

Analysis of Emotional Intelligence in the Learning Process of Elementary School Students

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Abstract: This study aims to analyze the structure of emotional intelligence among elementary school students using an Exploratory Factor Analysis (EFA) approach. A total of 240 students from grade 4 to grade 6 in some schools the basis of the state in the Cirebon City area was made sample study through stratified random sampling technique, to ensure representation based on level class, type gender, and group age. Instrument measurements used were developed based on the four model branch Mayer-Salovey-Caruso's capabilities, which include aspects perception emotions, management emotions, understanding to emotions, as well as the ability to use emotions in a constructive way. Data analysis was carried out using Partial Least Squares Structural Equation Modeling (PLS-SEM) method, which shows that all over construct own very good validity and reliability, indicated by the factor loading value > 0.70 and Average Variance Extracted (AVE) > 0.50 . The Perceptions of Emotions dimension has the biggest contribution to construct emotional intelligence, while the Ability to Generate is the dimension with the lowest contribution. The findings underscore the need for contextual and accurate instruments to measure emotional intelligence in children as well as support the integration of emotional education into curriculum school bases in a systematic way.

Keywords: Elementary School, Emotional Intelligence, Learning Process.

INTRODUCTION

This study provides a deeper understanding of the structure of emotional intelligence in children at the elementary school level. By involving 240 students from a number of public elementary schools. The sampling technique used is stratified random sampling, which aims to ensure representation based on class level (grade 4 to class 6), type sex as well as age. Selection of 240 participants carried out to fulfill minimum criteria for implementation of exploratory factor analysis, which according to (Ishiwatari et al. 2020) this study succeeded in describing the diversity of emotional and cognitive responses that reflect real conditions in the elementary education environment. The sufficient number of participants allows exploratory factor analysis to be carried out optimally, so that the resulting factor structure has strong statistical validity. The implementation of research at the elementary school level also enriches the literature, which previously focused more on measuring emotional intelligence among adolescents and adults (Mavroveli et al. 2008). These findings reinforce the importance of integrating emotional education in a targeted manner into the elementary

school curriculum, not only as a supporter of academic achievement, but also as a foundation for developing children's social and personal competencies. Therefore, the instrument developed for these children has the potential to be a reference in designing more appropriate interventions by educators and parents.

Intelligence is defined as a person's ability to recognize, understand, and regulate personal emotions and the emotions of others. In the realm of elementary education, this ability plays an important role in supporting the learning process, forming social relationships between students, and influencing how they respond to challenges in the classroom (Denham, Bassett, and Zinsser 2012). However, research that specifically analyzes the structure of emotional intelligence in elementary school children is still relatively minimal. Therefore, this study aims to explore the structure of emotional intelligence in elementary school students using the Exploratory Factor Analysis (EFA) approach, with the hope of identifying the main factors that form children's emotional intelligence. The results of this study are expected to be a reference for teachers and parents in developing appropriate support for children's emotional growth and academic achievement (Tadjuddin et al. 2020).

The concept of emotional intelligence was first introduced by (Extremera, Fernández-berrocal, and Salovey 2014) later expanded as a complex set of social skills distinct from intelligence quotient (IQ). Since then, attention to the concept has increased significantly, marked by its extensive discussion in the popular literature, including in the context of organizations and team dynamics (Martens, Laprade, and Winston 2004) and (Charbonneau and Nicol 2002). However, this surge of interest has also sparked claims that exaggerate the role of emotional intelligence in individual success, while most of these claims are not fully supported by empirical evidence (Marsh et al. 2023) and (Ivcevic and Mayer 2006). One of the most famous claims comes from (Boyatzis, Goleman, and Rhee 2000), who state that IQ only contributes about 10-20% to life success, while the rest is influenced by emotional intelligence. This claim has led to over-interpretation, although research by (KJ Mayer and Salomon 2006).

This study uses the four-pronged ability model of (JD Mayer, Salovey, and Caruso 2006a) as a theoretical framework. This model includes four main components, namely: (1) the ability to recognize emotions, (2) the use of emotions to help the thinking process, (3) understanding emotions, and (4) the ability to manage emotions. This model positions emotional intelligence as a cognitive-affective construct, distinct from personality traits, and allows for scientific measurement. In developmental measurement, emotional intelligence has been studied through various instruments, such as the Emotional Quotient Inventory (Bar-On 2007) and the Multifactor Emotional Intelligence Scale (MEIS). However, some major instruments were created for adult populations and work contexts, and have faced criticism regarding their validity and reliability, especially in measuring emotional intelligence in a pure way (Caruso, Mayer, and Salovey 2002) and (Lorente et al. 2007). On the other hand, this study emphasizes the importance of measuring instruments that are adapted to the needs of children and their environment, taking into account the typical emotional situations faced by elementary school students.

In addition, the expression of emotional intelligence is greatly influenced by social, cultural, and developmental changes. For example, the emotional skills needed in a work environment are certainly different from those needed in an elementary school classroom (Extremera, Fernández-berrocal, and Salovey 2014). (Yang et al. 2017) Therefore, the development of the instrument in this study was specifically designed to reflect children's emotional behavior and responses in the context of education, not based on the general experience of adults. By using an exploratory factor analysis approach, this study not only aims to map the structure of emotional intelligence relevant to elementary school students,

but also to build an empirical foundation for a more valid, contextual, and measurement development tool that can be applied in the world of children's education.

METHOD

This study uses a quantitative approach by applying the Exploratory Factor Analysis (EFA) method to identify the structure of emotional intelligence factors in elementary school students. EFA is used to explore various dimensions that are components of emotional intelligence, based on student responses to the designed instrument items (Liu et al. 2009).

Research Subject

This study involved 240 elementary school students from grades 4 to 6, who came from a number of public schools in the Cirebon city area. Sampling was carried out using stratified random sampling techniques to ensure representation based on grade level, gender, and age (Klassen et al. 2012) Inclusion criteria in this study included students who had obtained written permission from their parents or guardians, and had the ability to understand and follow the instructions for completing the instrument (Yadi 2017).

Research Instruments

The instrument used in this study is an emotional intelligence measuring tool developed based on the four-branch ability model. (JD Mayer, Salovey, and Caruso 2006b) which includes the ability to recognize emotions, use emotions to support the thinking process, understand emotions, and manage emotions. This study uses several aspects and includes several indicators, the first aspect, perception of emotions, management of emotions, understanding emotions, ability to generate. The instrument consists of 15 statements arranged in the form of a 4-point Likert scale, with answer choices ranging from "strongly disagree" to "strongly agree". Content validity is obtained through expert judgment to ensure that the test items reflect the concepts being measured. (Hosany and Prayag 2013) while initial reliability was tested through a limited scale trial before the implementation of the main data collection.

Table 1. Instruments

ASPECTS OF EMOTIONAL INTELLIGENCE	INDICATOR	ITEM NUMBER		AMOUNT QUESTION
		FAVOURABLE	UNFAVORABLE	
Perception of emotions	Awareness of one's own emotions	1.2		2
	Ability to recognize other emotions	3.4		2
	Ability to detect false displays of emotion	5	6	2
Emotional management	Ability to discuss one's own emotions	8	7	2
	Ability to manage other emotions	9	10	2
Understanding emotions	Ability to discuss one's own emotions	11		1
	Ability to detect false displays of emotion	12		1
	Empathetic concern		13	1

Ability to produce	Ability to use our own emotions to facilitate thinking	14	1
	Ability to manage other emotions	15	1
TOTAL			15

In general, there are 15 questions formulated based on indicators from each dimension, including aspects of emotional awareness, managing one's own and others' emotions, detecting false emotional expressions, empathy, and utilizing emotions in cognitive processes.

Data collection

Data collection was carried out in a way directly at school at school with classroom teacher involvement as companion. Before students filled out the questionnaire, they were first given a brief explanation of the purpose of the learning and guidance in answering the instrument (Williams 2020) . The researcher ensured that each student filled out the questionnaire independently, although he still provided assistance if there were terms or statements that were difficult to understand (Mortini 2017) . The filling process took place in a conducive and pleasant class environment for about 30 to 40 minutes to maintain student focus and the accuracy of the data collected.

Data Analysis Techniques

Data from the questionnaire used to measure the emotional intelligence of elementary school students were analyzed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) method with the help of the latest version of SmartPLS software. This method is used to test the accuracy of the measuring instrument (measurement model) and the connection between variables in the structural model. The PLS-SEM method was selected and combined with Exploratory Factor Analysis (EFA) approach because both of them capable describe latent structure of construct intelligence emotional still Not yet fully clear in a way theoretical. In addition, the combination This rated Enough flexible for used in a complex model, although amount the sample relatively limited. Before further analysis is carried out, data quality evaluation is carried out through validity and reliability testing as shown in Table 2.

Table 2. Research Results

	Alpha Cronbach	Reliability composite (rho_a)	Reliability composite (rho_c)	Average variance extracted (AVE)
Ability to Produce	0.795 years	0.795 years	0.907	0.83
Emotional Intelligence	0.97	0.972 years	0.973 years	0.707
Emotion Management	0.875	0.886	0.914	0.728
Emotional Perception	0.946 years	0.947 years	0.957 years	0.786
Understanding Emotions	0.866	0.87	0.918 years	0.789 years

All over AVE values > 0.50 , meaning that each construct has good convergence validity. These indicators are quite representative of the constructs being measured. All constructs meet the reliability criteria because all Cronbach's Alpha and Composite Reliability values are > 0.70 . This shows that the indicators used for each construct are consistent and reliable.

RESULTS AND DISCUSSION

Validity testing aims to evaluate the extent to which indicators are able to represent the intended construct, while reliability is used to assess the level of internal consistency between items in one latent variable. Convergent validity is used to identify the extent to which indicators in one construct have a high relationship or correlation with each other, which is evaluated through the factor loading value and Average Variance Extracted (AVE). All analyses were conducted using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach which is considered appropriate for models involving complex latent constructs and relatively limited sample sizes.

Factor Loading

The instrument used for measuring emotional intelligence consisting of more than 15 statement items has been proven to meet the convergent validity requirements adequately. This is evidenced by all the loading factor values of the items exceeding the minimum threshold of 0.70. In accordance with the criteria put forward by (Retzer and Weckwerth 2021), a loading value ≥ 0.70 indicates that the contribution of each indicator itself is quite large in representing the latent construct being measured. In these findings, item P3 has the highest loading value of 0.925 which reflects the individual's ability to recognize friends' feelings through nonverbal expressions. Conversely, the item with the lowest loading value is P6 with a loading value of 0.859 which assesses the individual's difficulty in distinguishing the expression of a friend's sincerity when asking for help.

Both values are still in the very good category and show the representation of indicators against a stable and consistent construct. Each indicator represents the main dimensions of emotional intelligence, including the ability to recognize emotions (such as P1, P3, and P5), the ability to make decisions and establish social interactions (P2), and aspects of empathy and concern for others (P4, P12, and P13). In addition, aspects of regulation and management of emotions both internal and external social are represented by indicators P7 to P10, as well as P14 and P15.

Table 3. Factor Loading Results

ITEMS	CODE	FACTORS LOADING
I am able to recognize good emotional awareness in both positive and negative situations in the classroom.	P1	.884
I can make decisions and interact well in class.	P2	.851
I can understand my classmates' feelings through their body language.	P3	.925
I empathize when classmates are sick or having difficulty with assignments.	Page 4	.905
I can tell whether my friend's expression is sincere or not when I ask for help.	Page 5	.895
I find it difficult to tell whether my friends are sincere or not when I ask for help.	p.6	.859
I find it difficult to talk about my experiences when I feel very happy or disappointed.	Page 7	.814

I can express my feelings when I'm angry.	p.8	.920
I am able to calm my friends who are angry or upset.	Page 9	.849
I find it difficult to speak in a way that makes others feel valued and.	Page 10	.826
calmer in emotional situations. I am not afraid to express my emotions to others.	Page 11	.861
I can tell when my friends are showing unexpected emotions.	Page 12	.916
according to the situation they are in. I find it difficult to care about other people's feelings.	Page 13	.887
I rarely use my gut feeling to strengthen the way I solve problems.	Page 14	.909
I know what to say or do to ease my friend's tension in an emotional situation,	Page 15	.913

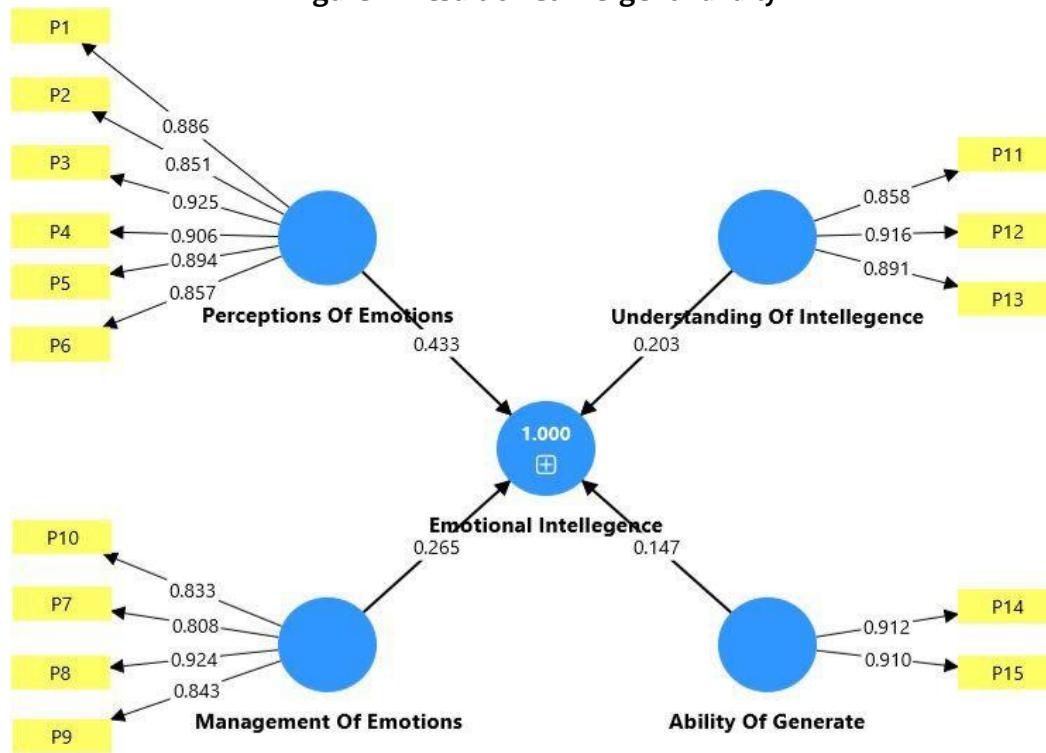
The table serves to present the results of factor loading of each statement item (P1 to P15) on the emotional intelligence measurement instrument. The loading values displayed in the table range from 0.814 to 0.925, this indicates that all items have a significant contribution to its construction. (Retzer and Weckwerth 2021) .

Convergent Validity Test

This model illustrates the relationship between the main construct (Emotional Intelligence) and its four constituent dimensions, namely Emotional Perception, Intelligence Understanding, Emotional Management, and Emotional Arousal Ability. Each dimension is measured through a number of indicators labeled from P1 to P15. The Emotional Perception dimension consists of six indicators (P1 - P6) which show high factor loading values, ranging from 0.851 to 0.925. This reflects that these indicators have good consistency and representative power in describing students' perceptions of emotions. This dimension makes the greatest contribution to the Emotional Intelligence construct, which is 0.433, indicating that perception of emotions is the most dominant aspect in forming emotional intelligence.

This finding is in line with previous research by (JD Mayer and Mayer 2016) which states that emotional perception is an important initial foundation in the overall development process of emotional intelligence. Furthermore, the Emotional Management dimension is measured using four indicators (P7–P10), with loading factor values ranging from 0.808 to 0.924. This dimension contributes 0.265 to Emotional Intelligence, indicating that students' ability to manage emotions plays a significant role in the formation of emotional intelligence. This result is also supported by (Goleman 2004) who emphasized the importance of emotional management in forming adaptive responses to social and interpersonal situations.

Meanwhile, the Intelligence Understanding dimension consisting of only three indicators (P11–P13) has a contribution of 0.203 to the main construct, with loading factors ranging from 0.858 to 0.916. Meanwhile, the Ability to Produce dimension consisting of only two indicators (P14 and P15) shows high loading factor values, namely 0.910 and 0.912. However, its contribution to the Emotional Intelligence construct is relatively small, namely 0.147. This shows that although the indicators in this dimension are individually quite strong, their influence on overall emotional intelligence is not as great as other dimensions. (Retzer and Weckwerth 2021) . This finding is slightly different from the study conducted by (Gualda, Moraleda, and Brackett 2023), which found that the ability to motivate oneself through emotions also plays a major role in improving academic performance and psychological well-being, although in the context of this study its contribution is relatively smaller.

Figure 1. Result Of Convergent Validity

The figure shows the results of the convergent validity test of emotional intelligence constructs with PLS-SEM, which consists of four dimensions: Emotion Perception, Intelligence Understanding, Emotion Management, and Ability to Produce. All indicators (P1–P15) have loadings > 0.7, indicating good convergent validity.

Validity and Reliability Test

The results of the reliability test on the emotional intelligence construct and its four dimensions, namely the Ability to Generate Emotions, Emotion Management, Emotion Perception, and Emotion Understanding. Reliability measurements were carried out using three main indicators, namely Cronbach's Alpha, composite reliability (ρ_A and ρ_C), and average variance extracted (AVE). All constructs have a Cronbach's Alpha value above 0.7, which reflects the level of internal consistency of the instrument in the good category. (Hair et al. 2019). The highest value is shown by the overall Emotional Intelligence construct of 0.970, while the lowest value is in the Emotional Arousal Ability dimension of 0.795 which is still included in the acceptable reliability criteria.

All constructs obtained composite reliability values (ρ_A and ρ_C) above the minimum threshold of 0.7, even most of them marked close to or exceeding the number 0.9. This shows that each indicator in the construct itself has a very strong internal (Ab Hamid, Sami, and Mohmad Sidek 2017). For example, the Emotional Perception construct obtained a ρ_A value of 0.947 and a ρ_C value of 0.957 which indicates a high level of coherence between items. Meanwhile, the AVE value used for the convergent validity test of all constructs has also exceeded the minimum limit of 0.5, indicating that the proportion of variance that can be explained by the indicators in the construct is quite sufficient (Hair et al., 2019).

The highest AVE value was recorded in the Ability to Generate Emotions construct of 0.83, while the lowest value of 0.707 was found in the Emotional Intelligence construct, both of which still reflect good convergent validity. When compared with studies previously indicated existence inconsistency reliability between dimensions intelligence emotional , findings in study This precisely show greater stability and uniformity high at almost all over construct , so that the more strengthen legitimacy developed instruments in context participant educate school base.

Table 4. Results of Reliability and Validity

	Alpha Cronbach	Composite reliability (rho_a)	Reliability composite (rho_c)	Average variance extracted (AVE)
Ability to Produce	0.795 years	0.795 years	0.907	0.830
Emotional Intelligence	0.970	0.972 years	0.973 years	0.707
Emotion Management	0.875	0.886	0.914	0.728
Emotional Perception	0.946 years	0.947 years	0.957 years	0.786
Understanding Emotions	0.866	0.870	0.918 years	0.789 years

The table shows the results of reliability and validity tests. The results of all constructs have met the requirements of reliability and validity. Cronbach's Alpha, Composite Reliability > 0.70 and AVE > 0.50 indicate that the construct is consistent and able to explain the indicator variance well.

Model Fit

The results of the test of the suitability between the structural model and the analyzed data. One of the main indicators used is the Standardized Root Mean Square Residual (SRMR), with a value of 0.082. This value reflects the average standardized difference between the model covariance matrix and the observation data. In the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach, SRMR is seen as an important measure to evaluate the overall model feasibility (goodness-of-fit). Based on the guidelines from (Henseler 2018), an SRMR value below 0.10 indicates that the model has adequate suitability. Therefore, the value obtained is 0.082 indicating that the structural model built has met the statistical feasibility criteria. In addition, the Unweighted Least Squares Discrepancy (d_ULS) value was recorded at 3.14.

This indicator describes the degree of inconsistency between the empirical covariance matrix and the model estimation results. The lower the d_ULS value, the higher the level of model suitability. Although there is no set threshold standard, d_ULS which is often used in bootstrap analysis for evaluation is a model that lies in the error distribution that can occur in an acceptance manner (Hair et al. 2019). Meanwhile, several other indicators such as Geodesic Discrepancy (d_G), Chi-square, and Normed Fit Index (NFI) are not available in the table, indicating that the calculated No values or no provided by the PLS-SEM soft analysis tool are used. This is understandable considering that the PLS approach is more predictive and not entirely based on covariance estimation like the AMOS or LISREL-based SEM approaches (Sarstedt et al. 2016) .

Table 5. Model Fit Results

Saturated model		
SRMR	0.082	0.082
d_UIS	3.14	3.14
d_G	There isn't any	There isn't any
Chi-square	∞	∞
Non-Financial Funds (NFI)	There isn't any	There isn't any

The table serves to show the results of the evaluation of the suitability of the structural model measurement model analyzed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach.

DISCUSSION

The results of the study indicate that the structure of emotional intelligence in elementary school students consists of four main dimensions that are relevant to the developmental stage and educational environment of children. The Emotional Perception dimension is proven to be the most prominent component in forming overall emotional intelligence. This shows that at elementary school age, the ability to recognize and understand emotions, both one's own emotions and those of others, is an important foundation in the formation of social emotional skills. Indicators in this dimension show high loading values, reflecting very strong measurement consistency.

In addition, the dimensions of Emotional Management and Emotional Understanding also have a significant contribution to the construct of emotional intelligence. This shows that students at the elementary school level have begun to show the ability to regulate emotional reactions and understand the dynamics of emotions that arise in social interactions. However, the dimension of the Ability to Generate Emotions, although individually has a high loading value, but provides a relatively small contribution of influence. This is likely due to the level of cognitive maturity that is not yet optimal in elementary school-age students in using emotions to support the process of thinking or solving problems reflectively.

The implications of the results of this study are very important for the world of education, especially in designing a socio-emotional curriculum. The development of instruments that have been proven valid and reliable, and are in accordance with the characteristics of child development, will help teachers and parents in mapping students' emotional needs. Thus, educational interventions can be designed more appropriately to equip children with the skills to manage emotions, establish healthy social relationships, and face academic challenges positively and productively.

CONCLUSION

This study successfully revealed the structural factors of emotional intelligence in elementary school students through the Exploratory Factor Analysis approach. There are four main dimensions that form the construct of emotional intelligence, namely Emotional Perception, Emotional Management, Emotional Understanding, and Emotional Arousal Ability. All dimensions show adequate levels of validity and reliability statistically. The Emotional Perception dimension was found to be the most influential aspect in shaping students' emotional intelligence, while the Emotional Arousal Ability was the dimension with the lowest influence. These findings emphasize the need to develop measurement instruments that are relevant to children's developmental stages and the importance of integrating emotional education into the learning system in elementary schools. With an

empirical evidence based approach, this study provides a foundation for designing adaptive intervention programs that are used to support children's emotional and academic development holistically. Educators can implement these findings through various learning strategies that support the growth of students' emotional aspects, such as implementing post-learning reflections, social simulations or role playing to improve empathy and interpersonal skills, writing emotional journals as a medium for intrapersonal reflection, and relaxation techniques such as breathing exercises to help manage stress. This kind of holistic approach allows the learning process to take place not only cognitively, but also affectively, thus supporting students' emotional development optimally and sustainably.

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