

Investigating the Impact of Emotional Intelligence on Academic Performance of Engineering Students: An Exploratory Study in Pakistan

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ARTICLE INFO

Article history:

Received: 22 April, 2018

Accepted: 12 February, 2020

Published: 03 March, 2020

Keywords:

Academic performance(AP),

Emotional intelligence(EI),

Engineering students,

Public universities,

Private universities

ABSTRACT

Emotional intelligence (EI) has become one of the leading predictors of human success in professional, personal and academic life. This study investigates the influence of emotional intelligence and its four domains (self-awareness, self-management, social-awareness, and social-management) on academic performance (AP) of engineering students. The data for this research has been collected through a structured questionnaire from 350 students of public and private sector engineering universities of northern Punjab Pakistan. The results from analysis of variance (ANOVA) and correlation statistics supports the developed hypotheses by indicating positive influence of emotional intelligence on academic performance. Furthermore, senior students are found to be more emotionally intelligent than junior students. Also, the public sector engineering universities provide better environment for the promotion of emotional intelligence as compared to private universities. However, the level of emotional intelligence both at public and private universities needs to be improved. This study also provides a framework for improving emotional intelligence of students.

1. Introduction

Emotional intelligence finds its origin from social intelligence and has gradually become an important predictor of human success in diversified fields [1]. While its close relationship with social behaviors including self-esteem [2], healthiness [3], happiness [4] and prosperity [5] has long been established, Emotional Intelligence (EI) has also been found to be indicative of a successful professional career, influencing managerial functionality [6], career selection [7], leadership qualities [8] and workplace success [9]. In fact, the successful professional career is closely associated with the proper intellectual growth during educational training. In our educational system, students often face difficulty in coping with the academic burden in terms of assignments, projects and exams mainly due to lack of proper guidance, poor learning environment, language difference and socio-economic factors. The mental component associated with this academic burden is ignored which gradually leads to stress and anxiety that students do not know how to deal with. Therefore, a number of researchers including Adeyemo [10] and Gharetepeh et al. [11] have recommended inclusion of emotional intelligence at undergraduate level in order to ascertain the academic success of students.

Previously, researchers have considered various factors of emotional intelligence in their studies to examine the impact on academic performance of students of different fields and study levels. Parker et al. [12] and Mohzan et al. [13] reported a significant connection of intrapersonal and interpersonal skills with academic performance of the secondary school students. Sloboda [14] and Elias et al. [15] studied the negative impact of pressure, anxiety, and stress on academic success of medical students and found them to be effective.

Acharya [16] and Rajandran et al. [17] observed that apart from social, physical or family problems, emotional problems also hinder the learning process and academic performance of dental and undergraduate students, respectively. Chew et al. [18] examined students of medical college in Malaysia and found strong relationship of emotional intelligence with academic performance and their dealing with patients after graduation. Sansgiry et al. [19] studied some factors which included academic assessment, time management skills and nervousness and verified their effect on academic performance of students. Magnuson [20] concluded that academic performance can be affected by socio-economic status. Liao and Wei [21] reported that greater academic stress shows a negative affect towards academic performance. They concluded that excessive involvement of stress in students may affect their academic performance leading to poor quality of life and reduced self-confidence. The reported literature on the specific engineering education suggest that the technical skills of students should be supplemented with soft skills, as the collective set of competencies help engineering students to optimize their academic and professional performance [22]. A strong connection was found by Davis [23] between professional capabilities of engineers and their emotions, which was further authenticated by Kosti et al. [24] who carried out an extensive research on software engineering professionals. A similar study was conducted by Brackett et al. [9] who reported an improvement in the grade point ratio of civil engineering students by improving their emotional intelligence.

There are other research studies reported in literature which discuss the relationship of emotional intelligence with students' academic performance in a Pakistani perspective.

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Some of the researchers have investigated the impact of emotional intelligence on the performance of secondary school teachers [25] intermediate students [26] and business students [27]. Kamran et al. [28] studied the relationship of emotional intelligence, anxiety and procrastination of intermediate science students in the light of appraisal-anxiety avoidance model and revealed that trait anxiety was the only predictor of procrastination indicating that students who were anxious tended to procrastinate more. Chaudhary et al. [29] investigated the level of emotional intelligence among university students and found it is higher in female than male students. They also proposed that choice of subjects, for instance social science or physical science, may also affect emotional intelligence of students. Farooq et al. [30] suggested socio-economic status of family to be one of the essential elements affecting students' performance. On the other hand, Saifi and Mehmood [31] demonstrated the influence of income and occupation on academic performance of students. Kaur et al. [32] carried out a comparative study among students of different fields and reported that students of psychology were more emotionally intelligent. Noor [33] suggested that academic performance of students can be enhanced if they are trained to improve their emotional intelligence in early adulthood.

It is evident from literature review that certain factors including academic environment, stress, guidance, socio-economic status and language difference can largely affect the academic performance of a student. However, considering the associated mental component in terms of self-awareness, self-management, social awareness and social management can prove to be helpful for better academic performance. The literature review also reveals that a major portion of previous research has been driven to exploring the impact of emotional intelligence on academic performance of students of social sciences or medical fields; however, little or no work is reported focusing that of engineering students in the Pakistani perspective despite the growing demand from industrial employers for better empathy and self-awareness among fresh engineering graduates [34]. Therefore, the current work aims to explore the impact of emotional intelligence on academic performance of first year (junior) and final year (senior) undergraduate engineering students of public and private sector engineering universities of Pakistan.

2. Hypotheses

The study is based on the following hypotheses:

- H1: Emotional Intelligence (EI) is significantly associated with academic performance (AP) of Engineering Students.
- H2: EI is significantly associated with academic performance of junior students in an engineering university.
- H3: EI is significantly associated with academic performance of senior students in an engineering university.

H4: EI is significantly associated with academic performance of engineering students of a public sector university.

H5: EI is significantly associated with academic performance of engineering students from a private sector university.

3. Research Method and Material

3.1 Participants

Data was collectively gathered from a total of 350 mechanical engineering students of UET Taxila (University of Engineering and Technology, Taxila; the public sector university) and NUST (National University of Science and Technology; the private sector university). Out of these 350 students, 175 were from UET Taxila which included 90 junior and 85 senior students whereas 175 were from NUST including 90 junior and 85 senior students. The ages of students ranged between 19 years to 24 years.

3.2 Assessment Measures

Demographical evidence was gathered from the students concerning their age, gender, university nature and the semester through demographic data form. Additionally, two separate 5-point Likert-scale questionnaires [35] were developed to collect the research-specific data of students.

The theoretical framework depicted in Fig. 1 elaborates the relationship of various factors of EI and AP which form the basis of the survey questionnaires. Participants completed a one-page EI questionnaire that included 19 questions based on four core variables of EI (self-awareness SA, self-management SM, social awareness SOA and social-management SOM). Moreover, participants also completed academic performance questionnaire that included 17 questions based on important variables of socio-economic status, learning facilities, academic environment, stress, proper guidance, and language. These survey forms were developed with the help of previous research works and Trait EI Questionnaire [36]. A total of 355 questionnaires were distributed out of which four were not properly filled whereas one was returned unfilled so these were discarded.

3.3 Procedure

Initially, formal letters of permission were written to departmental heads of UET Taxila and NUST mentioning a brief introduction of the research. There are almost 20 engineering universities in the region but the reason why the afore-mentioned universities were chosen was because these were considered as the top-ranked universities among the public and private sectors separately, with diversified demographics of students. After obtaining the formal permission from the departmental administrations, students were approached in their classrooms for data collection. Firstly, the participants were briefed about the significance of the research and then instructions about filling the questionnaires were given followed by distribution of questionnaires. The concept of each question was explained in detail to avoid any discrepancy in the responses.

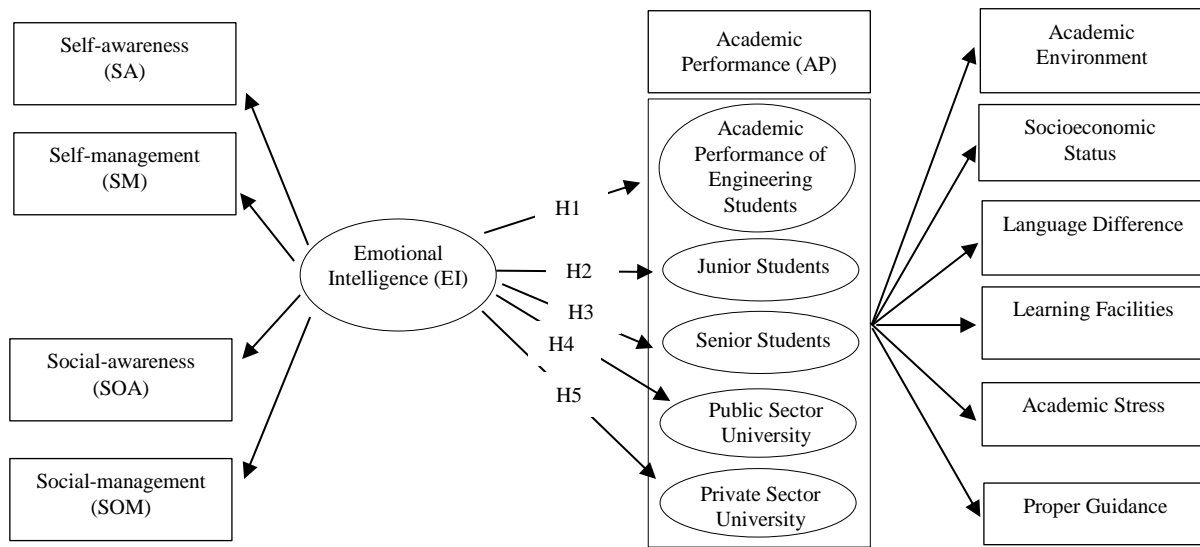


Figure 1: Theoretical framework of EI and academic performance.

Table 1: Descriptive statistics (Mean, Standard deviation, Kurtosis, Cronbach’s) of main variables.

Variables	Public sector university first year				Public sector university final year			
	Mean	SD	α	kurtosis	Mean	SD	α	kurtosis
SA	3.5	0.48	0.75	0.03	3.6	0.66	0.82	1.9
SM	2.9	0.65	0.70	0.24	3.3	1.0	0.82	-0.28
SOA	3.2	0.81	0.70	-0.27	3.7	0.64	0.74	-0.41
SOM	2.9	0.69	0.76	1.5	3.6	0.76	0.86	0.35
EI	3.1	0.44	0.67	0.29	3.6	0.61	0.73	1.8
AP	3.2	0.50	0.77	0.35	3.5	0.64	0.84	-0.36
Private sector university first year								
SA	3.8	0.29	0.82	-0.82	3.5	0.71	0.82	1.3
SM	2.6	0.66	0.84	-1.2	2.6	0.96	0.84	-0.49
SOA	3.3	0.60	0.74	-1.1	3.7	0.46	0.72	0.13
SOM	3.4	0.53	0.70	-1.2	3.3	0.63	0.75	-0.82
EI	3.3	0.29	0.57	-0.41	3.3	0.34	0.65	-1.70
AP	3.6	0.30	0.74	-0.62	3.3	0.42	0.75	1.26

SA: Self Awareness, SM: Self-Management, SOA: Social Awareness, SOM: Social Management

The researchers remained present in the class rooms during the data collection session. On average, students consumed 20 to 25 minutes to complete each questionnaire. All responses were lately collated and analyzed using SPSS 24 software.

4. Results and Discussion

Table 1 shows the details of descriptive statistics which include mean, standard deviation, Cronbach’s alpha values, and Kurtosis values of EI, its four domains, and academic performance. The Cronbach’s alpha values suggest that data observes the normal distribution. It shows that the gathered data is reliable enough to be used for inferential statistics. The Kurtosis (normality test) values are within the prescribed range i.e. -2.75 to 2.75 [37]. Table 2 shows the correlation statistics among EI, its variables, and academic performance. EI is found to be significantly linked with academic performance ($r=0.71$). This supports the first hypothesis.

However, self-management (SM) has a relatively weak association ($r =0.39$) with academic performance. On the other hand, social management (SOM) carries the strongest relationship ($r=0.62$) with academic performance. The correlation of a variable with itself is always 1.00, so these values are replaced by dashes to make the table easier to read.

Table 2: Correlation among the factors.

Variables	SA	SM	SOA	SOM	EI	AP
SA	---	---	---	---	---	---
SM	0.28	---	---	---	---	---
SOA	0.24	0.22	---	---	---	---
SOM	0.24	0.25	0.45	---	---	---
EI	0.59	0.70	0.69	0.71	---	---
AP	0.42	0.39	0.50	0.62	0.71	---

SA: Self Awareness, SM: Self-Management, SOA: Social Awareness, SOM: Social Management

Table 3: Summary of ANOVA results.

Model	Hypothesis	r	R square	Adjusted square	R	Standard error of estimate	F	Sig.	Conclusion
1	H1 EI → AP	0.71	0.50	0.50	0.36	133.8	0.00	Supported	
2	H2 Juniors	0.70	0.49	0.49	0.33	63.8	0.00	Supported	
	H3 Seniors	0.73	0.53	0.52	0.32	73.7	0.00	Supported	
3	H4 Public sector	0.74	0.54	0.54	0.41	86.1	0.00	Supported	
	H5 Private sector	0.67	0.45	0.42	0.28	47.0	0.00	Supported	

Table 3 shows the results of one way ANOVA and summary of all the models analyzing the effect of variables and objectives identified in hypotheses. Main statistics including R square (coefficient of determination) has been given. R square explains the goodness of the fit of our models. The table also demonstrates the correlation coefficients (r) values of the data against each hypothesis. EI is taken as an independent variable, while academic performance is a dependent variable.

The results reveal that students recording high on EI also scored high on academic performance. The correlation coefficient $r=0.71$ at 95% confidence level of model 1 indicates that EI is significantly connected with academic performance. R square value also shows that model 1 is statistically significant and the degree to which academic performance can be explicated by EI is 50.6%, i.e. (R square=0.506). $F_{cal}=133.814$ ($p<0.05$) at 0.00 significance level supports H1 suggesting that EI has a positive and significant effect on the academic performances of undergraduate engineering students. This result is in accordance with similar studies, previously carried out by Schutte et al. [38] and Tapia [39] who found an important connection between EI and Scholastic aptitude test.

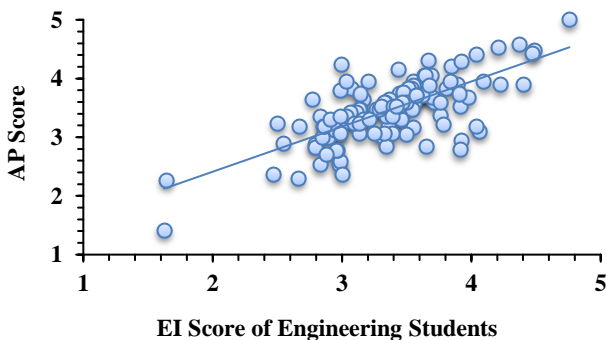


Fig. 2: Relationship of EI and AP of engineering students.

The academic performance of undergraduate engineering students against their respective EI levels is depicted in Fig. 2. The graph pattern verifies the direct positive relationship between the dependent and independent variables. It is clearly demonstrated that engineering students having better EI level also performed well academically and vice versa. This result is consistent with the findings of previous researchers, for instance, Skipper and Brandenburg

[40] who reported that increase in EI score resulted an increase in academic performance of the engineering students.

The correlation coefficient of junior students regarding emotional intelligence and academic performance is $r=0.70$ and that of senior students $r=0.73$. This supports hypothesis H2 and H3. The R square values of 0.49, $F_{cal}=63.8$ ($p<0.05$) (for junior) and R square values 0.53, $F_{cal}=73.7$ ($p<0.05$) (for seniors) at 0.00 significance level satisfy H2 and H3. This verifies the significance of model 2 which means that emotional intelligence of senior students and their academic performances is higher as compared to that of junior students. This difference can be attributed to age factor as discussed by Extremera et al. [41] who found a positive relationship between EI and age. It also infers that soft skills and abilities develop chronologically.

Figs. 3 and 4 illustrate the relationship of EI with academic performance of junior and senior students respectively. It is clear that the EI is positively related with academic performance of junior as well as senior engineering students.

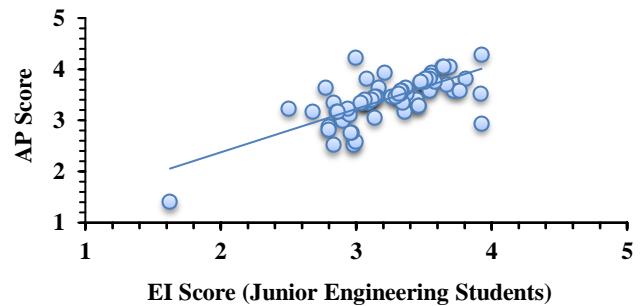


Fig. 3: Relationship of EI and AP of junior engineering students.

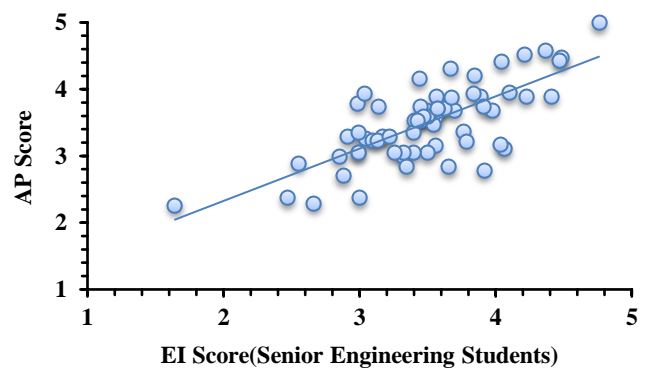


Fig. 4: Relationship of EI and AP of senior engineering students.

However, the graph reveals that senior engineering students are more emotionally intelligent than their juniors, scoring high on EI as well as AP. The same finding was reported by Maraichelvi and Rajan [42].

Model 3 also appears to be significant as R-square values for public and private sector are 0.54 and 0.45 respectively. This shows that H4 and H5 is true which means that EI has a significant positive relationship with academic performance in public as well as private sector universities. The coefficient values (0.74 & 0.67) reveal a stronger association of EI and academic performance of students in public sector as compared to private sector engineering universities. The F_{cal} ($p < 0.05$) values support Model 3 that EI of engineering students from a public sector university is significantly better than the students of a private sector university. This verifies the supposition that educational environment may affect the emotional intelligence and consequently academic performance of students.

Figs. 5 and 6 reveal the relationship of EI with academic performance of students studying in the public sector and the private sector universities respectively. It is found that EI is positively related to academic performance in public as well as private sector engineering universities.

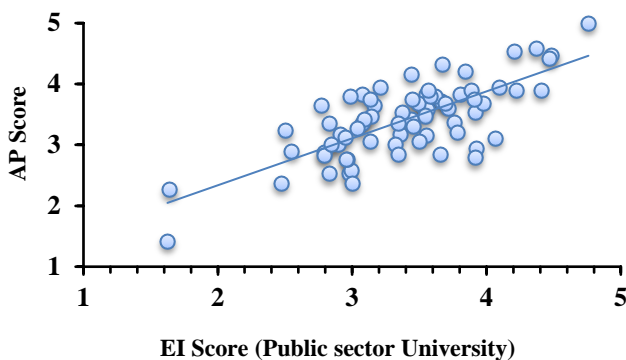


Fig. 5: Relationship of EI and AP of students in the Public Sector University.

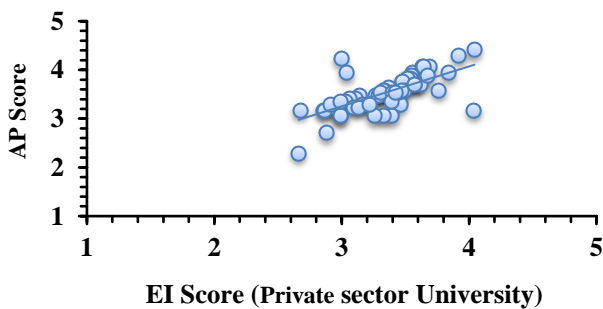


Fig. 6: Relationship of EI and AP of students in the Private Sector University.

However, in the case of Public Sector University, the graph indicates a relatively higher academic performance exhibited by students with respect to emotional intelligence.

On the contrary, a relatively lower academic improvement, while assessing EI, is observed in the private sector university.

Fig. 7 shows the final model of EI and academic performance. It sums up the statistical analyses which is performed on the required set of data obtained from a public and a private engineering university.

5. Conclusions

The current study was focused on exploring the impact of emotional intelligence (EI) on academic performance (AP) while considering junior (1st year) and senior (final year) undergraduate students from mechanical engineering departments of two engineering universities of northern Punjab, namely UET Taxila and NUST. The research was based on five hypothesis mentioned under section 2. Statistical analysis has been carried out including employment of ANOVA. It is concluded that there is a significant direct relationship between EI and academic performance of engineering students. Students with better EI scores are more diligent towards academic achievements and show superior performance as compared to those who are weak in managing their emotions. EI has direct positive association with academic performance of both senior and junior engineering students; however, in comparison to junior students, senior students appear to be more emotionally intelligent. On the other hand, comparative analysis of the public and private sector universities reveal that EI is significantly linked with academic performance of engineering student in both, as proved in Hypotheses 4 and 5. However, in terms of coaching on emotional intelligence, public sector engineering universities provide a better environment than the private sector universities. Furthermore, all the four domains of EI, namely, self-awareness, self-management, social awareness and social management have significant effect on academic performance of the student, as the results depicted in Table 1 reveal. Hence the current research verifies the applicability of a modified version of EI model in the context of academic performance in developing countries like Pakistan. This study has important implications regarding inclusion of EI into Pakistani engineering universities' curriculum as it has been proved to be a strong predictor of academic performance. In the light of the findings discussed above, it is recommended that authorities should create awareness in students as well as teachers about the importance of EI. A learning environment conducive to developing team spirit, societal development, and emotional sensitivity can result in enhanced academic performance of students. As it has been conversed previously that students who are good at understanding and managing their emotions perform good academically.

Nevertheless, it is important that which aspects of emotional intelligence need to be addresses in that regard. In Fig. 8, a framework for enhancement of academic performance of engineering students through emotional intelligence has been presented.

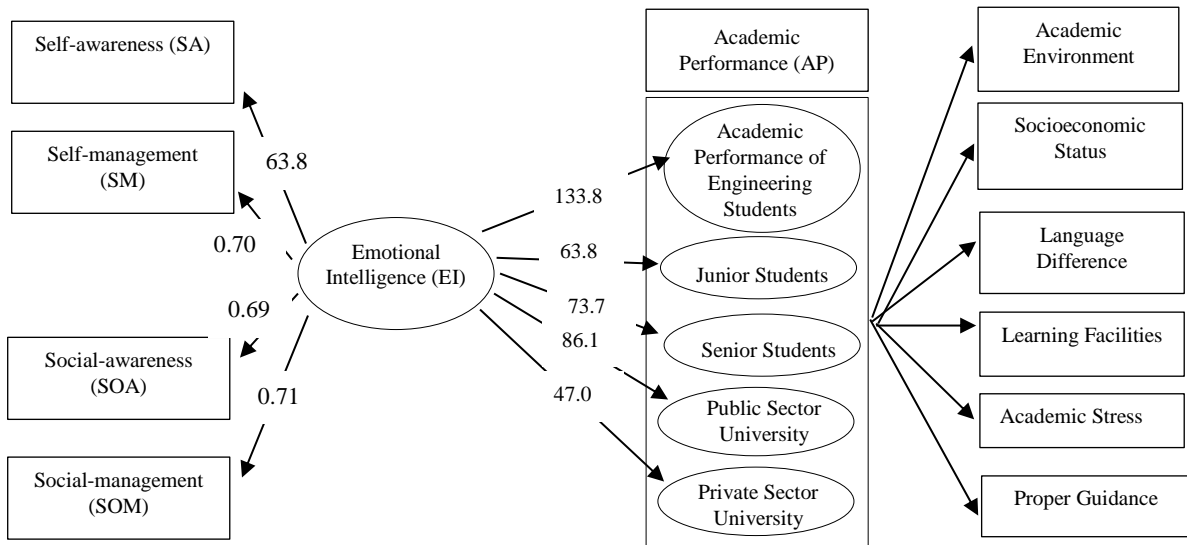


Fig. 7: Final framework of emotional intelligence and academic performance.

It suggests that soft skills which include self-motivation (self-reliance and precise self-assessment) self-management (honesty, trustworthiness and goal-oriented attitude), social awareness (organizational awareness and sympathy) and social management (good communication, conflict management, and relationship building) among engineering students should specifically be enhanced in addition to professional skills. The afore-mentioned soft skills are the specific areas of emotional intelligence which are important for a high academic achiever. Moreover, teachers sufficiently qualified in adopting techniques, can also foster core values of EI among students [43]. Suitable counseling's programs can be designed to inculcate these key soft skills in students.

UET Taxila and NUST for giving consent to approach the students during lectures for data collection.

This study did not receive any definite grant from funding agencies in the public, commercial, or not-for-profit sectors.

It is certified that the article is the authors' original work, hasn't received prior publication and isn't under consideration for publication elsewhere.

Conflict of Interest: The authors state that they have no conflict of interest.

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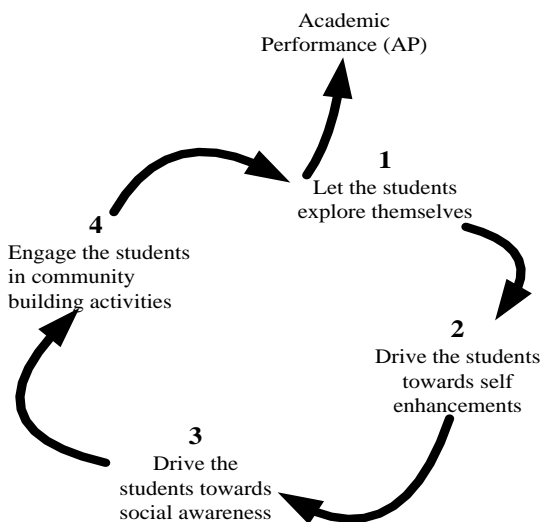


Fig. 8: Emotional intelligence framework.

Acknowledgment

The authors wish to express their gratitude and thanks to administrations of mechanical engineering departments of

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