2. As the Skewness was quite small in most of the cases, therefore, data were amenable to statistical analysis.

Table 2: Showing Mean scores, Standard deviations (SD), Skewness and Kurtosis of the Variables Understudy

S. No.	Variable	Boys (N=305)				Girls (N=254)			
		Mean	SD	Skewness	Kurtosis	Mean	SD	Skewness	Kurtosis
1	Achievement Motivation Score	131.10	20.33	-0.93	3.45	142.19	17.81	-0.069	-0.484

2	Academic Self-Efficacy	27.04	4.90	-0.06	-0.26	29.67	4.18	-0.22	-0.14
3	Social Self-Efficacy	27.95	4.48	-0.26	-0.15	27.91	4.60	-0.34	0.05
4	Emotional Self-Efficacy	26.46	4.35	-0.10	0.44	25.77	4.81	0.04	-0.24
5	Perceived Competence	29.76	4.77	-0.90	2.40	30.10	4.44	0.83	2.97
6	Affect	37.31	5.85	0.13	-0.25	38	6.38	-0.37	0.58
7	Value	41.6	7.80	-0.38	-0.06	41.66	7.29	-0.39	-0.30
8	Competence	19.04	4.40	0.88	5.81	20.0	3.78	-0.31	0.06
9	Difficulty	19.48	4.18	-0.24	0.06	19.37	4.05	0.07	0.27

Table 3 shows the inter-correlations of various variables taken in study with achievement motivation among both boys and girls.

Table 3: Showing Correlations of Variables under Study with Achievement Motivation for the Engineering Students (Boys, N=305; Girls, N=254)

S. No.	Variable	Achievement Motivation	
		Boys	Girls
1	Academic Self-Efficacy	.43**	.37**
2	Social Self-Efficacy	.21**	.39**
3	Emotional Self-Efficacy	.08	.33**
4	Perceived Competence	.27**	.30**
5	Affect	.19**	.25**
6	Value	.26**	.29**
7	Competence	.26**	.24**
8	Difficulty	.02	-.01

****Value significant at 0.01 level**

The correlational patterns revealed that two dimensions of Self-Efficacy i.e. academic - efficacy, social-efficacy, were found to be positively correlated with achievement motivation among boys pursuing engineering courses. Whereas, in case of girls, along with these two dimensions of Self-efficacy, emotional-efficacy was also found to be positively correlated with their achievement motivation. Further, Perceived Competence was found to be significantly related to achievement motivation among both boys and girls. Furthermore, the results suggested that three dimensions of Attitude towards Area of Study i.e. affect, value and competence were found to be positively correlated with achievement motivation among both boys and girls pursuing engineering courses.

The results highlight that self-efficacy had been found to be a significant correlate of achievement motivation among engineering students. Table 3 reveals that both boys and girls, who scored high on academic efficacy, were high in achievement motivation. This means that the engineering students having beliefs regarding their ability to succeed in academic activities had high achievement motivation than those students who lacked these beliefs regarding their academic competence. Chemers et al. (2001) also reported that academic efficacy was strongly related to academic performance. Further, Table 3 highlights that social efficacy was found to be positively correlated with achievement motivation among

both male and female engineering students. This implies that the engineering students, who possessed the ability to relate and get along with peers, used to develop and maintain social relationships, had high achievement motivation in comparison to their counterparts, who lacked this social competence. Ladd (1990) found that pupils, who were able to make more new friends in the school, were also those who scored better in a standardized achievement test. The results shown in Table 3 highlight that beliefs of girls about their competencies in emotional domain were positively related to their achievement motivation. Thus, the girls possessing the ability to regulate unpleasant emotions also had high achievement motivation. However, emotional-efficacy had not been found to be a significant correlate of achievement motivation among boys.

Furthermore, Table 3 reveals that perceived competence was found to be positively correlated with achievement motivation among both boys and girls. This implies that the engineering students, who perceived themselves capable of learning, the particular engineering course, they had opted for, possessed high achievement motivation. Pajares and Graham (1999) also reported that students' task specific self-efficacy was the only motivation variable to predict performance. Valentine et al. (2004) also highlighted perceived academic competence as an important correlate of academic achievement.

The results of the present study reveal that attitude towards the area of study has significant bearing on achievement motivation among engineering students. The results shown in Table 3 highlight that among both boys and girls, affect was correlated with their high achievement motivation. Affect refers to students' positive and negative feelings concerning the area of study. Thus, the students having positive feelings towards engineering course had high need to achieve in comparison to those students, who did not feel in the same way. As the positive affect is an indicator that students enjoyed learning the course, they were pursuing and these positive feelings contributed towards their higher achievement motivation. Goetz et al. (2007) also reported that positive affect led to more enjoyment and persistence in learning activities that in turn contributed towards higher academic achievement.

Further, Table 3 shows that the value dimension of attitude towards the areas of study was also a correlate of high achievement motivation among engineering students. This result implies that the students, who perceived pursing engineering useful in their life, possessed high need to achieve. Value, therefore, provided them with specific reasons for doing engineering and had the potential to influence their level of persistence. Hence, the students, who perceived the usefulness and worth of area of study in personal and professional life, possessed high need for achievement. Miller and Byrnes (2001) also reported that adolescents' valuing of academic goals was the best predictor of their achievement behaviour. Also, Greene et al. (2004) pointed out that when students perceived a subject to be of value for their future goals, then they were willing to study hard to master and developed competence in that subject and were likely to exert efforts to do better than their peers on the subject.

Furthermore, Table 2 highlights that cognitive competence dimension of attitude towards the area of study was also a correlate of achievement motivation among these students. Cognitive competence refers to the attitude one holds about his/her intellectual knowledge and skills, when applied to the area of study. It means that the students, who perceived themselves intellectually capable of learning engineering concepts, have higher achievement motivation than those who lacked this confidence in their abilities. Similarly, Durik et al. (2006) in their study indicated that ability beliefs and importance positively predicted career aspirations, course choices and intrinsic value predicted reading and high school courses.

However the relationship between the difficulty dimension of attitude and achievement motivation has not come out be significant among these students.

Conclusions

Overall, the results suggest that the self-beliefs of learning engineering subjects and ability of nurturing social ties with others correlate significantly with achievement motivation among both male and female engineering students. Besides, emotional serenity contributes significantly towards the high need for achievement among female engineering students. Also, perceived competence plays a significant role in influencing achievement motivation among engineering students. Further, positive attitude towards engineering in terms of perceiving value in pursuing it, positive feelings towards the course and cognitive ability to learn it relate positively with achievement motivation among engineering students. Hence, it is concluded that socio-cognitive variables i.e. self-efficacy, perceived competence and attitude towards the area of study are correlates of achievement motivation among engineering students.

Scope for future work

These results can be extrapolated to the higher education institutions of other developing countries, which in recent years have witnessed rapid growth of higher education especially that of professional higher education and subsequent enrolment of large number of students in professional courses. Loyalka et al. (2012) in their study on the quality of engineering education in BRIC countries viz. Brazil, Russia, India and China found that, although, the new engineering graduates from these countries were profoundly influencing domestic and international high-skilled labor markets, but in all four countries, a minority of engineering students received high quality training in elite institutions, while the majority of the engineering students received low quality training in non-elite institutions. The achievement levels of students in the final year at non-elite institutions were found to be only equal to those of first-year students from elite institutions. Besides, high graduation rates could imply that engineering programs in the BRIC countries fail to "weed out" poorly performing students, creating a culture, in which, those admitted to engineering institutions are easily able to graduate, regardless of their academic performance.

Further, the rapid growth of private higher education institutions in the countries of South and East Asia, Central and Eastern Europe, Middle East and North Africa (MENA) and Latin America has provided access to students who might not be qualified for the public institutions or who cannot be accommodated in other universities. Thus, there has been a rising concern about the issues of achievement and learning among students as the higher education would not become more inclusive or accessible if large proportions of 'new' students fail or do not acquire the requisite skills.

References

Ainley, M. & Ainley, J. (2011). Student engagement with science in early adolescence: The contribution of enjoyment to students' continuing interest in learning about science. *Contemporary Educational Psychology*, 36(1), 4–12.

Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review*, 64, 359–372.

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice Hall, Englewood Cliffs, NJ.

Bandura, A. (1997). *Self-Efficacy*: *The Exercise of Control*. Freeman, New York.

Chemers, M. M., Hu, L. & Garcia, B. F. (2001). Academic self-efficacy and first-year college student performance and adjustment. *Journal of Educational Psychology*, 93(1), 55–64.

Cole, J. S., Bergin, D. A. & Whittaker, T. A. (2008). Predicting student achievement for low stakes tests with effort and task value. *Contemporary Educational Psychology*, 33, 609–624.

Deo, P. & Mohan, A. (1985). *Achievement Motivation Scale*. National Psychological Corporation, Agra.

Durik, A. M., Vida, M. & Eccles, J. S. (2006). Task values and ability beliefs as predictors of high school literacy choices: A developmental analysis. *Journal of Educational Psychology*, 98(2), 382–393.

Eccles, J. S., Wigfield, A., & Schiefele, U. (1998). Motivation to succeed. In: W. Damon and N. Eisenberg (Eds.). *Handbook of Child Psychology: Social, Emotional, and Personality Development*. 1017–1095. Wiley, New York.

Eccles, J., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L. & Midgley, C. (1983). Expectancies, values, and academic behaviors. In: J. T. Spence (Eds). *Achievement and Achievement Motivation.* 75–146. W. H. Freeman, San Francisco.

Ethington, C. A. (1991). A test of a model of achievement behaviors. *American Educational Research Journal*, 28, 155–172.

Fast, L. A., Lewis, J. L., Bryant, M. J., Bocian, K. A., Cardullo, R. A., Rettig, M. & Hammond, K. A. (2010). Does math self-efficacy mediate the effect of the perceived classroom environment on standardized math test performance? *Journal of Educational Psychology*, 102(3), 729–740.

Goetz., T., Frenzel, C. A., Pekrun, R., Hall, N. C. & Ludtke, O. (2007). Between-and within-domain relations of students' academic emotions. *Journal of Educational Psychology*, 99, 715–733.

Greene, B. A., Miller, R. B., Crowson, H. M., Duke, B. L. & Akey, K. L. (2004). Predicting high school students' cognitive engagement and achievement: Contributions of classroom perceptions and motivation. *Contemporary Educational Psychology*, 29, 462–482.

Hsieh, P. P. & Schallert, D. L. (2008). Implications from self-efficacy and attribution theories for an understanding of undergraduates' motivation in a foreign language Course. *Contemporary Educational Psychology*, 33, 513–532.

Ladd, G. W. (1990). Having friends, keeping friends, making friends, and being liked by peers in the classroom: Predictors of children's early school adjustment. *Child Development*, 61, 1081–1100.

Legault, L., Green-Demers, I. & Pelletier, L. (2006). Why do high school students lack motivation in the classroom? Toward an understanding of academic amotivation and the role of social support. *Journal of Educational Psychology*, 98(3), 567-582.

Lodewyk, K. R. & Winne, P. H. (2005). Relations among the Structure of Learning Tasks, Achievement, and Changes in Self-Efficacy in Secondary Students. *Journal of Educational Psychology*, 97(1), 3–12.

Loyalka, P., Carnoy, M., Froumin, I., Dossani, R., & Tilak, J.B. (2012). Getting the quality right: Engineering education in the BRIC countries, Working Paper, Center for Education Policy Analysis, Stanford University, available at: http://cepa.stanford.edu.

Ma, X. (2001). Participation in advanced mathematics: Do expectation and influence of students, peers, teachers, and parents matter? *Contemporary Educational Psychology*, 26, 132–146.

Meece, J. L., Wigfield, A. & Eccles, J. S. (1990). Predictors of math anxiety and its influence on young adolescents' course enrollment and performance in mathematics. *Journal of Educational Psychology*, 82, 60–70.

Middleton, M. J. & Midgley, C. (1997). Avoiding the demonstration of lack of ability: An under-explored aspect of goal theory. *Journal of Educational Psychology*, 89, 710–718.

Miller, D. C. & Byrnes, J. P. (2001). To achieve or not to achieve: A self-regulation perspective on adolescents' academic decision making. *Journal of Educational Psychology*, 93(4), 677–685.

Muris, P. (2001). A brief questionnaire for measuring self-efficacy in youth. *Journal of Psychopathology and Behavioural Assessment*, 23(3), 145–149.

Nwagbo, C. (2006). Effects of two teaching methods on the achievement in and attitude to biology of students of different levels of scientific literacy. *International Journal of Educational Research*, 45, 216–229.

Pajares, F. & Graham, L. (1999). Self-Efficacy, motivation constructs, and mathematics performance of entering middle school students. *Contemporary Educational Psychology*, 24, 124–139.

Pajares, F. & Schunk, D. H. (2005). Self-efficacy and self-concept beliefs: Jointly contributing to the quality of human life. In: Marsh H., Craven, R. and McInerney, D. (eds). *International Advances in Self-Research*. pp 95–121. Information Age Publishing, Greenwich, CT.

Pekrun, R., Goetz, T., Titz, W. & Perry, R. P. (2002). Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research, *Educational Psychologist*, 37, 91–105.

Perkrun, R. (2006). The control-value theory of achievement emotions: Assumptions, corollaries, and implications for educational research. *Educational Psychology Review*, 18(4), 315–341.

Pintrich, P. R. & De Groot, E. V. (1990). *A Manual for the use of Motivated Strategies for Learning Questionnaire (MSLQ).* National Centre for Research to Improve Post Secondary Teaching and Learning, Ann. Arbor, MI.

Schau, C. G., Dauphinee, T. L., Vecchio, D. A. & Stevens, J. (1995). The development and validation of the Survey of Attitude towards Statistics. *Educational and Psychological Measurement*, 55, 868–875.

Valentine, J. C., DuBois, D. L. & Cooper, H. (2004). The relation between self-beliefs and academic achievement. *Anthropology and Education Quarterly*, 19, 270–287.

Valkyrie, K. T. (2006). Self-regulated learning: An examination of motivational, cognitive, resource management, meta-cognitive components and academic outcomes with open admissions community college students. *Dissertation Abstracts International*, 67 (6), 2027(Abstr).
Vancouver, J. B. & Kendall, L. N. (2006). When self-efficacy negatively relates to motivation and performance in a learning context. *Journal of Applied Psychology*, 91(5), 1146–1153.
Zeldin, A. L., Britner, S. L. & Pajares, F. B. (2008). A comparative study of the self-efficacy beliefs of successful men and women in mathematics, science, and technology careers. *Journal of Research in Science Teaching*, 45(9), 1036–1058.
Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology*, 25(1), 82–91.

Copyright statement