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Emotional Intelligence and Academic Performance of Graduate Engineering Students.

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ABSTRACT

This study was undertaken to explore the relationship between EI and academic performance as well as the effect of family environment and early childhood experience on EI by administering Personal Excellence Map developed by Nelson, Low & Hammet (2007) to 390 graduate engineering students identified through simple random sampling. The study found that only one-fourth of the sampled engineering students are emotional intelligent. The study also found the effect of family environment, early childhood experience on the EI of engineering students. Furthermore, EI is also found to be significantly related to academic performance of the students. The implications of the findings are discussed.

Keywords: Emotional intelligence, family, academic performance, engineering students, cluster analysis

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INTRODUCTION

A student with a positive attitude is crucial for his persistence and continuous success in college (Tinto, 1975; Tinto & Goodshell, 1993). EI was first introduced by Salovey and Mayer (1995) but became popular by the works of and subsequently began to emerge as an important concept through the works of Daniel Goleman (1995). Salovey and Mayer (1997) defined EI as “the ability to perceive and express emotion, assimilate emotion in thought, understand and reason with emotion, and regulate emotion in the self and others”. A substantial body of literature suggests that as a measured construct, EI could predict performance in higher education as well as in industrial/organization settings (Goleman 1995). While different theories of EI have been proposed, there is still debate about how EI should be conceptualized and measured (Davies, Stankov, & Roberts, 1998; Cherniss, Extein, Goleman, & Weissberg, 2006). However, as a psychological phenomenon, EI continues to be an area of intense interest, in both the academic and professional world. Literature in organizational studies, business and psychological studies increasingly suggest individual failure and poor performance to lower emotional intelligence. (Martinez-Pons, 1997; Brackett, Mayer, & Warner, 2004; Mayer, Salovey, & Caruso, 2004; Cote & Miners, 2006). Emotional intelligence is extremely critical for success in today’s work environment, as they are employed to work in a team rather than individually (Ciarrochi, Chan, & Bajgar, 2001; Charbonneau & Nicol, 2002). Students with high EI skills are better able to cope with demanding and complex college experience, which in turn contributes to academic performance and personal health (Bastian, Burns, & Nettelbeck, 2005; Low & Nelson, 2003). While debate on whether the traits that comprise EI are personality traits or mental abilities for which adequate measures already exist, it is quite clear that students as well as working professionals need to possess EI skills to have a successful professional career. In the context of research studies, while there are numerous studies on the role of EI in a managerial, professional and work place settings, surprisingly little research has been done in higher educational environment (Brown & Schutte, 2006; Boyatzis & Saaticioglu, 2008). There is a paucity of research, however, linking EI with academic performance in engineering students (Saibani, Sabtu, Muhamad, Wahab, Sahari, & Deros, 2012; Skipper & Brandenburg, 2013; Leicht, Macht, Riley, & Messner, 2013). When students are not well equipped with personal and social competencies, the costs to both the individuals and the society is extremely very high. Given the centrality of EI in student academic and future career success, this current study examined the emotional intelligence of graduate engineering students, its relationship with academic performance and the influence of family.

Theoretical Background and Hypothesis Development

Thorndike (1920) was the first to alight on the notion of emotion intelligence when he first used the word ‘*social intelligence*’ as one of the three dimensions of individual intelligence – mechanical, abstract and social intelligence. Subsequently attempts were made by several others to define and validate the notion of social intelligence (Thorndike, 1937; Schneider, Ackerman, & Kanfer 1996). According to Mayer and Salovey (1997), EI comprise of four elements such as emotional perception, emotional facilitation, emotional understanding, and emotional management. EI is appealing, because intelligence as a predictor of individual performance and success have not explained a considerable amount of variance so far (Van Rooy & Visveswaran, 2004). Interest in EI also reflects the newer findings explaining individual differences in processing of affective information predicting individual success and growth (Brackett, Mayer, & Warner, 2004).

Emotional Intelligence and Academic Performance

Studies on the academic success of students are at the heart of educational psychologists (Petrides, Frederickson, & Furnham, 2004; Qualter, Gardner, Pope, Hutchinson, & Whiteley, 2011). Results so far reveal a variety of factors to student academic performance and career success; students’ IQ, socio economic status, motivation, peer-relationship, teacher-student relationship, parental involvement and personality. Among all these factors, while IQ had been commonly used as a determinant and associated with academic success; increasingly studies suggest that IQ alone is not a reliable predictor of students’ academic achievement (Extremera & Fernandez-Berrocal, 2006; Downey, Mountstephen, Lloyd, Hansen, & Stough, 2008). Some authors have claimed that emotional intelligence predicts success at work, at school, and in relationships, as well as or better than IQ (Van der Zee, Thijs, & Schakel, 2002; Rastegar & Karami, 2011). Today, more than ever, researchers, educators and parents are recognizing the importance of emotional intelligence for academic achievement and career success (Abisamra, 2000; Parker, Hogan, Eastabrook, Oke, & Wood, 2004;

Adeyemo, 2007). Students low on EI may find failure more difficult to deal with, which undermines their academic motivation (Barchard, 2003; Low & Nelson, 2003). EI is crucial for academic achievement on two aspects, because academic success involves a great deal of ambiguity and academic work is generally self-directed, which requires higher levels of self-management (Song, Huang, Peng, Law, Wong, & Chen, 2010). Therefore, individuals with high EI are likely to perform better academically (Ciarrochi, Chan & Bajgar (2001). While EI theory suggests that students with high emotional intelligence would academically perform higher, support for this assertion is rather limited. Hence, the following hypothesis;

H1: Emotional Intelligence would be significantly related to academic performance of engineering college students.

Emotional Intelligence and Role of Family

Studies have well established the linkages between the academic achievement of adolescent students and family environment and support. In a family if there is good understanding and communication with proper behavioral standards then they would raise up children who are emotionally competent, responsible, independent and also socially competent (Goleman, 1995). Children from a healthy family not only learn that they count on the family and the immediate environment for their emotional security, safety and well-being, they also develop competencies and behaviours that will allow them to manage their well-being independent of the physical presence of caregivers (Repetti, Taylor, & Seeman, 2002). Truly, family plays a critical role in the development of emotional competence and adjustment among adolescents (Steinberg, 1992; Steinberg, Lawborn, Darling, Mounts, & Dornbush, 1994; Ryan, Stiller, & Lynch, 1994; Zellman & Waterman, 1998). Having considered the findings of the above studies, this study attempted to find out whether there would be any significant difference in any component or total emotional intelligence between engineering college students who stay with their family with those who stay away from home (in the hostel). To effectively anchor this research question, the following hypothesis is examined in this study.

H2: Day Scholars and hostellers would significantly differ from each other on emotional intelligence.

METHODS AND MEASURE

This descriptive study examined the emotional intelligence of engineering students studying in private engineering institutions in the Chennai City of Tamil Nadu, India. A well structured questionnaire comprising of student related information (demographic variables) and emotional intelligence was administered to about 390 graduate engineering students identified through simple random sampling method. For the purpose of this study, 93-item short of 'Personal Excellence Map' developed by Nelson, Low and Hammett (2007) was used. PEM measure reports various dimensions of emotional intelligence, which include individual perception about; belief system, support system, guidance system, balance system and power system. Graduate engineering students were asked to respond to the emotional intelligence measures using a 5-point Likert scale.

- i. N=0 for "Never like or descriptive of me"
- ii. R=1 for "Rarely like or descriptive of me"
- iii. S=2 for "Sometimes like or descriptive of me"
- iv. U=3 for "Usually like or descriptive of me"
- v. A=4 for "Always like or descriptive of me"

Reliability Statistics

A total of 390 responses were received from graduate engineering students. These coded responses complete in all parameters are entered in SPSS for data analysis. Reliability analysis was examined using Cronbach Alpha Coefficients, which was found significantly high at .869 for the PEM used in this study.

Sample Characteristics

The mean of the respondents who took part in this study is 19.10 years, and majority of the respondents is male (53.6%), day scholar students (73.1%), pursuing their engineering graduation from self-

financed engineering colleges (57.7%), and who had their school education in cities (53.3%). With regard to their interest, greater majority of the students have joined the engineering program based on their own interest. With regard to family-related information, majority of them (72.1%) are from nuclear families where at least one parent is gainfully employed (71.8%), born as first child (46.7%) and consider that their family support is very advantageous (69.5%) for them. When asked about how they would decide on the kind of job, less than majority of them have reported that they would love to do a job that use their talent and skills well (44.6%) followed by high salary (25.9%). Majority of these respondents (60% and above) are also reported to have performed academically well (outstanding).

RESULTS – DESCRIPTIVE STATISTICS

Table 1: Emotional Intelligence Score of Graduate Engineering Students

El Dimensions	Sub-Dimensions	Items	Mean	S.D	Rank
Support System	Assertion	6	2.93	3.974	3
	Team Building	5	2.99	3.513	2
	Positive Influence	5	2.63	3.191	6
	Empathy	7	2.3	3.788	11
Guidance System	Personal Orientation	7	2.41	3.534	9
	Self-Control	6	2.79	3.780	4
	Goal Settings	6	2.54	3.932	7
Power System	Drive Strength	7	2.15	3.148	12
	Self-Management	7	2.5	3.452	8
Balance System	Decision Making	7	2.05	3.060	14
	Stress Management	7	2.41	3.617	9
Belief System	Self Esteem	5	2.74	3.460	5
	Congruence	6	1.99	2.295	15
	Self-Appreciation	6	2.13	2.630	13
	Self Confidence	6	3.31	4.101	1

Table 1 shows the mean based ranking of emotional intelligence dimensions among graduate engineering students. It is observed that the sampled respondents are reported with high emotional intelligence on dimensions such as self confidence, team building, assertion, self-control and self-esteem. Similarly, lower emotional intelligence is found on dimensions such as congruence, decision making, self-appreciation, drive strength and empathy. It is therefore concluded that the graduate engineering students are emotionally intelligent on belief system and support system dimensions; however, the level of intelligence as reported is not as high as it could be expected (see figure 1).

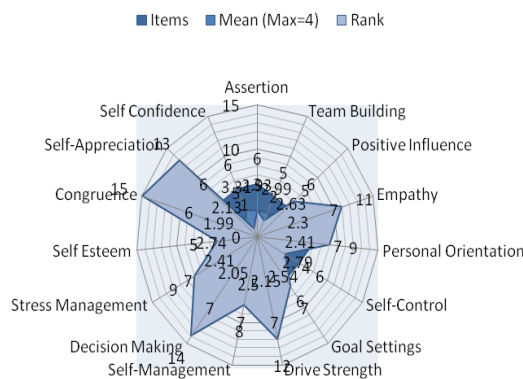


Figure 1: Mean Score of EI Dimensions

Table 2: EI Dimensions –Correlation Coefficients

Dimensions	Correlations				
	SupportSys	GuidSys	BalanSys	PowerSys	BeliefSys
SupportSys	1	.603**	.495**	.635**	.527**
GuidSys	.603**	1	.505**	.593**	.448**
BalanSys	.495**	.505**	1	.661**	.427**
PowerSys	.635**	.593**	.661**	1	.502**
BeliefSys	.527**	.448**	.427**	.502**	1

** . Correlation is significant at the 0.01 level (2-tailed).

Table 2 shows the correlation coefficient matrix of the dimensions of EI. As evident, all the dimensions of the EI are highly and positively correlations to each other thereby confirming the preliminary construct validity of the EI measure and its dimensionality.

EI of Graduate Engineering Students

In this study, to know the level of EI among graduate engineering students, K-means cluster analysis is used to segment students into exactly 'k' number of clusters of greatest possible distinction (in this case, 3 clusters – high EI, moderate EI, and low EI). Based on these clusters, several other analysis explaining the relationship between the segmented clusters with other key demographic and other variables can be ascertained to make further interpretation and inferences.

Table 3: Final Cluster Centers

	Cluster			F	Sig
	1	2	3		
Support System	51	62	75	424.042	.000
Guidance System	41	51	56	255.958	.000
Balance System	28	33	37	109.453	.000
Power System	26	32	37	202.901	.000
Belief System	53	57	68	151.389	.000
N	131.000	163.000	96.000		
Percent	33.6	41.8	24.6		

Table 3 shows the results of the cluster segmentation of graduate engineering students. As evident, cluster 1 contains about one-third (33.6%) of the sampled respondents who reported lower level emotional intelligence compared to cluster 2 and cluster 3. Cluster 3, which contains about less than one-fourth of the respondents (24.6%) are reportedly having higher level of emotional intelligence. Based on the cluster distinction, cluster 1 is named as *High EI students*, cluster 2 as *Moderate EI students* and Cluster 1 as *Low EI students*. Examination of F value reveals that among the five dimensions of EI, graduate engineering students are highly intelligent (EI) in support system and guidance system dimensions. Moreover, all the five dimensions are found to be statistically significant as well. It is therefore concluded that the emotional intelligence levels of sampled graduate engineering students varies with regard to the dimensions and all the five dimensions are a significant determinant of their EI.

Table 4: Eigenvalues

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation	Wilks' Lambda	Chi-square	Sig.
1	4.741 ^a	97.4	97.4	.909	.155	718.883	.000
2	.127 ^a	2.6	100.0	.336	.887	46.047	.000

a. First 2 canonical discriminant functions were used in the analysis.

Reliability of cluster groups can be tested using discriminant function analysis.

Table 4 shows the Eigenvalues and the canonical correlation for the discriminant function. As observed, function 1 has the larger Eigenvalue, percentage of variance and canonical correlation coefficient, which means that the first function explains the majority of the variance in the relationship. The closer Wilks' lambda is to 0, the more the variable contributes to the discriminant function. Finally, as the p-value is less than 0.05, it is concluded that the corresponding function explains the group membership well.

Table 5: Standardized Canonical Discriminant Function Coefficients

	Function	
	1	2
Support System	.665	.232
Guide System	.475	-.620
Balance System	.178	.087
Power System	.214	-.312
Belief System	.361	.716

Table 5 shows the standardized canonical discriminant coefficients, which ranks the importance of each variable (higher the standardized discriminant function coefficient, more the group differ on that variable). In this case, the standard coefficient for **zsupport System** in first function is greater in magnitude than the other coefficients. It is therefore concluded that the support system dimension has the greatest impact on the discriminant score.

Table 6: Structure Matrix

	Function	
	1	2
Support System	.679*	.187
Guide System	.469*	-.244
Balance System	.345*	-.056
Power System	.391	.678*
Belief System	.518	-.645*

*. Largest absolute correlation between each variable and any discriminant function

Table 6 shows the correlations between the observed variables (the three continuous discriminating variables) and the dimensions created with the unobserved discriminant function (dimensions), which means how closely a variable is related to each function. Generally, any variable with a correlation of 0.3 or more is considered to be important, in this case, all the dimensions of EI are significant.

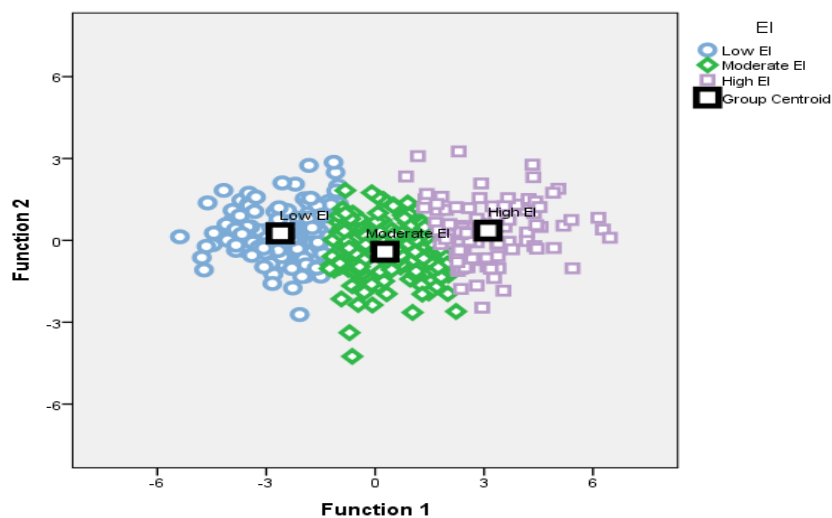


Figure 2: Canonical Discriminant Functions

Figure 2 shows the diagrammatic representation of cluster segmentation and their group centroids. As observed, all three cluster groups are distinct and separated thereby explaining the stability of the cluster segmentation.

Table 7: Classification Results^a

EI		Predicted Group Membership			Total
		Low EI	Moderate EI	High EI	
Count	Low EI	131	0	0	131
	Moderate EI	5	155	3	163
	High EI	0	2	94	96
%	Low EI	100.0	.0	.0	100.0
	Moderate EI	3.1	95.1	1.8	100.0
	High EI	.0	2.1	97.9	100.0

a. 97.4% of original grouped cases correctly classified.

Table 7 shows the classification results. While the rows indicate the observed groups, the columns indicate the predicted groups and values reflect the correct classification of observations into groups. As evident, 97.4% of original grouped cases are correctly classified. It is therefore concluded that the cluster segmentation is reliable and correct.

Association and Relationships

Chi-square test is done to test the associational hypothesis between the key variables used in this study and correspondence analysis is performed to examine the relationship.

Table 8: Results of Chi-Square Tests

Association with EI	Value	Sig.	Support
Gender	1.981	.371	Not Supported
Academic Performance	212.168	.036	Supported
Family Type	7.097	.029	Supported
Family Advantage	11.460	.022	Supported
Scholar Type	1.662	.436	Supported
School Satisfaction	4.396	.355	Not Supported
C2T Satisfaction	13.583	.035	Supported
Teen Satisfaction	18.467	.005	Supported

(C2T- Child to Teenage)

Table 8 shows the results of Chi-Square tests which reveal significant association for academic performance family type, family advantage, scholar type, C2T and teen satisfaction with emotional intelligence of graduate engineering students. However, variables such as gender and satisfaction with school experience are found to be not associated with emotional intelligence. Graduate engineering students belonging to joint families are found to be emotionally intelligent compared to nuclear families. Similarly, day scholar students and those who perceive their family add to their advantage are also found to be emotionally intelligent than others. This suggests the important role of family in the development of emotional intelligence of graduate students. Moreover, this study also finds that influence of early childhood experience and experience during teen age on the emotional intelligence of graduate engineering students in the sampled population. Figure 3 to 6 shows the results of correspondence analysis examining the relationship between emotional intelligence and hypothesized variables such as academic performance, family advantage, C2T and teen satisfaction. As observed, those who have scored high on emotional intelligence also scored high in their previous academic semester (figure 3). Similarly, graduate engineering students who perceive that their family support them in a big way also found to score high in emotional intelligence (figure 4).

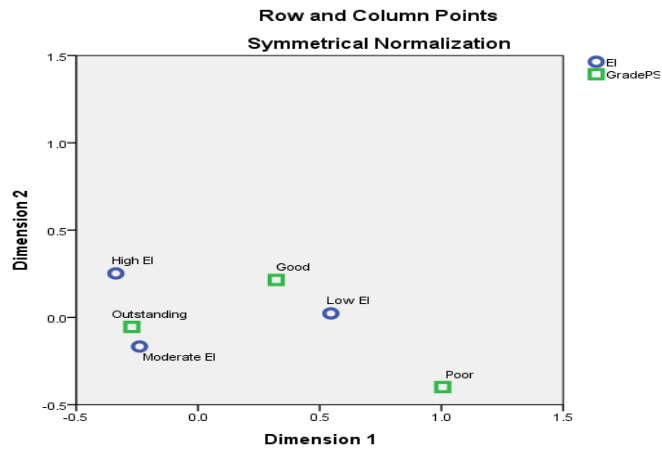


Figure 3: Correspondence Analysis – EI and Academic Performance (Previous Semester)

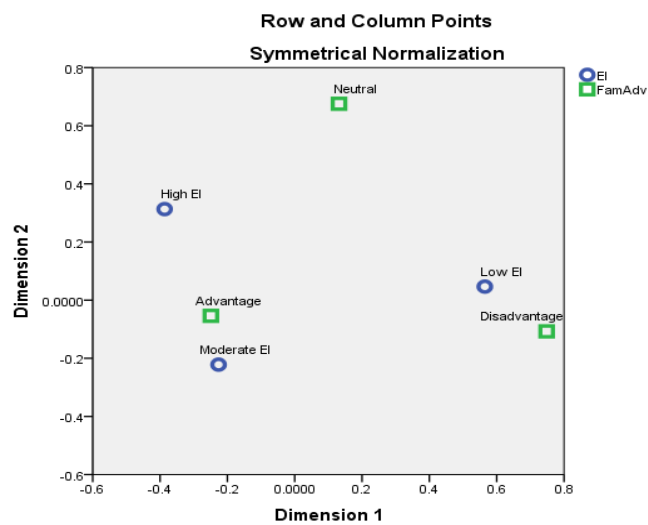


Figure 4: Correspondence Analysis – EI and Family Advantage

Graduate engineering students who report their C2T (Child to Teenage) and teen age experience has been enjoyable and memorable found to score high in emotional intelligence. This analysis confirms the relationship between academic performance and emotional intelligence as well as the role of family, childhood and teenage experiences for the development of emotional intelligence among graduate engineering students.

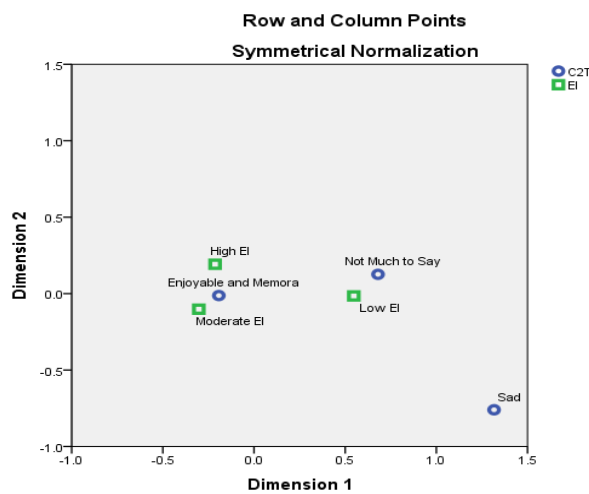


Figure 5: Correspondence Analysis – EI and C2T (Child to Teenage) Experience

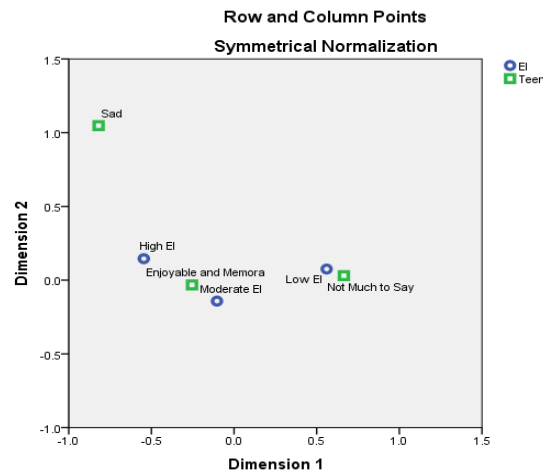


Figure 6: Correspondence Analysis – EI and Teenage Experience

DISCUSSION

This study examined the level of EI among graduate engineering students and found higher scores for factors such as self confidence, team building, assertion, self-control and self-esteem factors of EI. Similarly, lower score of EI is reported for factors such as congruence, decision making, self-appreciation, drive strength and empathy. This indicates that graduate engineering students are emotionally intelligence on support system and guidance system dimensions of PEM measure. Moreover, through K-means cluster analysis, it is found that only about one-fourth of engineering students are found with high EI score. This indicates that the majority of graduate engineering students are not emotional intelligent. This study also found significant relationship between EI and academic achievement of graduate engineering students. This finding is consistent with findings of several other studies (Abisamra, 2000; Parker, Creque, Barnhart, Harris, Majeski, Wood, Bond, & Hogan, 2004; Romanelli, Cain, & Smith, 2006; Jaeger & Eagan, 2007; Chew, Zain, & Hassan, 2013) explaining the relationship between EI and academic success. Similarly, MacCann, Fogarty, Zeidner, & Roberts (2011) found the mediating role of coping in explaining the relationship between EI and academic achievement. Family plays an important role in the development of EI of adolescent students. This study found that those graduate engineering student who stayed with their parents (day scholars) are more emotionally more intelligent than those students who were staying in the college hostel. This indicates the importance of family and the perception of support from the parents to the development of emotional intelligence among students (Manuel, 2002; Khajehpour, 2011). By constantly supporting their children in the studies and because of regular interaction the parents, students are able to feel the support and guidance, which is crucial for being confident and self assured.

CONCLUSION

EI really matters. EI is the ability to manage and use emotions for personal effectiveness. People with high EI are able to manage their stress levels and communicate effectively with others, which enhance their life experience in both personal and professional fronts. Unlike IQ, which generally remains constant, EI can be improved over time. Therefore interest on EI has been recognized worldwide and studies have proliferated. In this study, the researcher found that the level of EI among graduate engineering students is very low on many dimensions of the PEM measure used. Students who stay with their parents were also found to have higher EI score compared to those who study from hostel, which indicates the importance of family environment and parental support for the development of EI. This study also found the effect of early childhood experience on EI. Relationship of students with their parents and the immediate academic experience provides motivation and necessary help to cope with the pressure and tensions, which in turn contribute to their well-being, academic performance and successful career. The findings of this research have important theoretical and practical implications for researchers, educationalists, parents and policy makers.

Given the importance of EI for personal effectiveness, growth and well-being, this study suggest that it is high time that policy makers, educators, teachers and parents focus on EI of the students, especially those pursuing professional courses. This is essentially because, the pressure to perform and stay on top of their

academic environment is too high in professional courses and those students who are low in EI find it extremely difficult to cope with the demands and rigor of professional education, which results in failure, poor performance and retention problems. On the other hand, EI enables students to develop a sense of efficacy in solving problems, create self-identity as well as to cooperate, and participating productively in a group. EI determines their self-awareness and people skills, which is crucial to stay on the top in today competitive scenario. EI really matters. Future studies, longitudinal studies, intervention studies, and model testing research are required to shed more light on the relationships (direct, indirect, mediation and moderation) between EI, academic success and related variables such as health, well-being and career success.

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