# Analysis of Students' Emotional Intelligence and Their Relationship with Academic Achievement in Science

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Abstract. The pandemic has significantly reshaped our lives, particularly the way we learn. Despite the increased use of technology in education during this period, there have been persistent negative effects that extend beyond cognitive aspects, impacting students emotionally. Therefore, it is crucial to conduct emotional analyses of students, as emotional states can also influence their science achievement. A study involving 215 students from Senior High School 2 Sungai Penuh employed descriptive and correlation methods. Students' achievement scores were collected from teachers' semester reports, while emotional intelligence data were gathered using questionnaire. The findings indicated that students generally exhibit high emotional intelligence in learning science, with a mean score of 82.09. Nevertheless, future research should prioritize enhancing social skills. Among the students, 120 were categorized as having "very good" emotional intelligence, 84 as "good," and only one required special attention. With five emotional intelligence indicators and four subjects in achievement scores, 36 intercorrelations were analyzed, all of which were found to be statistically significant, albeit with varying correlation coefficients. The study revealed that motivation significantly influences students' achievement, whereas empathy has a less pronounced impact. These findings lay a foundation for designing educational approaches that foster emotional intelligence and improve learning outcomes.

Keywords: Correlation, Emotional intelligences, Learning, Post pandemic, Science Achievement

1   Introduction

The pandemic era has profoundly altered the way we live our lives, reshaping various aspects, including education, and particularly the way we learn. Pandemic showes us that education is fragile. At the peak of the COVID-19 pandemic, approximately 1.6 billion learners worldwide were affected by school closures [1]. The pandemic's impact on educational processes and outcomes was highly significant across different levels. Throughout the pandemic, the use of technology experienced a substantial surge out of necessity, with a notable reliance on tools such as Learning Management Systems (LMS) and video conferencing platforms like Google Meet or Zoom. This

situation has exerted an influence on the preparation, process, and results of the learning process.

The impact has two distinct sides. On one hand, we can harness technology for immediate and comprehensive learning benefits. It is widely recognized that digital interactive learning tools have the potential to revolutionize science education in today's classrooms [2]. For instance, physics education technology (PhET) stands out as an immensely effective option for learning science [3]. Additionally, learning can be designed as a combination of both face-to-face and online formats, known as blended learning [4].

From the other hand, despite the integration of technology into learning, the process still yields negative impacts on students. These effects extend beyond just cognitive aspects, encompassing the emotional well-being and mental health of students [5]. This situation persists even beyond the pandemic era. Therefore, in the post-pandemic landscape, it becomes vital not only to digitally transform learning but also to explore and analyze students' emotional and mental health states.

Students' personalities such as emotions and thoughts, have been identified as influential factors that shape their learning styles. Emotional expression and regulation play pivotal roles in determining academic success [6]. Emotional intelligence emerges as a crucial factor for success [7], and applicable to students at all educational levels [8]. Moreover, our personal social and emotional skills act as protective factors throughout our lives, bolstering resilience and serve to strengthen resilience [5].

The key ingredients of emotional intelligence are personal and social competencies [7]. These align with the concepts of intrapersonal and interpersonal competencies [9]. Personal ability or intrapersoal cmpetency refers to the capacity to understand onself, while social ability or interpersonal competency pertains to the ability to understand other people. Personal competence determine how we manage ourselves and social competence determine how we handle relationships [7]. For this study, we will adopt Goleman notion on emotional intelligence.

Our emotional intelligence shapes our learning potential, built upon its five elements: self-awareness, self-regulation, motivation, empathy, and social skills [7]. The first three elements pertain to personal ability, while the latter two involved in social ability. Understanding oneself and others, along with cultivating the ability to self-manage and engage with others, constitute the most crucial aspects of learning for students [10].

Emotional skills are part of new social contract for education [1]. New ways of organizing learning is needed with emotional skills as main aspects to consider. Those skills not only about personal competence, but alo social competence. Both competence are important for learning, including science learning [11]. Consequently, conducting emotional analyses of students becomes imperative.

So the primary objective of this study was to investigate students' emotional intelligence (including self-awareness, self-regulation, motivation, empathy, and social skills). Then students' emotional states can also be correlated with their academic performance in science subjects (physics, chemistry, biology) and mathematics. The correlation between emotional intelligence and achievement score also analyze to gain more insight about student and their science learning.

2   Methods

Descriptive and correlation methods were conducted with population consisting of 215 students at Senior High School 2 Sungai Penuh. Data concerning students' academic achievement scores were sourced from science and mathematics teachers based on the previous semester's tests. Information about students' emotional intelligence was gathered using an emotional intelligence assessment tool adapted from a previous study, namely *The Emotional Competence Framework Questionnaire* [11]. The questionnaire comprised 25 items that students were required to respond to, assessing their emotional intelligence as outlined in Table 1. Respondents were instructed to select from options such as Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), and Strongly Disagree (SD) for each question.

Table 1. Indicators and Competencies of Emotional Intelligence

Indicators	Competencies
EI1. *Self-Awareness*	*Emotional awareness*: Feel sad when get bad grade and try to improve it *Accurate self-assessment*: Proud of yourself even though you realize have many weaknesses *Self-confidence*: Always try to defend your opinion during discussions
EI2. *Self-Regulation*	*Self-control*: Able to control emotions in various situations *Trustworthiness*: Never cheat when doing assignments or exams *Conscientiousness*: Willing to take responsibility when you make a mistake *Adaptability*: Able to respond to criticism and suggestions *Innovation*: Feel happy when friends share new and different opinions
EI3. *Motivation*	*Achievement drive*: Seeing a failure as a process of achieving success *Commitment*: Study seriously to get the best grades *Initiative*: Always give the best in every opportunity *Optimism*: Always believe and try to achieve your goals
EI4. *Empathy*	*Understanding others*: Aware when friends are angry and try to make it up *Developing others*: Enjoy helping others in solving their problems *Service orientation*: Act quickly to help friends who are in trouble *Leveraging diversity*: Respect diversity that exist in the class *Political awareness*: Willing to cooperate in completing group assignments
EI5. *Social Skills*	*Influence*: Always participate in various events and organizations at school *Communication*: Enjoy discussing the material that has been studied with *Conflict management*: Feel happy to help solve problems between friends *Leadership*: Always motivate friends and groups to complete tasks *Change catalyst*: Appreciate the opinion of friends for a better change *Building bonds*: Easily going with other people, including with new one *Collaboration and cooperation*: Prefer to do the task by collaboration *Team capabilities*: Able to direct the group to achieve gorup goals

The students' questionnaire responses were assigned numerical values using a scale ranging from 5 to 1, corresponding to Strongly Agree (SA) to Strongly Disagree (SD). The collected data on emotional intelligence were subsequently examined and discussed for each indicator and competency. The data were also presented according to students' viewpoints. Following this, the averages for each indicator, competency, and student were transformed to a 100-point scale and classified using a straightforward categorization system, as demonstrated in Table 2.

Table 2. Emotional Intelligence Classification

Average ($\bar{X}$)	Emotional Intelligence Classification
$80 < \bar{X} \le 100$	Very Good
$60 < \bar{X} \le 80$	Good
$40 < \bar{X} \le 60$	Need Attention
$\bar{X} \le 40$	Bad

Finally, the emotional intelligences data were analyzed in relation to the students achievement scores in science and mathematics. The choice between utilizing the Pearson correlation test for parametric data and the Spearman's rank correlation (Spearman's rho) for nonparametric data was determined based on the nature of the data. These tests conducted through statistical software, such as SPSS Statistics.

3   Results and Discussion

3.1   Descriptive Results

The data derived from students' responses and teacher semester reports were subjected to descriptive analysis. However, it's important to note that not all student responses were included in the analysis; specifically, 10 out of 215 data points were excluded due to missing responses to certain questions within the questionnaire. The outcomes of this analysis are presented in Table 3.

Table 3. Statistics Descriptive Results

	N	Range	Min	Max	Mean	Std. Deviation	Variance	Skewness Statistic	Std. Error
Self-Awareness	205	66.67	33.33	100.00	83.02	10.81	116.95	-0.637	0.170
Self-Regulation	205	52.00	48.00	100.00	80.99	10.51	110.46	-0.207	0.170
Motivation	205	45.00	55.00	100.00	88.51	10.52	110.64	-0.826	0.170
Empathy	205	44.00	56.00	100.00	83.67	10.06	101.30	-0.291	0.170
Social Skills	205	62.50	37.50	100.00	74.24	12.25	149.98	-0.051	0.170
Average EI	205	40.50	59.50	100.00	82.09	8.10	65.56	-0.160	0.170
Physics	205	27.00	70.00	97.00	86.64	5.39	29.09	-0.703	0.170
Chemistry	205	24.00	73.00	97.00	87.16	6.11	37.36	-0.439	0.170
Biology	205	24.00	75.00	99.00	87.41	5.82	33.88	-0.352	0.170

	N	Range	Min	Max	Mean	Std. Deviation	Variance	Skewness	
								Statistic	Std. Error
Mathematics	205	27.00	70.00	97.00	86.82	5.90	34.89	-0.643	0.170
Average Achievement	205	23.30	72.50	95.80	87.03	5.04	25.44	-0.543	0.170

On average, the scores for all science and mathematics subjects were quite similar. Specifically, Biology and Chemistry scores slightly outperformed the others, with scores of 87.41 and 87.16, respectively, while Physics achieved a score of 86.64 and Mathematics scored 86.82. When considering the range of scores, Physics and Mathematics displayed higher variability compared to Biology and Chemistry.

Based on these data, it can be concluded that the average science scores were notably high, surpassing the minimum criteria for satisfactory performance, which is typically set at 75. Nevertheless, there were instances where some students scored below 75: three students in Physics, three students in Chemistry, and four students in Mathematics, as illustrated in Figure 1. Notably, all students attained scores equal to or greater than 75 in Biology.
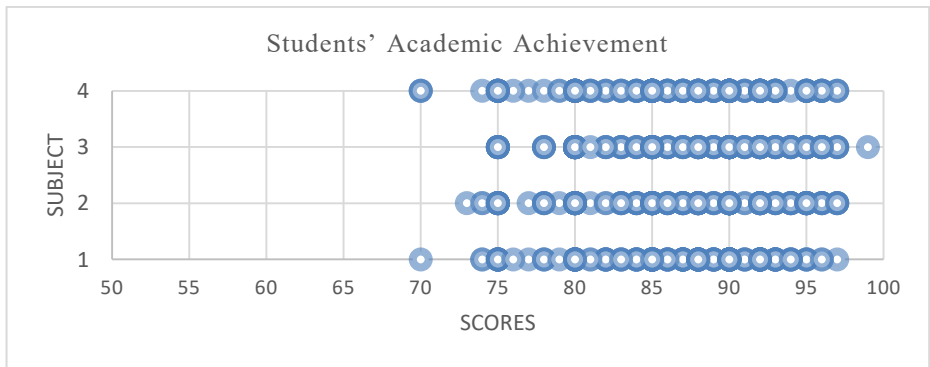
Fig. 1. Students' Academic Achievement (1: Physics, 2: Chemistry, 3: Biology, 4:Mathematics)

Information regarding students' emotional intelligence was collected through their responses to the questionnaire. On the whole, students' emotional intelligence was classified as "very good" with a score of 82.09. As mentioned earlier, emotional intelligence was divided into personal and social competences. Personal competence was assessed through indicators such as self-awareness, self-regulation, and motivation, which delve into how we manage ourselves. On the other hand, empathy and social skills were the indicators for social competence, focusing on how we navigate relationships. It's important to highlight that scores for the various emotional intelligence indicators exhibited differences, warranting a more detailed discussion and analysis.

Self-Awareness
    Self-awareness is a key aspect of personal competency. In general, students' self-awareness was classified as "very good," with a score of 83.02. Self-awareness was

evaluated through three distinct competencies: emotional awareness, accurate self-assessment, and self-confidence. The data revealed that students from the science class scored remarkably high in accurate self-assessment (89.95), followed by emotional awareness (87.41). However, students obtained a comparatively lower score in self-confidence (71.71), though it still falls within the "good" category. Notably, the dominant student responses received scores of 5 (44.88%) and 4 (30.57%), while only 3.90% of all responses received scores of 1 and 2 as shown in Table 4.

From these findings, it can be inferred that students recognize the significance of self-awareness as a pivotal competency for their success in learning, particularly in science. Self-awareness involves understanding one's internal states, preferences, resources, and intuitions [7], as well as comprehending how one perceives oneself and the impact one has on their environment [12]. Additionally, self-awareness encompasses a conscious assessment of specific facets of oneself [13], which can encompass knowledge and related skills. Recognizing our strengths and weaknesses in knowledge and abilities is of paramount importance for achieving success in learning.

Table 4. Students' Emotional Intelligence (EI1. Self-Awareness)

Competencies	Score	Students' Response Distribution on Self-Awareness (%)
Emotional awareness: Feel sad when get bad grade and try to improve it	87.41	
Accurate self-assessment: Proud of yourself even though you realize have many weaknesses	89.95	1.30 — 2.60 44.88 / 20.65 / 30.57
Self-confidence: Always try to defend your opinion during discussions	71.71	
Mean	**83.02**	

Self-Regulation.

The second indicator for personal competency is self-regulation. Self-regulation is a competency that involves managing one's internal states, impulses, and resources [7]. It's closely intertwined with self-awareness; while self-awareness is about understanding oneself, self-regulation is about effectively managing those aspects. In essence, self-awareness serves as the foundation for self-regulation. This particular aspect of emotional intelligence was evaluated across five competencies: self-control, trustworthiness, conscientiousness, adaptability, and innovation.

Overall, students' self-regulation was classified as "very good" with a score of 80.99. However, this score only slightly surpasses the boundary between "good" and "very good." Among the five competencies, three were categorized as "very good": conscientiousness (87. 02), adaptability (85.76), and innovation (85.76). The remaining two competencies were categorized as "good": self-control (75.22) and trustworthiness (71.22) as shown in Table 5. Upon examining the distribution of students'

responses, it's evident that the predominant scores were 4 (38.44%) and 5 (35.61%). Responses with scores of 1 and 2 (4.00%) showed a slight increase compared to the previous indicator.

Students who exhibit high levels of self-regulation possess the ability to effectively monitor and manage their learning processes, displaying a strong determination to achieve their learning objectives. Such learners generate thoughts, emotions, and behaviors that are aligned with their goals [14]. Consequently, self-regulation involves a self-directed process through which learners transform their cognitive abilities into tangible academic skills. This aligns with the idea that students control or regulate their cognition, motivation, and behavior [15].

Enhancing self-regulation in the science classroom can be approached through various methods, such as (a) inquiry-based learning, (b) the role of collaborative support, (c) instructional strategies to enhance problem-solving and critical thinking skills, (d) methods to assist students in constructing mental models and undergoing conceptual changes, (e) the integration of technology, and (f) the examination of student and teacher beliefs [16]. It could be valuable to conduct a more in-depth and systematic study of each of these methods in the future.

Table 5. Students' Emotional Intelligence (EI2. Self-Regulation)

Competencies	Score	Students' Response Distribution on Self-Regulation (%)
Self-control: Able to control emotions in various situations	75.22	
Trustworthiness: Never cheat when doing assignments or exams	71.22	
Conscientiousness: Willing to take responsibility when you make a mistake	87.02	
Adaptability: Able to respond to criticism and suggestions	85.76	
Innovation: Feel happy when friends share new and different opinions	85.76	
Mean	**80.99**	

Motivation.

The final component within the personal competency domain is motivation. Motivation pertains to students' beliefs in their ability to learn [16]. The data collected from students' responses indicate that motivation scored the highest (88.51) compared to all the emotional intelligence indicators. From this, it can be confidently inferred that students displayed a high level of motivation toward learning science.

All the competencies within the motivation category were classified as "very good." Among these, optimism (91.32) emerged as the highest-rated competency, followed by achievement drive (89.85), initiative (87.41), and commitment (85.46) as shown in Table 6. Interestingly, the distribution of students' responses in relation to motivation was also noteworthy. Less than 1% of responses scored 1 or 2, while a significant majority (89.51%) of responses garnered scores of 4 and 5.

It's worth noting that many studies define motivation as part of self-regulation [7], [14]–[17]. Motivation represents emotional tendencies that guide or facilitate the achievement of goals [7]. The trio of cognition, motivation, and behavior constitutes components of self-regulation [15]. Motivation was monitor and control by self-regulation [17]. Motivation includes elements like self-efficacy and epistemological beliefs, which in turn play roles in motivating both students and teachers [16]. In the context of learning, self-regulation doesn't just involve a deep understanding of a skill; it also encompasses self-awareness, self-motivation, and the behavioral capacity to effectively apply that knowledge [14].

Table 6. Students' Emotional Intelligence (EI3. Motivation)

Competencies	Score	Students' Response Distribution on Motivation (%)
Achievement drive: Seeing a failure as a process of achieving success	89.85	
Commitment: Study seriously to get the best grades	85.46	■ 1 ■ 2 ■ 3 ■ 4 ■ 5
Initiative: Always give the best in every opportunity	87.41	0.12 0.73 9.63
Optimism: Always believe and try to achieve your goals	91.32	54.02 35.49
Mean	**88.51**	

Empathy

Within emotional intelligence, there are two distinct competences: personal and social competences. Personal competence pertains to how we manage ourselves, while social competence relates to how we handle relationships [7]. We have previously explored personal competence through the lenses of self-awareness, self-regulation, and motivation. Now, let's delve into social competence, specifically through the dimensions of empathy and social skills.

Empathy is also a kind of awareness, but awareness of others' feelings, needs, and concerns. Empathy involves being attuned to others. It extends beyond interactions with people to encompass understanding problem situations as well [18]. In the context of learning science, empathy serves not only to engage students but also as a fundamental strategy for comprehending contentious situations [19].

When it comes to students' empathy in learning science, the exploration has resulted in a classification of "very good" with a score of 83.69, as illustrated in Table 7. All facets of empathy fall within this same category, with the exception of "developing others." Starting with the highest scores, the order is as follows: political awareness (87.90), leveraging diversity (87.71), service orientation (82.34), understanding others (81.66), and developing others (78.73). The two aspects with the highest scores signify that students are aware of their learning environment and class dynamics. Students possess a profound respect for diversity and are willing to collaborate with

others. The subsequent three aspects revolve around being attuned to others, particularly their peers in the class. They also exhibit a willingness to assist classmates who are facing difficulties. In the context of learning science, this data might indicate that students are inclined to help their peers with science-related issues.

Confirming this, the distribution of students' responses regarding empathy was also notably high. Among all responses, only 1.56% scored 1 or 2, while more than three-quarters (81.95%) earned scores of 4 and 5. This data suggests that students are not only empathetic but are also actively engaged in supporting their peers within the realm of science education.

Table 7. Students' Emotional Intelligence (EI4. Empathy)

Competencies	Score	Students' Response Distribution on Empathy (%)
Understanding others: Aware when friends are angry and try to make it up	81.66	
Developing others: Enjoy helping others in solving their problems	78.73	
Service orientation: Act quickly to help friends who are in trouble	82.34	
Leveraging diversity: Respect diversity that exist in the class	87.71	
Political awareness: Willing to cooperate in completing group assignments	87.90	
Mean	**83.69**	

Social skills

With empathy, social skills were explore to gain more insight about social competence in emotional intelligence. Social skills refer to the adeptness at eliciting desirable responses from others [7]. Possessing social skills is crucial for students to effectively collaborate and engage in cooperative group activities [10]. Unfortunately, among all the competencies and indicators, social skills obtained the lowest score. On average, social skills scored 74.24, falling within the "good" range.

Social skills were further examined through eight distinct competencies, as illustrated in Table 8. One of these competencies was categorized as "very good" (conflict management, 84.00), while the remaining seven were rated as "good." The competency with the lowest score pertained to influence, which encompasses students' participation in class or school events (66.17). Analyzing the distribution of students' responses, it becomes evident that the percentage of scores 1 and 2 increased to 7.99%. Notably, responses with scores 4 and 5 were the lowest in comparison to the other indicators, accounting for 56.65%.

The importance of social skills lies in their pivotal role in fostering effective collaboration and positive interactions among students, both in the classroom and in broader school activities. Recognizing the areas where social skills could be enhanced can guide educators in fostering a more cooperative learning environment.

Table 8. Students' Emotional Intelligence (EI5. Social Skills)

Competencies	Score	Students' Response Distribution on Social Skills (%)
Influence: Always participate in various events and organizations at school	66.17	
Communication: Enjoy discussing the material that has been studied	75.81	
Conflict management: Feel happy to help solve problems between friends	84.00	
Leadership: Always motivate friends and groups to complete tasks	75.02	
Change catalyst: Appreciate the opinion of friends for a better change	71.22	
Building bonds: Easily going with other people, including with new one	72.29	
Collaboration and cooperation: Prefer to do the task by collaboration	77.27	
Team capabilities: Able to direct the group to achieve gorup goals	72.20	
Mean	**74.24**	

The pie chart shows the legend: 1, 2, 3, 4, 5 with values 1.71, 6.28, 35.37, 32.38, 24.27.

Analyzing the scores within each emotional intelligence indicator, we can ascertain that four out of the five indicators were classified as "very good," while one indicator (social skills) was rated as "good." Based on this assessment, we can conclude that students' emotional intelligence in the context of learning science is high. However, it's important to direct our focus toward improving social skills in subsequent studies.

This conclusion is further supported by observing the average scores of each student's emotional intelligence, as depicted in Figure 2. Among all the students, 120 students were categorized as having "very good" emotional intelligence, 84 were categorized as "good," and only one student required special attention due to having the lowest score (59.50) in emotional intelligence. The highest score attained was 99.00, which is nearly perfect. This data highlights the generally strong emotional intelligence of the students, emphasizing the need to address the area of social skills for future improvement.
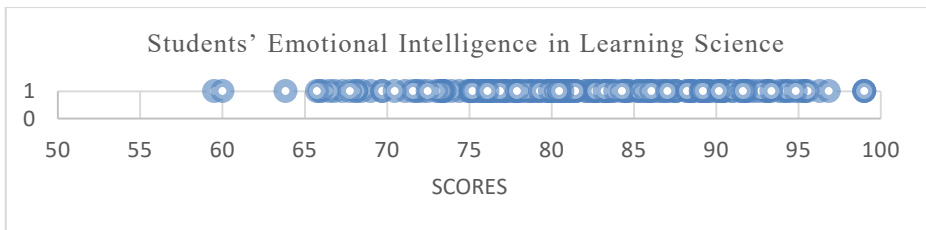
Fig. 2. Students' Emotional Intelligence in Science

3.2   Correlation Test Results

The subsequent analysis and discussion focus on examining the relationship between emotional intelligence and academic achievement in science and mathematics. To measure the strength of this relationship, the Pearson correlation test was employed. This choice was guided by the normal distribution of all the data, as indicated in Table 3 (with skewness values falling between -1 and 1). Additionally, the data demonstrated a linear relationship, as illustrated in Figure 3.
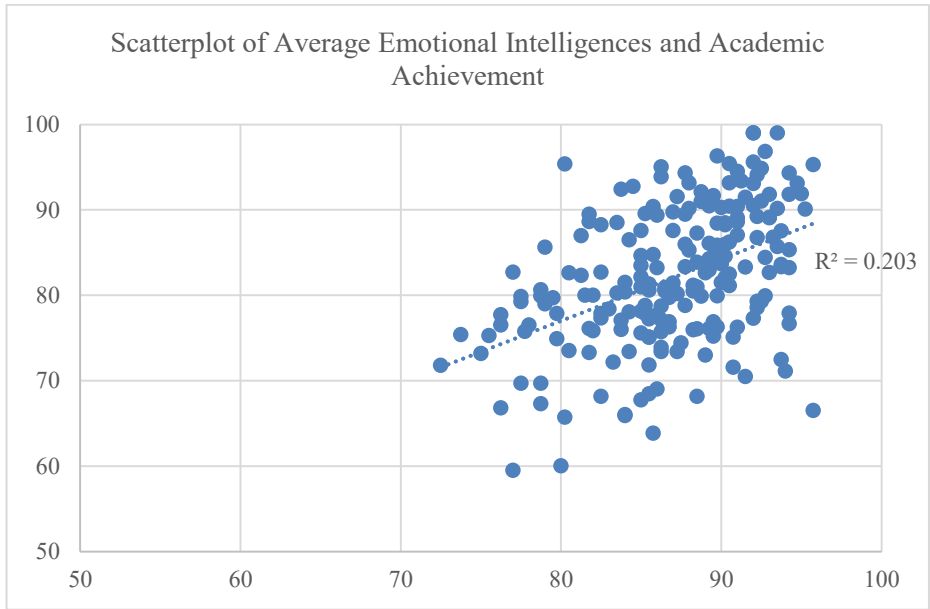

Fig. 3. Scatterplot of Average Emotional Intelligences and Academic Achievement

The outcomes of the parametric correlations between average emotional intelligence scores and academic achievement are presented in Table 9.

Table 9.   Correlations of Average Emotional Intelligences and Achievement

		Average Emotional Intelligence (EI)	Average Achievement Score
Average Emotional Intelligence (EI)	Pearson Correlation	1	0.451**
	Sig. (2-tailed)		0.000
Average Achievement Score	Pearson Correlation	0.451**	1
	Sig. (2-tailed)	0.000	

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

The Pearson correlation coefficient obtained, with a value of $r = 0.451$ and $\rho = 0.000$, falls within the category of "large" or even greater than the usual threshold [20]. This outcome suggests a strong positive correlation between average emotional intelligence and average achievement in science learning. This finding aligns with previous research, which also indicated a significant relationship between emotional intelligence and academic performance, although with a lower Pearson correlation coefficient, $r = 0.140$ and $\rho = 0.039$ [6].

Furthermore, the parametric correlations, assessed through Pearson's Test, for each individual indicator of emotional intelligence (EI) and students' learning achievement scores, as well as their intercorrelations, are presented in Table 10. This table offers a comprehensive view of the specific relationships between each emotional intelligence indicator and academic achievement scores, as well as how these indicators are related to one another.

Table 10. Correlation between emotional intelligence indicators and achievement

		EI1	EI2	EI3	EI4	EI5	Phys	Chem	Bio	Math
EI1	Pearson Correlation	1	0.460*	0.387*	0.382*	0.438*	0.338*	0.400*	0.287*	0.272*
	Sig. (2-tailed)	.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EI2	Pearson Correlation	0.460*	1	0.488*	0.485*	0.570*	0.213*	0.307*	0.256*	0.204*
	Sig. (2-tailed)	0.000	.	0.000	0.000	0.000	0.002	0.000	0.000	0.003
EI3	Pearson Correlation	0.387*	0.488*	1	0.434*	0.442*	0.391*	0.470*	0.350*	0.350*
	Sig. (2-tailed)	0.000	0.000	.	0.000	0.000	0.000	0.000	0.000	0.000
EI4	Pearson Correlation	0.382*	0.485*	0.434*	1	0.491*	0.249*	0.252*	0.241*	0.197*
	Sig. (2-tailed)	0.000	0.000	0.000	.	0.000	0.000	0.000	0.001	0.005
EI5	Pearson Correlation	0.438*	0.570*	0.442*	0.491*	1	0.345*	0.331*	0.329*	0.208*
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	.	0.000	0.000	0.000	0.003
Phys	Pearson Correlation	0.338*	0.213*	0.391*	0.249*	0.345*	1	0.663*	0.529*	0.600*
	Sig. (2-tailed)	0.000	0.002	0.000	0.000	0.000	.	0.000	0.000	0.000
Chem	Pearson Correlation	0.400*	0.307*	0.470*	0.252*	0.331*	0.663*	1	0.755*	0.726*
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	.	0.000	0.000
Bio	Pearson Correlation	0.287*	0.256*	0.350*	0.241*	0.329*	0.529*	0.755*	1	0.651*
	Sig. (2-tailed)	0.000	0.000	0.000	0.001	0.000	0.000	0.000	.	0.000
Math	Pearson Correlation	0.272*	0.204*	0.350*	0.197*	0.208*	0.600*	0.726*	0.651*	1
	Sig. (2-tailed)	0.000	0.003	0.000	0.005	0.003	0.000	0.000	0.000	.

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

In intercorrelation, there are five indicators for emotional intelligence (self-awareness, self-regulation, motivation, empathy, and social skills) and four subjects in science and mathematics achievement scores (physics, chemistry, biology, and mathematics). So we acquired 36 intercorrelations between two indicators or subjects or data. Those intercorrelations consist of 10 intercorrelations among indicators of emotional intelligence (red layer in Tabel 10), 6 intercorrelations among science and mathematics achievement scores (blue layer in Tabel 10), and 20 intercorrelations between every indicators of emotional intelligences and science achievement scores (purple layer in Tabel 10). All 36 intercorrelations were found significant with the Pearson correlation coefficient varied. Note that the Pearson correlation score in the Tabel was shown in duplicate.

All intercorrelation among indicators of emotional intelligence were belong to medium with Pearson correlation from 0.30 to 0.50, except one correlation that was categorized as large ($r = 0.570$) between EI2 and EI5 (self-regulation and social skills). Intercorrelation among indicators of emotional intelligence was rich and deep. Wide description could be address those correlation as previous discussed in emotional intelligences section. Now we will spent a little space for self-regulation and social skills. Self-regulation closely related to self-awareness. Self-awareness is about knowing and self-regulation is about managing self. Self-awareness content develop as understanding about comparison between self-perception and perception of societal or organizational standards, others' expectations, and their own goals and values [12]. Self-awareness and regulation support the development and maintenance of social relationships [13].

All intercorrelation among four subjects in science and mathematics achievement scores were belong to large (with Pearson correlation from 0.50-0.70) and much larger than typical (with Pearson correlation higher than 0.70). This result make sense because Science and Mathematics have closer relationship in their content and process in students mind. Mathematics also more frequenlty found in Physics and Chemistry and Biology. Although make sense, this result worth to explore in greater or specific detail to gain more understanding about each subject in science and their intercorrelations. Especially for Physics, the correlation with other science and mathematics scores belong to large. Students' Chemistry score had correlate in much larger with Biology and Mathematics scores.

The last group of intercorrelation was cross sectional between every indicators of emotional intelligences and academic achievement scores. There are two categorization found in 20 correlations: 10 correlations were categorized as medium and 10 correlations were cateogorized as small.

First, we found that self-awarenes (EI1) have medium strength of correlation with Physics and Chemistry, but categorized as small with Biology and Mathematics. Second, self-regulation (EI2) only have medium correlation with Chemistry. The correlation with the others three were categorized as small. Third, the results showed that motivation (EI3) interestingly have medium strength of correlation with all academic scores. Foutrh, empathy (EI4) have small correlation with all academic scores. Last, social skill (EI5) have medium correlation with all academic score, except for mathematics.

Based on those intercorrelation results, we can infer that motivation is one of the significant factors that affect students' academic achievement. On the other hand,

empathy was shown to have a much less effect on students's academic achievement. These results could be used as a foundation to design learning that facilitates and encourages students' emotional intelligence and learning outcomes such as school-based social and emotional learning programmes [5]. There are some populer approach in learning science that encourage interaction and social skills, such as inquiry (especially guided inquiry) [21], peer instruction [22], puzzle-based learning [23], [24], and game-based learning [25], [26].

4   Conclusion

Emotional intelligence is one of the most important aspect of students in learning science. There are two ability or competency in emotional intelligence framework: personal ability or intrapersoal competency and social ability or interpersonal competency. Personal ability or intrapersoal competency in learning science can help teachers better understand how their students personality. Social ability or interpersonal competency in learning science can help teachers to better understand how students perceive their social environmten. For students, both ability can help learn and understand science better dan understand how science related to issue that can affect people and society.

We realized that the academic achievement data was the final score from teacher's report about student learning. Those data was a combination from some components such as test, assignments, and activity in class. For more accurate data, in the next study we can create and design more reliable test to measure student academic achievement in science. This study about emotional intelligence are also important to explore in greater detail for university students and its correlation with grade-point-average (GPA) or using others valid and reliable test. The study could be expanded to gain more understanding about emotional intelligences based on gender and level of education, then its correlation with literacy (science and mathematics), cognitive understanding, scientific skills (reasoning, problem solving, thinking skills, argumentation, communication, collaboration, and others skills), attitudes, and other competencies (agency in learning, citizenship, and personal qualities).

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