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Autonomous Learning In Mathematics Statistical Learning Materials For Junior High School Students

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a b s t r a c t

This study investigates students' learning autonomy in mathematics education, recognizing its importance in fostering critical thinking, problem-solving, and lifelong learning skills. A descriptive qualitative method was used to explore the level of independence among junior high school students in Cirebon Regency. The research involved 33 students who completed a learning independence questionnaire consisting of 30 items covering 8 indicators, such as initiative, responsibility, self-regulation, and goal-setting. Data were analyzed using a percentage formula to interpret student responses. The findings show that two indicators scored below the minimum sufficient level, indicating a lack of independence in certain aspects of learning. The remaining indicators met the sufficient criteria. Overall, the average percentage of student learning independence was 64.63%, which falls into the "sufficient" category. In terms of individual classification, 3 students demonstrated good independence, 22 were categorized as sufficient, 6 as poor, and 2 as very poor. These results suggest that while most students show a moderate level of autonomy, there remains a significant need for improvement. Teachers should implement learning strategies that promote self-directed learning and internal motivation to enhance students' autonomy, particularly in mathematics, where independent learning is key to mastering complex concepts.

Keywords:
Learning autonomy; mathematics; junior high school

INTRODUCTION

'Autonomous' derives from the term 'autonomy', signifying autonomy from external reliance, while independence denotes a state wherein an individual executes tasks utilizing their full potential, devoid of external assistance. Additionally, autonomy manifests in educational contexts, referred to as self-regulated learning. Learning autonomy encompasses the disposition, motivation, and capability to engage in proactive educational endeavors driven by the ambition to achieve specified competencies (Tezer et al., 2019).

The acquisition of learning autonomy within the educational process is an essential attribute that students must cultivate, as it necessitates a commitment to being accountable for their own academic achievements. Learning autonomy is indispensable for students to foster responsibility for their educational outcomes. It cultivates disciplined behavior and self-regulation in their academic pursuits. Early development of this independence promotes lifelong learning. When ingrained as a character trait, education transcends the classroom, enabling exploration beyond conventional settings. Students exhibit learning independence through confidence, perseverance, independent thinking, and problem-solving skills (Nadhif, 2020).

Students must possess autonomy in mathematical learning. The logical nature of mathematics underscores its significance in education. Mathematics is intrinsically linked to human activity and cognitive development (Sari & Hasibuan, 2019). A principal objective of mathematics education is fostering a favorable disposition towards the subject. Indicators of students' learning autonomy encompass 1) assessing learning requirements, establishing objectives, and formulating study plans; 2) selecting and implementing learning methodologies; 3) monitoring and appraising utilized strategies (Nurhafsari & Sabandar, 2018). Effective mathematical study necessitates concentration and perseverance for proficient problem-solving. Engaging with challenges enables students to independently formulate solutions without reliance on peers or teacher assistance. Autonomy in learning is a critical internal factor influencing educational achievement. Students exhibiting strong learning independence are likely to achieve optimal educational outcomes.

Student learning autonomy is demonstrated by particular attitudes during the learning process. Indicators involve self-confidence, self-directedness, responsibility, initiative, and preference for problem-centered learning (Astuti, 2015). According to Sumarmo (Hendriana, et al, 2018), indicators of learning independence are: 1) intrinsic motivation and initiative; 2) habit of assessing learning needs; 3) ability to monitor and organize learning; 4) capability to set personal learning goals; 5) perception of learning challenges; 6) ability to seek relevant resources; 7) selection and application of learning strategies; 8) evaluation of learning processes and outcomes; 9) development of self-efficacy and self-concept.

The cultivation of learning autonomy should be a paramount consideration within the educational process, as empirical research indicates that the level of student autonomy in mathematics education remains comparatively inadequate (Ansori & Herdiman, 2019; Febriyanti & Imami, 2021). Notwithstanding, the attribute of independence has been shown to exert a beneficial impact on the enhancement of student academic performance

(Kurnia, et al, 2019; Dewi, et al, 2020; Wiriani, 2021). Consequently, it is imperative for educators to intensify their efforts to foster independent learning in mathematics among students. Rafika, et al (2017) stated that the advancement of student learning autonomy is aimed at achieving a defined set of competencies. This facilitates the attainment of educational objectives, which are delineated as learning outcomes, across both cognitive and practical domains.

In light of the elucidation provided, it is of paramount importance for students to possess autonomy in their mathematical education; consequently, researchers are inspired to undertake a research entitled "Analysis of Learning Autonomy in Mathematics Education Among Junior High School Students." The objective of this investigation is to perform a comprehensive examination of the autonomous learning behaviors exhibited by junior high school students. It is anticipated that the outcomes derived from this study will illuminate aspects concerning the autonomy of students in their learning processes, thereby enabling educators to devise instructional methodologies that can nurture and enhance students' learning autonomy.

METHODS

This study employs qualitative research. This research was conducted in one junior high school in Cirebon. Thirty-three students were selected as the participants in this study. This research employed a mathematics learning autonomy questionnaire as its instrument, which encompassed thirty statement items accompanied by five response options: Strongly Agree (SS), Agree (S), Neutral (N), Disagree (TS), and Strongly Disagree (STS). Data collection for this study was executed through the administration of the mathematics learning autonomy questionnaire to junior high school students in Cirebon, utilizing Google Forms for distribution. The mathematics learning independence questionnaire utilized in this research comprises 11 indicators, specifically:

Table 1
Indicators of Autonomy in Student Mathematical Learning

No.	Indicators	Statement		Total
		+	-	
1.	Exhibiting an initiative towards mathematical learning.	1, 2	3, 4	4
2.	Determining learning targets	6, 7	5, 8	4
3.	Monitoring mathematics learning	9, 10		2
4.	Arranging mathematics learning	13	11,12	3
5.	Controlling mathematic learning	14	15	2
6.	Exploring relevant learning resources	21	20	2
7.	Employing relevant learning resources	18, 19	16, 17	4
8.	Opting a mathematics learning strategy	22	23, 24	3
9.	Establishing mathematics learning strategy	26	25	2
10.	Evaluating mathematics learning process	28	27	2
11.	Evaluating mathematics learning outcomes	30	29	2
	Total	15	15	30

Questionnaires distributed to students were analysed by using the following percentage formula (Suharsimi, 2006).

$$P = \frac{n}{N \times S} \times 100$$

With P = Percentage

n = Total Score Obtained

N = Maximum Total Score

S = Number of Questions/aspects

Subsequently, the findings regarding the percentage of autonomous learning were classified according to the subsequent rubric (Purwanto, 1994):

Table 2
Students' Mathematics Learning Autonomy Categorization

No.	Percentage	Category
1.	86 – 100	Excellent
2.	76 – 85	Good
3.	60 – 75	Fair
4.	55 – 59	Poor
5.	≤ 54	Bad

FINDINGS AND DISCUSSION

This research was conducted by collecting the data through a questionnaire comprising eight indicators of autonomy in the domain of mathematical learning, accompanied by five response options: Strongly Agree (SS), Agree (S), Neutral (N), Disagree (TS), and Strongly Disagree (STS). According to the finding, the percentage of student autonomy in mathematical learning was determined based on the indicator "Exhibiting an initiative towards mathematical learning," which is demonstrated in the subsequent table:

Tabel 3
Exhibiting an Initiative towards Mathematical Learning Percentage Indicators

Indicator	Statement	Percentage
Exhibiting an initiative towards Mathematical Learning	*I undertook the initiative to approach the front of the classroom to engage in statistical exercises.*	60%
	During the absence of the instructor, I engaged in the examination of statistical materials.	59,4%
	I solely conduct statistical investigations as assigned by the instructor.	46,1%
	I have never reviewed the statistics material taught by teachers at school.	65,5%
Average		57,7%

In Table 3, 'exhibiting an initiative towards mathematical learning' comprises two positive and two negative items. The first statement, "I undertook the initiative to approach the front of the classroom to engage in statistical exercises," received a 60% approval, categorized as sufficient. The second statement, "During the absence of the instructor, I engaged in the examination of statistical materials," garnered a 59.4% approval, classified as less sufficient. The third statement, "I solely conduct statistical investigations as assigned by the instructor," achieved a 46.1% approval, denoting less than once. The fourth statement, "I have never reviewed the statistics material taught by teachers at school," obtained a 65.5% approval, categorized as sufficient. The average percentage across these four items is 57.7%, indicating that student learning initiatives are categorized as lacking.

The percentage of students' mathematical learning autonomy regarding target determination is displayed in the subsequent table.

Tabel 4
Determining Learning Targets Percentage Indicators

Indicator	Statement	Percentage
Determining Learning Targets Percentage	*I don't care about low statistics test scores.*	80%
	I intend to achieve a statistics test score exceeding 80.	81,8%
	Setting learning targets helps me organize how I study.	73,3%
	Studying without a target reduces the burden on my mind.	57%
Average		73%

In Table 4, the learning target indicator comprises 2 affirmative and 2 negative items. The initial statement "I don't care about low statistics test scores" registers 80% in the favorable category. The subsequent statement "I intend to achieve a statistics test score exceeding 80." records 81.8% in the favorable category. The third statement "Setting learning targets helps me organize how I study" indicates a percentage of 73.3%, categorized as sufficient. The final statement "Studying without a target reduces the burden on my mind." shows a percentage of 57%, categorized as less favorable. The average percentage across the 4 items is 73%, thus concluding that the indicators of student learning initiative are categorized as sufficient.

The percentage of students' mathematical learning autonomy regarding mathematic learning monitoring is displayed in the subsequent table.

Tabel 5
Monitoring Mathematics Learning Percentage Indicator

Indicator	Statement	Percentage
Monitoring Mathematics Learning	*I consistently monitor my advancement in statistics.*	63,6%
	I sought the teacher's assessment of my statistical learning advancement.	63%
Average		63,3%

In table 5, there are two positive indicators for mathematical learning. The first statement reveals a 63.6% sufficiency in monitoring statistics study progress. The second statement indicates a 63% sufficiency in consulting teachers about statistical learning. The aggregate percentage of these items is 63.3%, concluding that the monitoring indicators for mathematical learning are sufficiently categorized.

The percentage of students' mathematical learning autonomy regarding mathematic learning arrangement is displayed in the following table.

Tabel 6
Arranging Mathematics Learning Percentage Indicators

Indicator	Statement	Percentage
	I will only study statistics if the home environment is quiet.	55,8%

Arranging Mathematics Learning	*I study statistics material when I'm in a good mood.*	43%
	I set hours to study statistics at home.	59,4%
Average		52,7%

In Table 6, arranging mathematics learning featured 1 affirmative and 2 negative items. The first item, indicating conditional study of statistics (*I will only study statistics if the home environment is quiet*), garnered a 55.8% response rate in the lower category. The second item, relating attitude or mood to statistics study (*I study statistics material when I'm in a good mood)*, received a 43% response rate in the less than once category. The third item, concerning study hours for statistics at home (*I set hours to study statistics at home*) achieved a 59.4% response rate in the lower category. The average percentage of these three items is 52.7%, suggesting that the indicators of mathematical learning are classified as deficient.

The percentage of students' mathematical learning autonomy regarding controlling mathematics learning is displayed in the following table.

Tabel 7
Controlling Mathematics Learning Percentage Indicators

Indicator	Statement	Percentage
Controlling Mathematics Learning	*During examinations, I minimize cell phone usage.*	69,7%
	I studied statistics under the supervision of my parents.	67,3%
Average		68,5%

In Table 7, the mathematical learning control indicator includes one positive and one negative statement. The first statement, "*During examinations, I minimize cell phone usage*," has a sufficient percentage of 69.7%. The second statement, "*I studied statistics under the supervision of my parents*," shows a sufficient percentage of 67.3%. The average percentage of the two items is 68.5%, indicating that the mathematical learning control indicators are categorized as sufficient.

The percentage of students' mathematical learning autonomy regarding the exploration of relevant learning resources is displayed in the following table.

Tabel 8
Exploring Relevant Learning Resources Percentage Indicator

Indicator	Statement	Percentage
Exploring Relevant Learning Resources	*I looked for statistical material from Google.*	48,5%
	I seek statistical data from diverse textbooks.	74,5%
Average		61,5%

In table 8, indicators of exploring relevant learning resources included one positive and one negative statement. The first statement, "*I looked for statistical material from Google*," yielded a 48.5% response rate in the category once. The second statement, "*I seek statistical data from diverse textbooks.*" achieved a 74.5% response rate in sufficient categories. The mean percentage of the two statements is 61.5%, indicating that the indicators of student learning initiative are adequate.

The percentage of students' mathematical learning autonomy regarding the employment of relevant learning resources is displayed in the following table.

Tabel 9
Employing Relevant Learning Resources Percentage Indicator

Indicator	Statement	Percentage
Employing Relevant Learning Resources Percentage Indicator	*I got statistical material only from the teacher's explanation.*	52,7%
	I exclusively utilize library mathematics textbooks for studying statistics.	58,8%
	I consulted a smart friend regarding confusing statistical concepts.	73,9%
	I employ diverse sources to analyse statistics.	70,3%
Average		63,9%

In Table 9, the employment of relevant learning resources indicators featured two affirmative and two negative statements. The statement "*I got statistical material only from the teacher's explanation*" yielded a 52.7% response, indicating a lower level of engagement. The statement "*I exclusively utilize library mathematics textbooks for studying statistics*" received a 58.8% response, also reflecting a lower engagement level. The third statement "*I consulted a smart friend regarding confusing statistical concepts*" achieved a 73.9% response, categorizing it as sufficient. The fourth statement "*I employ diverse sources to analyze statistics*" garnered a 70.3% response, similarly categorized as sufficient. The mean percentage across these four statements is 63.9%, suggesting that the indicators of student learning initiative fall within a sufficient range.

The percentage of students' mathematical learning autonomy regarding the selection of mathematics learning strategy is displayed in the following table.

Tabel 10
Opting Mathematics Learning Strategy Percentage Indicators

Indicator	Statement	Percentage
Opting Mathematics Learning Strategy	*I made small notes to make it easier for me to study statistics material.*	65,5%
	I only study statistics material when taking exams.	58,8%
	I will copy a friend's work in doing assignments.	63%
Average		62,4%

In Table 10, the selection of mathematical learning strategy indicators comprises 1 affirmative and 2 negative items. The statement "*I made small notes to make it easier for me to study statistics material.*" received a 65.5% rating, classified as sufficient. The statement, "*I only study statistics material when taking exams*," garnered a 58.8% rating, categorized as less sufficient. The statement "*I will copy a friend's work in doing assignments*" achieved a 63% rating, classified as sufficient. The cumulative average percentage of the three items is 62.4%, indicating that student learning initiative is categorized as sufficient.

The percentage of students' mathematical learning autonomy regarding the establishment of mathematics learning strategy is displayed in the following table.

Tabel 11
Establishing Mathematics Learning Strategy Percentage Indicators

Indicator	Statement	Percentage
Establishing Mathematics Learning Strategy	*I copied a friend's work during the statistics test.*	71,5%
	I have small notes about statistics material.	66,7%
Average		69,1%

In Table 11, the indicators for establishing mathematical learning strategy comprised one positive and one negative statement. The statement *"I copied a friend's work during the statistics test"* reflects a 71.5% sufficiency. The statement *"I have small notes about statistics material"* indicates a 66.7% sufficiency. The average percentage of these two items is 69.1%, suggesting that student learning initiative indicators are sufficiently adequate.

The percentage of students' mathematical learning autonomy regarding the evaluation of mathematics learning strategy is displayed in the following table.

Tabel 12
Evaluating Mathematics Learning Strategy Percentage Indicators

Indicator	Statement	Percentage
Evaluating Mathematics Learning Strategy	*I have never evaluated the strategies that have already been applied in studying statistics.*	64,8%
	I discussed with a friend in determining the best strategy for studying statistics.	70,3%
Average		67,6%

In Table 12, the indicators for evaluating mathematics learning strategy included one positive and one negative item. The statement, "I have never evaluated the strategies that have already been applied in studying statistics," received a sufficient percentage of 64.8%. The statement, "I discussed with a friend in determining the best strategy for studying statistics," achieved a sufficient percentage of 70.3%. The average percentage of these two items is 67.6%, indicating that student learning initiative is categorized as sufficient.

The percentage of students' mathematical learning autonomy regarding the evaluation of mathematics learning outcomes is displayed in the subsequent table.

Tabel 13
Evaluating Mathematics Learning Outcomes Percentage Indicators

Indicator	Statement	Percentage
Evaluating Mathematics Learning Outcomes	*I never checked again the answers to the statistics exercises that I had done.*	67,3%
	I compared the statistics test scores I got with my friends' statistics test scores.	75,2%
Average		71,2%

In Table 13, the indicators for evaluating mathematical learning outcomes comprised one positive and one negative statement. The first statement, regarding the lack of rechecking answers *(I never checked again the answers to the statistics exercises that I had done)*, had a sufficient percentage of 67.3%. The second statement, concerning the comparison of scores with peers *(I compared the statistics test scores I got with my friends' statistics test scores)*, recorded a sufficient percentage of 75.2%. The average percentage of these two items is 71.2%, indicating that student learning initiative falls within the sufficient category.

The table displays the percentage summary of students' autonomy indicators in mathematics learning.

Table 14
Recapitulation of All Indicators of Student' Learning Autonomy

No.	Indicator	Frequency of Statements	Percentage
1.	Exhibiting an initiative towards mathematical learning.	4	57,7%
2.	Determining learning targets	4	73%
3.	Monitoring mathematics learning	2	63,3%
4.	Arranging mathematics learning	3	52,7%
5.	Controlling mathematic learning	2	68,5%
6.	Exploring relevant learning resources	2	61,5%
7.	Employing relevant learning resources	4	63,9%
8.	Opting a mathematics learning strategy	3	62,4%
9.	Establishing mathematics learning strategy	2	69,1%
10.	Evaluating mathematics learning process	2	67,6%
11.	Evaluating mathematics learning outcomes	2	71,2%
	Average		64,63%

In Table 14, students' learning autonomy indicators are categorized into two criteria: less and sufficient. The less criterion encompasses indicators 1 and 4, whereas the sufficient criterion includes indicators 2, 3, 5, 6, 7, 8, 9, 10, and 11. The overall average score for student learning independence indicators was 64.63%, falling within the sufficient criteria.

The Frequency Distribution of Students' Mathematics Learning Autonomy is illustrated in the subsequent table.

Tabel 15
The Frequency Distribution of Students' Mathematics Learning Autonomy

No.	Percentage	Category	Frequency
1.	86 – 100	Excellent	0
2.	76 – 85	Good	3
3.	60 – 75	Fair	22
4.	55 – 59	Poor	6
5.	≤ 54	Bad	2
	Total		33

In Table 15, it can be seen that among the thirty-three students who participated as respondents, merely 2 students demonstrated commendable criteria regarding their autonomy in the learning of mathematics. The majority of students exhibited an adequate level of mathematical learning independence, and it is also evident that there exists a subset of students who previously experienced deficiencies in their mathematical learning autonomy.

The findings indicate a lack of perceived importance of learning autonomy among students. Students are expected to exhibit initiative and responsibility in their learning endeavors to enhance problem-solving capabilities autonomously. This aligns with Amalia et al. (2018), who assert that learning autonomy fosters initiative, problem-solving skills, and self-confidence. Yasmin (Oktarin et al., 2018) further asserts that learning autonomy positively influences intellectual development, enabling students to analyze complex problems, set learning objectives, utilize resources effectively, and implement learning strategies. Consequently, fostering learning autonomy in mathematics is essential for maintaining student engagement and promoting lifelong learning.

CONCLUSION

Based on the outlined results and discussion, it has been demonstrated that no junior high school students in Cirebon Regency meet the very well criteria. Students' learning autonomy predominantly falls under the good and sufficient criteria. Nonetheless, specific indicators, particularly initiative in mathematics learning and regulation, are rated as less than sufficient. This indicates that student independence in mathematics learning requires enhancement to reach good criteria across all indicators. Consequently, teachers or educators must establish a conducive learning environment to foster and enhance students' learning autonomy for improved mathematical outcomes.

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