

Research Article

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Author for correspondence:

Tri Murwaningsih

✉ murwaningsih_tri@staff.uns.ac.id

✉ Universitas Sebelas Maret, Surakarta, Indonesia

Cognitive Autonomy Development among Adolescents: A Study of University Students in Indonesia

Tri Murwaningsih^{ID}, Muna Fauziah^{ID}, Hani Febriyanti^{ID}

Abstract

Background/purpose. This research aims to explore each component of the cognitive autonomy of Indonesian students, who are mostly 17 to 20-year-olds.

Materials/methods. Quantitative method with survey types was used in this research. The research sample consisted of 100 first-semester students at the Faculty of Teacher Training and Education, Universitas Sebelas Maret (12 male and 88 female students). The research sample was spread across 20 teacher training and education faculty study programs. The research sample consisted of 100 respondents. Questionnaires were used to collect data. The instrument's validity was tested using product-moment correlation with a score of 0.195 (valid). The instrument's reliability was tested using the Cronbach alpha formula, with a 0.79 (reliable) score. The data was analyzed using descriptive statistics with the Microsoft Excel application.

Results. The research findings show that students' cognitive autonomy was adequate, with an indicator of evaluative thinking obtaining 4.13 (82.54%), voicing opinions at 3.66 (73.20%), decision-making at 3.91 (78.10%), self-assessment at 3.48 (69.60%), and comparative validation at 3.91 (78.20%). The indicator of evaluative thinking becomes the most dominant, while the indicator of self-assessment becomes the lowest indicator. The score acquisition is caused by age, gender, peers, teacher's role, social condition, academic performance, learning environment, learning experience, emotional state, learning motivation, education, and student habituation.

Conclusion. This research concludes that most students have had cognitive autonomy, which is characterized by the possession of all indicators of cognitive autonomy. Future research is recommended to conduct research in early childhood to support the elements of cognitive autonomy appropriately, as well as research that focuses on emotional and behavioral autonomy to observe greater potential.



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1. Introduction

The teenage years become a transitional period from childhood to adulthood. Throughout the teenage years, biological, cognitive, and social changes occur in individuals, especially when individuals want to achieve great autonomy (Hill, 1983). Identity development becomes one of the important developments for the teenage years. The identity development process is shown by an individual's consistent attitudes and needs. The importance of this consistency arises from the involvement of autonomous behavior as a form of one's responsibility. Thus, achieving autonomy and fulfilling basic human needs becomes an important prerequisite for healthy psychosocial development in adolescence (Goyette, 2019). The development of autonomy maintains healthy relationships with others in the surrounding environment (McElhaney et al., 2009). The development of autonomy also allows adolescents to make decisions. This decision allows for a significant influence on their future lives.

Autonomy is one of the topics of psychosocial development related to independence, choice, desire, behavior, emotion, and cognition (Brown & Prinstein, 2011). During adolescence, autonomy is related to exploration triggered by adolescents' cognitive abilities and often takes the form of testing the limits of oneself and the social environment (Dutra-Thomé et al., 2019). The updates of adolescents' autonomy consist of increased self-confidence, which is shown by the emergence of differences in arguments from dominant figures (parents), personal experiences, and the formation of abilities to regulate behavior, direct goals, and make their own decisions according to personal experience without any encouragement from parents or adults around them (Yeh et al., 2007). On the other hand, adolescents have tried to become distinctly autonomous. This can be seen from the adolescents' ability to compare parents' opinions with other opinions (friends, teachers, or even themselves) and take action without having to inform their parents of their whereabouts.

Adolescent autonomy can be seen from the way adolescents act, feel, and think autonomously (behavioral, emotional, and cognitive) (Beckert, 2007). These aspects are interconnected reciprocally and interactively. When viewed from the development period, individuals experience affective autonomy in childhood, emotional autonomy in early adolescence, and cognitive autonomy in late adolescence. Thus, autonomy develops from the individual's behavior, emotions, and cognition. Therefore, if a person has independent behavior in childhood, it can be ascertained that they will be more independent in terms of emotions and cognition in adolescence (Beckert, 2005). These three aspects are very important to form autonomy during adolescence.

However, the practices that occur are different from what they should be. Adolescents' decisions to enroll in college are not always based on their cognitive autonomy, especially regarding their career prospects. Their choices are often based on perceptions of the difficulties of college life, parental influence, and the choices of the majority of their peers (Bednar & Fisher, 2002). Few adolescents investigate in advance about the choice of majors at the desired university. Furthermore, adolescents often engage in risky behaviors that cause disappointment in the social environment (Okpych & Courtney, 2019). Adolescents often show unrealistic behavior and are not accustomed to the limitations associated with their cognitive development. On the other hand, adolescents often interpret autonomy as defiance by engaging in activities without involving parents, especially those who violate the rules and expectations of authority figures.

This condition shows the importance of the existence of adolescent autonomy in controlling riskier things. Previous researchers have emphasized research on autonomy in adolescents. Benlahcene et al. (2020) highlighted the increase in autonomy factors according to adolescent age. In addition, Michael and Attias (2016) investigated autonomy in deaf adolescents. Another research highlighted the design and validation process of the autonomy scale (Bernal Romero et al., 2020). Lee et al. (2010) investigated the relationship between cultural values, collectivism, and transitions with

adolescent autonomy. Research that highlights autonomy has been carried out in developed countries, such as America, Taiwan, and Malaysia (Beckert et al., 2012; Benlahcene et al., 2020).

Although there are many studies on autonomy, they still focus on behavioral and emotional autonomy. Research on cognitive autonomy has not been widely explored (Beckert, 2018). Research related to adolescent cognitive autonomy is a complex problem so understanding related to cognitive autonomy is significant to be studied. Cognitive autonomy is important for adolescents in choosing majors for future career achievement and is useful for developing student independence, especially in problem-solving and assessing their future (Beckert, 2005).

Cognitive autonomy includes the ability to think independently and come up with meaningful moral opinions. The development of cognitive autonomy includes the ability to think evaluatively, interpret abstract thoughts, think rationally, develop values, and evaluate and predict risks after choices or decisions are determined. Meanwhile, Beckert (2007) examines cognitive autonomy into several specific components, such as evaluative thinking, voicing opinions, making decisions, utilizing comparative validation, and self-assessment. Based on the description above, this research aims to explore each component of the cognitive autonomy of Indonesian students who are mostly 17 to 20 years old. This study attempts to answer the research questions, namely how is the cognitive autonomy of Indonesian students who are mostly aged 17 to 20 years in the aspects of evaluative thinking, voicing opinions, decision making, self-assessment, and validation comparative?

2. Literature Review

In simple terms, autonomy is defined as regulating, thinking, feeling, and acting according to one's wishes (Bernal Romero et al., 2020; Fang, 2020). Autonomy is related to an individual's capacity to carry out everything independently (Beckert et al., 2012; Winch, 2021). This term is applied interchangeably with independence. However, in the context of adolescents, this term is interpreted differently. Meanwhile, the development of independence is part of autonomy in adolescence. Autonomy consists of behavioral, emotional, and cognitive components. Behavioral autonomy relates to how to act independently. Emotional autonomy relates to reducing the individual's emotional dependence on parents (Beyers et al., 2025; McElhaney et al., 2009). Meanwhile, cognitive autonomy relates to the ability to rely on oneself without any social validation (Brown & Prinstein, 2011; Marantika, 2021). These three components are very crucial in individual development from adolescence to adulthood. The process is passed throughout the individual's development. This research focuses on the cognitive autonomy component as an autonomy that has been less considered in recent studies.

Cognitive autonomy takes a long time to mature. The existence of cognitive autonomy influences the socio-cultural world. Individuals must become active and creative in their discoveries (Gilson, 2024; Thompson, 2006). Their decisions are taken from the values that are considered, not just accepting the standards of others or the flow that is adhered to (Ganzel, 1999; Newell et al., 2022). Cognitive autonomy is the ability to review one's thinking (evaluative thinking), express opinions, make decisions, evaluate oneself, and make comparative validations (Beckert, 2007; Deniz, 2023).

Evaluative thinking is the ability to evaluate an individual's way of thinking to logically conclude results (Cole, 2023; Miller & Byrnes, 2001). In addition, evaluative thinking is also characterized by the ability to set goals, as well as evaluate the positive and negative impacts of the choices determined (Archibald, 2024). This thinking produces rational decisions and encourages critical thinking in considering and assessing opinions (Nippold et al., 2020). This ability considers the negative and positive aspects of the opportunities created to achieve the goals set, plays the role of an objective critic, and reflects the results as a form of the decision-making process. Other scholars reflect on evaluative thinking as a way to balance the theory and practice of teaching (Archibald, 2021). Evaluative thinking embeds the principles and practices of adult education. It helps learners

hone their evaluation potential for social justice and equips students for ongoing professional development. The process of evaluative thinking helps them become lifelong learners of evaluation.

Voicing an opinion is defined as the ability to express personal ideas, clarify desires, and clarify beliefs and opinions (Reed & Spicer, 2003). The ability to voice an opinion is an inseparable part of realizing maturity, social and emotional intelligence, and competence. This ability requires effort to clarify one's desires in depth. Voicing opinion is a person's ability to convey ideas or thoughts verbally, logically, voluntarily, and with appropriate language. Previous findings prove that the ability to express opinions affects optimal student learning outcomes (Matulessy & Hikmah, 2022). This ability shows his/her thinking ability.

Decision-making is the ability to make decisions and consider alternatives and their results (Alzoubi & Aziz, 2021). Other characteristics are assessing probabilities, thinking analytically, and considering abstract ideas from their own experiences (Zimmerman, 2000). Every human being needs to be aware of other alternatives before making a decision. This will be related to their behavior. According to previous research, awareness of choices helps individuals think more broadly than taking behavior quickly (Orakcı, 2021). This method helps create solutions on certain subjects. Furthermore, awareness before deciding on behavior will find the right choice. Another concept underlines that student will not be separated from their way of making decisions in the learning process. In the learning process, students are not containers for information, but they are people who decide information from what they learn and process independently. Other studies only discuss decision-making with a conceptual approach (Morelli et al., 2022).

Self-assessment is defined as the ability to assess oneself and reflect on oneself (Peetsma et al., 2005). Self-assessment is also related to evaluating the process of actions and explaining the reasons for the actions taken (Kumar et al., 2023). Furthermore, this component also leads to evaluating the success that has been achieved after actions are taken, both in terms of strengths, talents, limitations, and others (Beckert, 2007). According to previous researchers, self-assessment is intended to optimize the quality of learning through active student involvement (Vasileiadou & Karadimitriou, 2021). With self-assessment, students' ways of approaching the learning process will be seen. This is useful for providing educators with information about each student's needs. In addition, self-assessment should not be oriented towards knowledge but rather towards active participation and social interaction of students during learning. Other studies only discuss systematic reviews of students' perceptions of self-assessment in terms of usefulness and the factors that influence it (Yan, Panadero, et al., 2023).

Comparative validation is defined as the ability to use comparisons to validate decisions (Bednar & Fisher, 2002). Comparative validity shows the number of people who influence adolescents about their thinking. This process demonstrates the need to reject unwanted pressure from the social environment. Simultaneously, individuals will be aware of the importance of comparative validation regarding the consequences of decisions made by others they trust (Bjønness et al., 2020; Collibee et al., 2016). Previous studies analyzed the topic of comparative validation as a research instrument (Taylor-Rowan et al., 2022). However, it was more used as a research method than as a discussion theme (Beasley et al., 2021). The description of comparative validation as part of cognitive autonomy is rarely done by previous researchers.

When researchers explore cognitive autonomy, there has been no research that explores each component of cognitive autonomy in adolescents or college students. Previous researchers' habits have focused more on conceptual research on cognitive autonomy or comparing cognitive autonomy from two countries (Barbosa & Wagner, 2013; Beckert et al., 2012; Morelli et al., 2022). Other studies that discuss the components of cognitive autonomy are discussed separately (not under the auspices of cognitive autonomy). Conceptual research and literature reviews are more often used to discuss

similar topics. This research gap needs to be filled by conducting research on a different focus. Limited information on the components of cognitive autonomy has a major impact, such as educators being less than optimal in targeting each component of cognitive autonomy in students. Knowing each component of cognitive autonomy can be useful for teachers in optimizing students' cognitive autonomy. In addition, this information can also affect students' behavior and emotional autonomy. Therefore, the components of cognitive autonomy are considered the main topic of this study. This study selected a sample of prospective teachers to explore each component of students' cognitive autonomy, most of whom were aged 17 to 20 years, especially students in Indonesia.

3. Methodology

3.1. Research Designs

This research is quantitative. This method is known as the positivistic method because it is based on the philosophy of positivism (Gower & Shanks, 2014). This method adheres to scientific rules that are empirical, objective, measurable, rational, and systematic. A quantitative approach was chosen because this research is aimed at obtaining information about the results of theory testing by measuring research variables in the form of numbers and analyzing them in statistical procedures. The design used is a survey. Survey design/survey method is an investigation conducted to obtain available phenomena and seek factual information about a group's information (Sayeed, 2015). The approach used is a cross-sectional survey. This approach is defined as a momentary or one-time tracking and is not accompanied by treatment to the respondent. Respondents were only observed once and measurements were made of subject variables during the examination.

3.2. Research Participants

The population of this research was all students of the Faculty of Teacher Training and Education, Universitas Sebelas Maret. The sampling technique was random sampling. The subjects of this research were 100 students from various study programs, the Faculty of Teacher Training and Education, Universitas Sebelas Maret, Batch 2024. Respondents were divided into 12 male students and 88 female students. The distribution of study programs designated as respondents in this study is listed in Table 1.

Table 1. Distribution of research respondent study programs

Number	Study Program	Number
1	Sociology Anthropology Education	3
2	Javanese Language Education	6
3	Mathematics Education	8
4	History Education	10
5	Biology Education	3
6	Accounting Education	5
7	Geography Education	2
8	Office Administration Education	35
9	Special Education	2
10	Fine Arts Education	2
11	Chemistry Education	2
12	Primary Teacher Education Surakarta	3
13	Education Technology	2
14	Building Engineering Education	2
15	Economic Education	7
16	English Language Education	2
17	Preschool	1
18	Chemistry Education	3
19	Information and Computer Technology Education	1
20	Guidance and Counseling	1

3.3. Data Collection Technique

This research used a questionnaire technique for data collection. The questionnaire is a data collection technique that is carried out by giving a set of statements or written questions to respondents to answer (Sayeed, 2015). This method is believed to be able to answer problems more objectively and accurately than the problems obtained from respondents. The instrument used is a questionnaire sheet containing several statements that match the indicators of the research variables. According to Beckert, the questionnaire contains five indicators of adolescent cognitive development. These indicators are evaluative thinking (seven statements), voicing opinions (five statements), decision making (six statements), self-assessment (three statements), and comparative validation (five statements) (Beckert, 2007).

The instrument was distributed via Google Form. There were 26 statements in the questionnaire. The scoring rubric uses a Likert scale. Likert scale is used to measure a person's agreement or disagreement with the object it is composed of. The questionnaire statements are arranged using a Likert scale. Each statement is given a score, namely SS / Strongly Agree = 5, S / Agree = 4, R / Undecided = 3, KS / Disagree = 2, and TS / Disagree = 1. The negative statement is given the opposite score.

3.4. Data Validity Technique

The instrument is validated first. The validation in question is content validation agreed upon by the validator or expert. The validation calculation uses the product moment correlation formula. The validation test is said to be valid if the validity test count value is more than the r table. In this research, the value of r table is 0.195 with a significance value of 0.05. The results of the validation of all instruments were declared valid. The complete results are presented in Table 2.

Table 2. Validity test using Microsoft Excel

Number	Validity	R Table	Decision
1	0,385	0,195	Valid
2	0,39	0,195	Valid
3	0,575	0,195	Valid
4	0,546	0,195	Valid
5	0,553	0,195	Valid
6	0,549	0,195	Valid
7	0,632	0,195	Valid
8	0,524	0,195	Valid
9	0,376	0,195	Valid
10	0,398	0,195	Valid
11	0,393	0,195	Valid
12	0,195	0,195	Valid
13	0,611	0,195	Valid
14	0,423	0,195	Valid
15	0,389	0,195	Valid
16	0,473	0,195	Valid
17	0,345	0,195	Valid
18	0,205	0,195	Valid
19	0,313	0,195	Valid
20	0,288	0,195	Valid
21	0,275	0,195	Valid
22	0,412	0,195	Valid
23	0,35	0,195	Valid
24	0,401	0,195	Valid
25	0,446	0,195	Valid
26	0,382	0,195	Valid

Then, the reliability test was carried out to test the fixity of the research instrument. The reliability test used Cohen's Kappa. Data is said to be reliable if the reliability coefficient value is more

than 0.60. The reliability test results reached a coefficient value of 0.79 or between 0.60 to 0.80. This means that the research instrument has a high degree of reliability. The criteria for the provision of the reliability coefficient as in Table 3.

Table 3. Reliability coefficients classifications

Number	Reliability Number	Interpretation
1	$0,80 < r_{11} \leq 1,00$	Very High Reliability Degree
2	$0,60 < r_{11} \leq 0,80$	High Reliability Degree
3	$0,40 < r_{11} \leq 0,60$	Sufficient Reliability Degree
4	$0,20 < r_{11} \leq 0,40$	Low Reliability Degree
5	$0,00 < r_{11} \leq 0,20$	Very Low Reliability Degree

3.5. Data Analysis Technique

The data collected is quantitative. The data was processed using a descriptive analysis technique. That is, the questionnaire data on adolescent cognitive development (students of the Faculty of Teacher Training and Education, Universitas Sebelas Maret) was obtained in the form of numbers in the research. Then, a descriptive analysis was carried out from the scores obtained in the research. In the calculation of quantitative data, researchers used the help of the Microsoft Excel program (to calculate validity, reliability, average, and other needs). The formula used to calculate the percentage of respondents in certain categories is based on the interval class of research data for each aspect. The formula is as follows:

$$P = \frac{f}{n} \times 100$$

Description:

P = percentage

F = frequency sought

N = total number of frequencies

Grouping according to categories, minimum and maximum scores were determined first, then, the mean and standard deviation were determined. Data were presented in the form of frequency tables and histograms. Data were also made in the form of categorization. The categorization is arranged in the form of five categories, namely very high, high, medium, low, and very low. The categorization process uses the Norm Reference Benchmark (NRB) to categorize student scores. The level of the category is adjusted to the indicators tested through categories adapted from Azwar (Azwar, 2016).

Table 4. Assessment Categorization Guidelines

Percentage Level	Assessment Category
$X > (Mi + 1,5 SDi)$	Very High
$(Mi + 0,5 SDi) < X \leq ((Mi + 1,5 SDi)$	High
$(Mi - 0,5 SDi) < X \leq ((Mi + 0,5 SDi)$	Medium
$(Mi - 1,5 SDi) < X \leq (Mi - 0,5 SDi)$	Low
$X \leq (Mi - 1,5 SDi)$	Very Low

4. Results

This research describes the cognitive autonomy of adults. Cognitive autonomy refers to the ability of adolescents to think independently and decide for themselves according to their reasoning without relying on parental assistance. Specifically, it is addressed to students in college who are studying in the first semester. The development of adult cognitive autonomy was initiated by Beckert. According to Beckert, adult cognitive autonomy is divided into five indicators, namely evaluative thinking, voicing opinions, decision making, self-assessment, and comparative validation. The research findings will be described based on these five indicators. Table 5 contains data on the results of the statistical score of the student cognitive autonomy questionnaire.

Table 5. Score statistics of student cognitive autonomy

Statistics	Score
Sample Size	100
Maximum Ideal Score	130
Minimum Ideal Score	0
Average	101
Standard Deviation	7,70
Variance	59,95

Table 5 shows that the cognitive autonomy of students obtained standard deviations and variances that are categorized as moderate. Then, to determine the level of cognitive autonomy of students in completing lectures. Table 6 presents the frequency distribution of students' cognitive autonomy in completing lectures.

Table 6. Categorization frequency distribution of student cognitive autonomy indicator

Conditions	Categories	Number of Students	Percentage
> 112	Very High	5	5%
104-112	High	17	17%
97-103	Medium	53	53%
89-96	Low	23	23%
< 89	Very Low	2	2%

Table 6 shows the data obtained that the cognitive autonomy of students is dominated by moderate category with a score range of 97 to 103. This calculation is based on the score of cognitive autonomy of students. The frequency of the most dominant score is caused by several factors, such as cognitive autonomy indicator factors and external factors of students. The scoring category was further analyzed about the average value and percentage of each indicator. This analysis was conducted to describe the strength of the indicators of cognitive autonomy of students. Comparison of each indicator according to the results of data analysis and visualized in Table 7.

Table 7. Percentage of students' cognitive autonomy on each indicator

Indicators	Average Value	Percentage (%)
Evaluative Thinking	4,13	82,54
Voicing Opinions	3,66	73,20
Decision Making	3,91	78,10
Self-Assessment	3,48	69,60
Comparative Validation	3,91	78,20

Table 7 shows the profile of student cognitive autonomy is dominated by evaluative thinking. This indicator obtained the highest average value compared to the others. The lowest average value is obtained on the indicator of voicing opinions with a percentage value at 75%. A complete explanation of the factors of each indicator is presented in the following sub-sections.

Evaluative Thinking

Evaluative thinking is related to how to foster independent thinking. This becomes a form of developing self-confidence in forming and expressing your thoughts and ideas. These findings explain the statistical score calculations of the evaluative thinking indicator, which are quite adequate. More complete information is presented in Table 8.

Table 8. Indicator score statistics of student evaluative thinking

Statistics	Score
Sample Size	100
Maximum Ideal Score	35
Minimum Ideal Score	0
Average	28,89
Standard Deviation	3,14
Variance	9,97

Table 8 is statistical information on evaluative thinking indicators in terms of mean, standard deviation, and variance. This indicator only presents seven statements, so the maximum score is only 35. From the maximum score of 35, the data obtained reached a score of 28. This score has reached more than half of the students. This condition shows that evaluative thinking has been owned by most students. To find more rigid information about the frequency of scores for each indicator, the scores with intervals for each indicator were analyzed. More complete information is presented in Table 9.

Table 9. Categorization frequency distribution of student evaluative thinking indicator

Conditions	Categories	Number of Students	Percentage (%)
> 34	Very High	3	3
30-34	High	36	36
27-29	Medium	40	40
24-26	Low	15	15
< 24	Very Low	6	6

Table 9 shows that students have been able to think evaluatively, the majority of which are in the medium category. The information in Table 7 illustrates that students' evaluative thinking varies. Even so, some students also have high evaluative thinking. On the other hand, some students have not maximized their evaluative thinking. When viewed from each statement, the evaluative thinking indicator is described by the way students analyze a decision from various points of view and the consequences that will be received next.

From the seven statements, this indicator excels in terms of thinking about the consequences of a decision, with an average score of 4.3 out of a maximum score of 5. However, students have not maximized in considering alternatives before making decisions or evaluating their thoughts. If other alternatives are less of a concern for students in making decisions, then their mental health will be targeted as a result of the failure that students may experience. However, students have thought about the impact of their actions on others, both long and short term. When described in detail on each statement, the results are as in Figure 1.

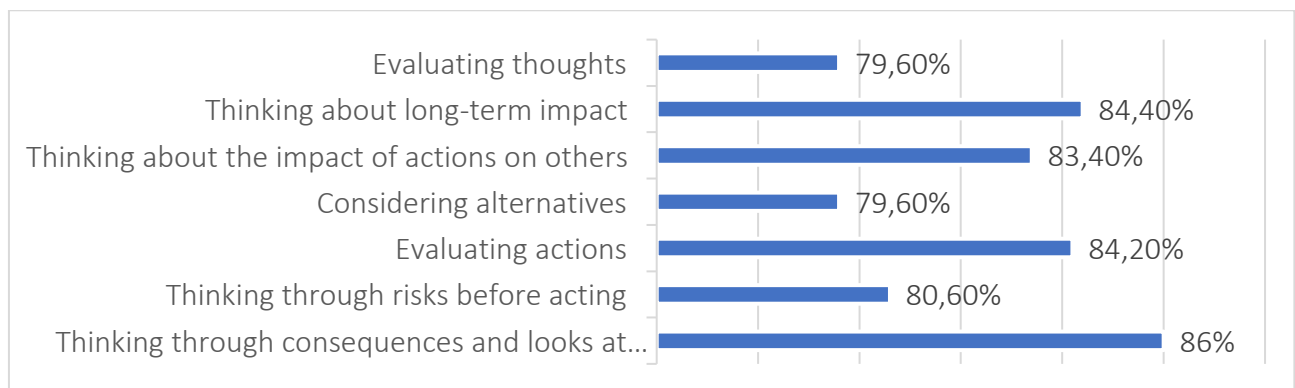


Figure 1. Percentage of each statement on the evaluative thinking indicator

Based on the data on evaluative thinking, it can be concluded that most students can think evaluatively with the majority of the moderate category and have a percentage of 82.54%. This ability is characterized by their ability to: 1) think about the consequences of decisions taken, 2) see every situation from another person's point of view, 3) think about all possible risks before acting, 4) evaluate daily actions, 5) consider various alternatives before making decisions, 6) think about the impact of actions taken on others, 7) think about the impact of actions in the long term, and 8) able to evaluate their thoughts. These markers are dominated by the ability to think about the consequences of decisions made by students, but weak in the ability to consider various alternatives before making decisions, and evaluate thoughts.

Voicing Opinions

The second indicator is voicing opinions. Cognitive autonomy is also related to voicing opinions. Voicing an opinion is individual freedom in conveying ideas without fear. Voicing opinions uses language well, precisely, logically, and creatively. In this research, the indicator of voicing opinions is also calculated based on statistical scores. The complete results are presented in Table 10.

Table 10. Indicator score statistics of voicing student opinions

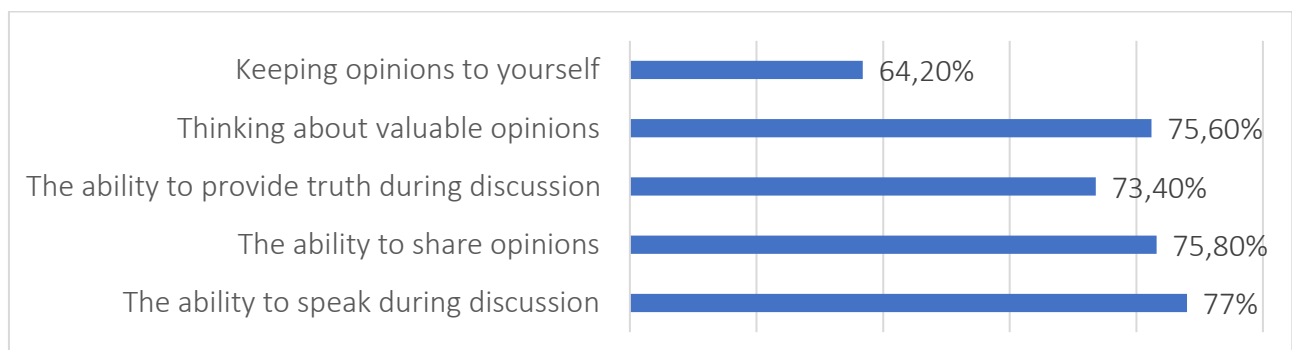
Statistics	Score
Sample Size	100
Maximum Ideal Score	25
Minimum Ideal Score	0
Average	18,3
Standard Deviation	2,27
Variance	5,28

Table 10 shows that the maximum ideal score for the indicator of voicing opinions ranges from 25. The score has an average value of 18.3. This means that most students can voice opinions. The ability of students is dominated by the high category. The category is obtained from the calculation of the categorization frequency distribution of students voicing opinions indicator. The complete data is as in Table 11.

Table 11. Categorization frequency distribution of student voicing opinion indicator

Conditions	Categories	Number of Students	Percentage (%)
> 22	Very High	2	2
19-22	High	48	48
17-18	Medium	30	30
15-16	Low	14	14
< 15	Very Low	6	6

Table 11 illustrates that the score of voicing students' opinions is dominated by the high category. A total of 48 students scored in the high category. Some other students scored in the medium category. When viewed from each statement item on the indicator of voicing opinions, the first statement (related to the ability to speak during discussions) is the most superior compared to other statements. Meanwhile, there are still students who have not dared to express their opinions and choose to keep their opinions to themselves. The percentage results of each statement are illustrated in Figure 2.

**Figure 2.** Percentage of each statement on the indicator of voicing opinions

Based on the data above, it can be concluded that most students have been able to voice opinions in a high category with an average percentage of 73.20%. This ability is superior in terms of

courage to speak during discussions, various views, defending the truth, and thinking of valuable opinions. However, students sometimes still keep their opinions to themselves

Decision Making

The third indicator relates to decision-making. Cognitive autonomy is very influential in the way an adolescent makes choices or decisions according to their reasoning abilities. This independence is influenced by various perspectives and consideration of pros and cons so that they reflect their own beliefs. When they are confident in their abilities, they will be able to take initiative and responsibility for their actions. Information about student decision-making was obtained from distributing questionnaires to students. Complete data regarding statistical scores on student decision-making indicators as in Table 12.

Table 12. Indicator score statistics of student decision making

Statistics	Score
Sample Size	100
Maximum Ideal Score	30
Minimum Ideal Score	0
Average	23,43
Standard Deviation	2,16
Variance	4,65

Table 12 shows that the average score obtained by students has reached a score of 23.43 out of a total score of 30. The score has passed the middle limit of the score in general or half of the total score. In addition to looking for statistical scores, this research also calculated the categorization frequency distribution of students' decision making indicator. The data are presented in Table 13.

Table 13. Categorization frequency distribution of student decision making indicator

Conditions	Categories	Number of Students	Percentage (%)
> 27	Very High	3	3
25-27	High	22	22
22-24	Medium	61	61
20-21	Low	11	11
< 20	Very Low	3	3

Table 13 shows that students already have decision-making skills, with the majority in the moderate category. 61 students master this ability. The information in the table is important data in the process of practicing student decision-making. There are six statement items on the decision-making indicator. From the six items, the majority of students have understood the consequences of the decisions they choose. In addition, the increasing age of students also increases their thinking ability, especially in thinking about the future. Unfortunately, there are still students who feel that the decisions they make are better than their other colleagues. The nature of dominance in friendship is still owned by students. To be clearer, it can be seen in Figure 3.

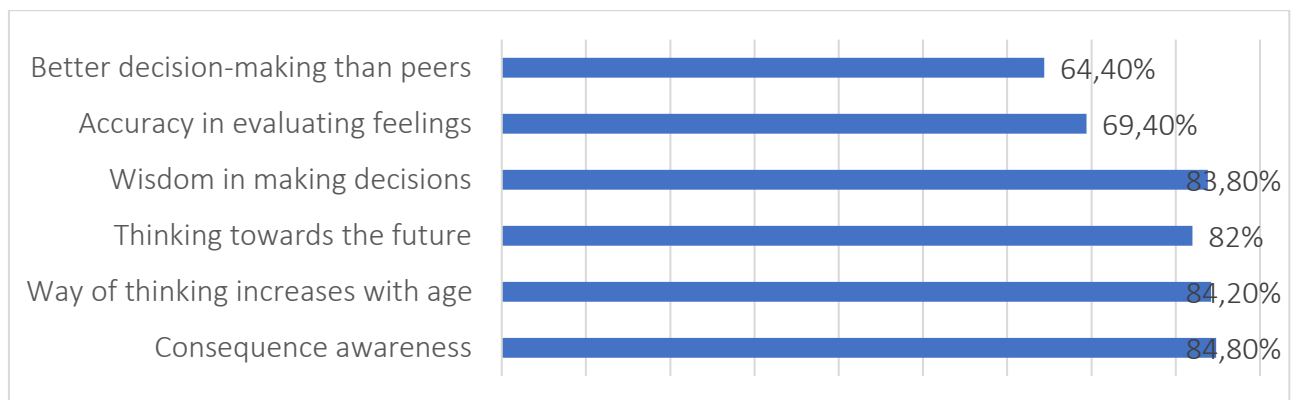


Figure 3. Percentage of each statement on the decision-making indicator

Based on the data above, it can be concluded that most students have been able to make decisions in the moderate category and obtained an average percentage of 78.10%. The data is characterized by excellence in terms of: 1) knowing the consequences of their decisions, 2) having a better way of thinking as they get older, 3) having distant thoughts about the future, and 4) having the ability to make wise decisions. However, there is still a need for improvement in terms of the ability to evaluate their feelings and the assumption that they are better than their peers in making decisions.

Self-Assessment

Self-assessment becomes part of self-reflection. It becomes an important practice in cognitive autonomy. Assessing oneself relates to taking the time to examine one's feelings, thoughts, and actions. Research data on self-assessment was obtained from distributing questionnaires. The results of the questionnaire in this research are presented in Table 14.

Table 14. Indicator score statistics of student self-assessment

Statistics	Score
Sample Size	100
Maximum Ideal Score	15
Minimum Ideal Score	0
Average	10,44
Standard Deviation	1,75
Variance	3,06

Table 14 illustrates that most students cannot assess themselves optimally. This category is based on the average score (see table 5) which only obtained 69.60%. The complete results of each category of students' self-assessment skills are presented in Table 15.

Table 15. Categorization frequency distribution of student self-assessment indicator

Conditions	Categories	Number of Students	Percentage (%)
> 14	Very High	2	2
12-14	High	28	28
10-11	Medium	21	21
8-10	Low	45	45
< 8	Very Low	4	4

Table 15 illustrates that most students cannot assess themselves. The most dominant category is the low category, which is owned by 45 students. Although the low category is the most dominant, more than 20 students obtain other categories (see high and medium categories). This data shows that some students have not been able to assess themselves or reflect on themselves. Self-reflection is an important activity for improving oneself.

If examined on each statement item, the indicator of assessing oneself is dominated by the ability to identify one's strengths. Unfortunately, only some students recognize themselves. Some students still feel that they are not the best judge of their talents. Also, there is an assumption from students that they are not the only ones who can identify their abilities. This indicates that students lack self-confidence. It is implied that students do not recognize themselves. The full data is presented in Figure 4.

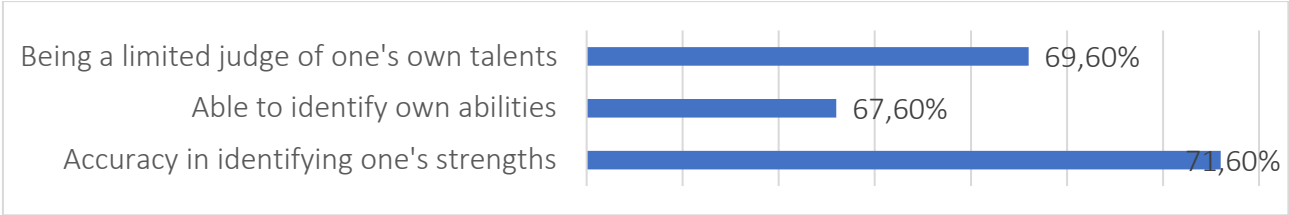


Figure 4. Percentage of each statement on the self-assessment indicator

Based on the description above, it can be concluded that students are not maximized in assessing themselves because they only get 69.60% of the total 100%. This ability is characterized by the inability of students to identify their abilities and talents. This indicates that students still rely on others as self-assessors. It is we who know very well about our condition.

Comparative Validation

The following indicator is comparative validation. Comparative validation relates to a person's ability to gauge themselves on their need for their own decisions. That is, someone feels the need of validation from others regarding their views or decisions. This indicator is measured using a questionnaire. The result of the questionnaire distribution obtained quite good findings. The complete data is presented in Table 16.

Table 16. Indicator score statistics of student comparative validity

Statistics	Score
Sample Size	100
Maximum Ideal Score	25
Minimum Ideal Score	0
Average	19,55
Standard Deviation	2,23
Variance	4,99

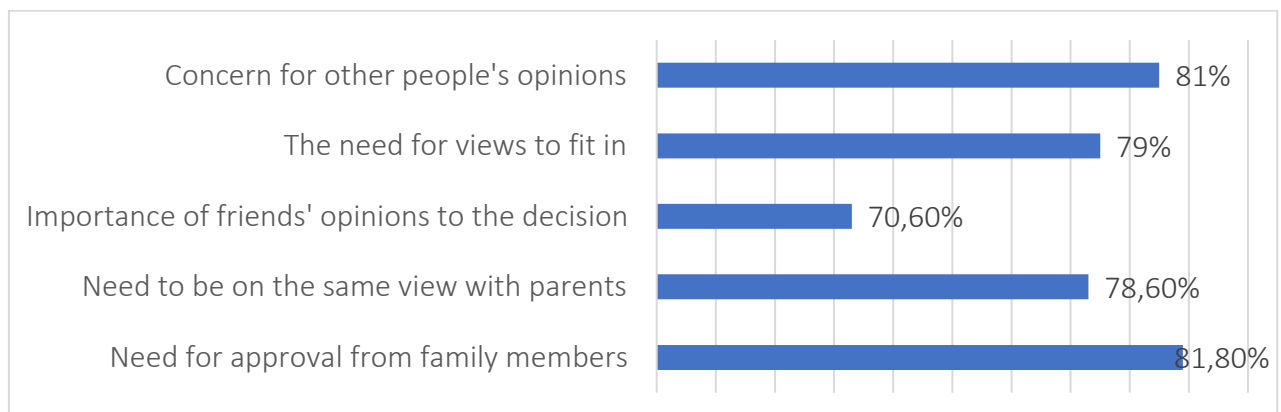
Table 16 illustrates information that students have a good skill of comparative validation competencies. In simple terms, most of the students (78.20%) felt that they need views of others on their decisions and expected others to care about them. These statistics are then being examined more deeply about the frequency of a number of the most dominant students. The complete data is presented in Table 17.

Table 17. Categorization frequency distribution of student comparative validity indicator

Conditions	Categories	Number of Students	Percentage (%)
> 23	Very High	3	3
21-23	High	20	20
18-20	Medium	58	58
16-17	Low	17	17
< 16	Very Low	2	2

Table 17 illustrates that most of the students already have comparative validity competencies. This is marked by the need of family members who accept their decision, the need of the same view with their parents and friends, or the need of care from others to themselves. A total of 58 students are in the medium category related to comparative validity competencies. 23 students are in high and very high categories, while 19 students are in lower categories (low and very low).

If examined from each statement, this indicator has an excellence in the feel of needing family members on decision making and the concern of others' opinion to the students. The percentage obtained from those two statements is greater than 80%. While the other three questions obtained below 80%. Unfortunately, friends' opinions are not a priority in students' decision making. The full data is presented in Figure 5.

**Figure 5.** Percentage of each statement on the comparative validation indicator

Based on the description above, it can be concluded that most students have the ability of comparative validity with an average percentage score of 78.20%. The most dominant statement items are the need for family members to approve student decisions and a sense of caring about other people's opinions of students. Meanwhile, students do not consider the importance of friends' approval of the decisions made by students.

5. Discussion

Evaluative Thinking

This research shows that most students already have evaluative thinking skills with the majority of moderate categories. This ability is shown by having the ability to think about the consequences of decisions taken, view each situation from various points of view, think about all possible risks before acting, evaluate daily actions, consider various alternatives before making decisions, think about the impact that others will feel for the actions taken, think about the long-term impact of the actions taken, and evaluate their thoughts. Evaluative thinking is dominated by the ability to think

about the consequences of decisions made by students, but not maximizing the ability to consider various alternatives before making decisions, and evaluating their thoughts.

This condition is caused by many things, such as the habituation of lectures conducted by students. Habituation of evaluative thinking is very good for developing students' abilities. Project-based activities have become a habit of students during lectures. In the project, students will do many activities that require critical and evaluative reasoning. According to previous research, project-based learning affects students' evaluative thinking skills (Pan et al., 2021). The continuous lecture process shapes students to think critically by assessing the good and bad of information. During this evaluative thinking process, students can add, subtract, and rate ideas according to specified criteria.

Students' good evaluative thinking is also caused by their stable emotional state. This is certainly in line with the age of students who are no longer young. College students have been able to maintain their own emotional stability. They have been able to control themselves to maintain their emotions. Previous findings have shown that college students can balance their emotional side during discussions and assessments (Demetriou & Nicholl, 2022). Students have also fulfilled a longer education compared to individuals who have not received higher education. According to Politis & Houtz (2015), students in higher education have better emotions and evaluative thinking than students at lower levels. The educational process they go through is a way of forming stable emotions. Students also show more developed intelligence traits. This condition causes their evaluative thinking to be more honed. In addition, the surrounding environment also supports the evaluative thinking process of students. They are facilitated by adequate lecture facilities and infrastructure. As Salsabila & Usman (2015) found, lecture facilities have a significant effect on students' thinking skills. Therefore, intellectual development in terms of evaluation is getting sharper. Students have an open attitude towards new things.

The conditions shown by students are emphasized in the way they assess the quality of learning. Students are also able to provide strong and valid arguments related to the information collected. Students show the ability to make good decisions or actions of choice. In line with the delivery of students, where they are accustomed to practicing their abilities through the process of reading from various written information and discussing with others. Consistent practice becomes a way for students to understand the various opinions of each student during discussions. This finding is in line with previous research, which concluded that the process of finding information through reading, summarizing, and commenting on reading materials can improve students' understanding and mindset (Gajdošová et al., 2022). The considerations discussed by students have an impact on the stability of students' evaluative thinking skills.

Voicing Opinions

The findings show that most students have been able to voice opinions with a high category characterized by the courage to speak up during discussions, various views, defending the truth, and thinking of valuable opinions. However, students sometimes still keep their opinions to themselves. These findings are due to the students' abilities, such as their courage. As we know, the student level has superior courage compared to the age below. In addition, students also get support from lecturers and peers. Support is very important to influence students' ability to voice opinions. According to several previous studies, social support from teachers and peers affects student achievement, speaking ability, and the courage to express opinions (Peng et al., 2022). On the other hand, as adolescents grow older and more capable, their cognitive autonomy is getting better, especially in expressing their own opinions through reflecting on their needs, desires, and beliefs (Benlahcene et al., 2020).

However, six students did not master the indicator of voicing opinions in this indicator. The low indicator is caused by internal factors, such as their self-confidence. Self-confidence is essential to

support the way and process of expressing opinions. Not a few students cannot voice opinions because they are not confident in themselves. Some previous studies have mentioned that every individual needs the aspect of self-confidence to carry out learning. A study found that the level of confidence affects students' academic performance.

Students' lack of confidence can arise due to a lack of information or insight. They may lack references or read less. Lack of references results in low achievement. The habit of reading is very important. Students need to cultivate reading every day. The culture of reading becomes a guideline for students when discussing. Broad insight is how they provide ideas with their point of view. The breadth of discussion material is also influenced by how broad their insights are. The broader the students' insights, the warmer the discussion process. This is in line with the findings of Engels et al. (2021), who found that there is a positive relationship between student insight and learning achievement.

Decision Making

The research findings show that most students have been able to make decisions in the moderate category. This finding is dominated by students' understanding of the consequences of the decisions they choose. In addition, students also have a better way of thinking as they get older and have thought about the future. Students are getting wiser in their decision-making skills. Nevertheless, some students still need to learn to evaluate their feelings and reduce the assumption that they are better than their friends in making decisions. The results of this study are not in agreement with Kweldju's research (2023), which found that most students did not optimize cognitive autonomy in their decision-making aspects, except those who already had initial intentions or ideals about their careers.

The data is caused by many factors, such as student attitudes, knowledge, and skills. These three things reinforce the way a person makes decisions. A calm attitude in students is very important before making a decision. They need to see from various points of view. This attitude also needs to be supported by their knowledge of the things to be decided. The amount of information and insight students have is the basis for students' decision-making. This knowledge and attitude are the starting point for having decision-making skills. This skill is characterized by how students set goals, set alternatives, clarify information, and get information about lectures. According to research by Cao et al. (2021), a person's attitude, knowledge, and skills affect the way they make decisions.

On the other hand, there are opinions about other factors, such as learning experience and environmental conditions. Learning experiences include students' instrumental and associative experiences. For example, students have experienced instrumental learning experiences through studying in their chosen major. This experience is gained from their learning process. As a result, they have an interest and career stability in the chosen study program. It is the same when students make the elementary school teacher education study program as an option when going to college. This finding aligns with other studies that produce data that learning experiences affect how individuals make decisions (Benlahcene et al., 2019). The knowledge that students gain from learning is applied by students. This knowledge guides them in making decisions.

Environmental conditions are shown from social factors and educational conditions. The social factors in question are in the form of changes in students based on the choice of study program that is determined. For example, students' decisions in having a major are influenced by the information they get about the prospects or career path of the chosen study program. For example, students choose an elementary school teacher education study program. Then, students already know and accept the consequences of their choice. Students are ready to become elementary school teachers. This result is supported by X's findings that the ability to make decisions is influenced by individual

social conditions. Another study mentioned that the ability to voice opinions increases in adolescence, both women and men (Gajdošová et al., 2022).

Then, educational conditions include parents' assessment of the further education chosen by students. Parents also consider their financial ability and resources that support their child's college process. Parents already have a view of the study program taken by their children. They know that their child will one day become an elementary school teacher. This research is supported by other studies that show parents influence students' educational considerations when choosing a major (Niu, 2016). In addition, Naite's findings mention that parents' understanding of education also has an impact on the student's learning process (Naite, 2021).

Self-Assessment

The findings of this study produce data that students are not optimal in assessing themselves, which is characterized by the inability of students to identify their abilities and talents. This finding is caused by several things, such as their learning experience. Appropriate and programmed learning experiences are a way for students to recognize their strengths and weaknesses. Students can increase self-awareness of their learning process. Several previous studies have mentioned that self-assessment is quite difficult to develop because teachers are not used to reflecting in class (Huang, 2022). Another phenomenon from previous studies is that teachers do not carry out reflection or carry out formative evaluations during learning (Rahman et al., 2021; Tigelaar & Sins, 2021). This has a broad and uncontrolled impact on the ability to assess oneself.

Other information obtained about factors that potentially affect the level of students' self-reflection ability includes academic performance, motivation, age, and gender. Academic performance is a factor in the high and low ability to assess oneself. Low academic performance causes students to be unprepared for learning, less than optimal to do self-regulation in learning, low self-efficacy, and low critical thinking ability. The findings of this study are in line with previous research data (Karaman, 2021; Yan, Wang, et al., 2023). Information obtained that the ability to assess oneself is influenced by students' academic performance. Good academic performance indirectly controls itself. Such mastery develops in line with the academic way of working.

Motivation also affects the ability to assess oneself because students consciously know the importance of self-reflection for personal growth and professional development. As stated by previous researchers, this factor shows that learning motivation is positively correlated with the ability to assess oneself (Wijnia & Baars, 2021; Yang et al., 2022). The positive correlation can be seen in the seriousness and perseverance of students in learning. This seriousness and perseverance make students able to label themselves. Labeling can be a sign that students understand clearly the urgency of learning and the benefits for themselves.

In addition, age also has potential in the process of student self-assessment. Research data shows that teenagers have a higher level of self-reflection. Those who are teenagers have a fairly good level of self-reflection compared to early adulthood. On the other hand, the ability of self-reflection is also influenced by gender. Female students can assess themselves better than male students. This finding is supported by previous research, which concluded that female students experience superior cognitive development to males (Davy Tsz Kit et al., 2022). Other researchers also agreed that female students' self-reflection skills are better than those of male students (Noor & Liaqat, 2018; Paloniemi et al., 2021). This finding contradicts other research stating that men have superior cognitive autonomy compared to women (Lee et al., 2010) because men have greater freedom of expression than women. They are quicker to grasp environmental conditions. Furthermore, students of adolescent age are also considered more capable of judging good and bad things than those below (Senft et al., 2022).

Comparative Validity

This finding concludes that most students already have comparative validity abilities in the medium category. This ability is dominated by the need for family members to approve of students' decisions and a sense of caring about other people's opinions of students. However, some students do not consider the importance of friends' approval of the decisions they make.

The data is influenced by the role of their family and peers. Parents who are involved in their children's decision-making will certainly know what their children need. That way, parents can provide advice and views on the dilemma experienced by their children. According to X's research, parents play a central role in assisting their children, especially when they are making decisions. Parental concern characterizes the solidarity between children and parents. The results of other studies report that parents encourage independence and clear direction towards the formation of independent behavior in children in adolescence (Wachyudi et al., 2024). Students, as children, feel the need for agreement on views between children and parents on one topic of discussion. This agreement reinforces children's decision-making. In line with these findings, there is research stating that parental support in the form of participation in decision-making encourages adolescent cognitive autonomy (Abdullah et al., 2020; N. E. Hill & Wang, 2015; Michael & Attias, 2016). Strong support is the foundation for them to obtain excellent academic performance. This statement is agreed upon by research X, which suggests that parental support significantly affects student academic performance.

Peers are just as important as parents. In adolescence or early adulthood, the relevance of views contributes to academic development in college. Peer influence is very strong, both in terms of attitudes, knowledge, and skills. Peers who support each other are positively correlated with their success. This statement is supported by research by Engels et al. (2021) that peer tutors affect students' academic performance. Peers are also a medium of counseling or guidance for students when they experience problems. Peers have a better understanding of the problems and pressures faced by groups or individuals. Peer tutors can promote students' academic resilience through emotional support, guidance, and role models that facilitate the development of skills and mindsets to overcome challenges and setbacks.

Students' cognitive autonomy is generally dominated by the fulfillment of the student's evaluative thinking component. However, the results are also contradictory with the lowest score obtained in the self-assessment component. The results are very different because evaluative thinking and self-assessment have conceptual differences. In terms of the concept, evaluative refers to the way students evaluate their way of thinking during discussions. Students try to make their thinking patterns run logically so that they can solve problems from various perspectives. This is very different from self-assessment. This ability emphasizes the process of reflection on the learning process, is the learning process, right? Are the efforts made by students in line with the learning outcomes obtained? What are my shortcomings or limitations that cause low learning outcomes? These questions are the basis for self-assessment reflection. Thus, it does not matter if the results are contradictory. This is related to the development of the two concepts.

6. Conclusion

This research concludes that most students of the Faculty of Teacher Training and Education, Universitas Sebelas Maret have had cognitive autonomy in the moderate category, which is characterized by having the ability of evaluative thinking, the ability to express opinions, the ability to make decisions, the ability to assess themselves, and the ability of comparative validation. The ability of evaluative thinking becomes the most dominant ability, while the ability to assess oneself becomes a weak ability. Each sign/indicator is caused by several factors, such as age, gender, peers,

teacher's role, social conditions, academic performance, learning environment, learning experience, emotional state, learning motivation, education, and habituation.

7. Suggestion

These findings have several limitations. For example, this research only uses a cross-sectional approach, so it does not provide a complete picture of the dynamic changes in students' cognitive autonomy. Thus, future researchers are advised to conduct longitudinal research to gain an in-depth understanding of the development of cognitive autonomy over time. In addition, the number of research samples is considered insufficient to represent the entire population in the research area. Thus, future researchers are recommended to conduct similar research with a wider distribution of samples.

This research has implications for the practice of evaluating cognitive autonomy at the student level. Lecturers and structural staff need to develop policies to integrate cognitive autonomy in lectures. This emphasis is expected to be an alternative in improving student performance. Researching at an early age is important to encourage and guide the elements of cognitive autonomy appropriately, even though the fact is that their neurophysiological cognitive development is not complete. Also, research focused on emotional and behavioral autonomy is needed to see greater potential.

Based on the findings of this study, the researcher recommends that educators study each component of their students' cognitive autonomy in depth so that educators can evaluate the abilities related to students' cognitive autonomy. This is a provision for educators in maintaining and improving students' learning achievement. Educators are advised to discuss these findings in teacher meetings, both on a small and large scale. This is so that all teachers understand the importance of cognitive autonomy for their students. In addition, curriculum developers need to consider these findings in terms of making policies to focus on all types of autonomy (cognitive, behavioral, and emotional) as an emphasis on the abilities that students must achieve. Curriculum development needs to consider these suggestions and apply them to all levels of education.

Declarations

Author Contributions. T.M: Literature review, conceptualization, methodology, data analysis, review-editing and writing, original manuscript preparation.

Conflicts of Interest. The author declares no conflict of interest.

Ethical Approval. The author declares that this research has obtained ethical permission from the informants.

Data Availability Statement. All data have been reported in this research manuscript.

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About the Contributor(s)

Tri Murwaningsih, M.Pd, is an associate professor in the office administration education study program, Faculty of Teacher Training and Education, Universitas Sebelas Maret, Surakarta, Indonesia. Active as a lecturer in the office administration education study program. His research focuses on the field of office education and education science. Several articles have been published on the topics: The Impact of Teachers' Professional Development on The Internet Self-Efficacy and ICT Competencies; A Well Structured Strategy Development via AI Integrated Analytics Systems to Improve Performance of Education; The influence of professional attitude, welfare, self-sustaining

development, and job satisfaction on teacher performance; and Improving concept mastery through learning media with interactive conceptual instruction approach viewed from learning style.

Email: murwaningsih_tri@staff.uns.ac.id

ORCID: <https://orcid.org/0000-0002-4295-3235>

Muna Fauziah, M.Pd, is an expert assistant in the elementary madrasah teacher education study program at Institut Agama Islam Nahdlatul Ulama Kebumen, Indonesia. Active as a lecturer in the elementary madrasah teacher education study program. Her research focuses on the fields of elementary madrasah teacher education, elementary education, and educational science. Several articles have been published on the topics: Social Skills in Early Childhood and Primary Schools: A Systematic Review; The effectiveness of the TASC, CPS, and DI on divergent thinking skills at elementary schools in Indonesia; The influence of professional attitude, welfare, self-sustaining development, and job satisfaction on teacher performance; and The Implementation of Problem-Based Learning with Multimedia for Improving Scientific Process Skills.

Email: munafauziah6@gmail.com

ORCID: <https://orcid.org/0000-0003-0917-9812>

Hani Febrianti, S.Pd, is a postgraduate student of Educational Technology Study Program, Universitas Sebelas Maret, Indonesia. She is active as a research assistant in the Office Administration Education and Educational Technology Study Program. Her research focuses on the field of Office Administration Education and Educational Technology.

Email: hanifebri11@student.uns.ac.id

ORCID: <https://orcid.org/0009-0009-7361-9967>

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