

The Exploration Local of Control in Physics Learning: Conductiong Survey Research

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ABSTRACT

The aim of this research to explore the level of Locus of Control students towards learning physics and to examine the interrelationship between the dimensions of Locus of Control in Physics Learning. A total of 215 students majored in Natural Sciences Senior High School who as the participants of this study and were invited to complete the instrument: Locus of Control in Physics Learning (LOCPL). The Locus of Control questionnaire was developed from Rotter (1966) and validated through an Exploratory Factor Analysis of participants' responses and Pearson Correlation Product Moment is used to measure the level of interrelation between dimensions. The results show that first, the validity and reliability instruments used in the study have a satisfactory level. Second, the value of the construct validity of the LOC instrument that varies from the numbers 0.415-0.782 with a total variance explained = 60.674%. Overall the value of the Cronbach's alpha coefficient instrument gets 0.607 results. The LOCI dimension occupies the first position in the LOC factor level, followed by LOCII and LOCIII. Then the results show that the interrelationship between each of the dimensions Locus of Control are significant.

The success of students in achieving educational goals or academic achievement indicates the success of education itself (Zappala-Piemme et al., 2023). A wide variety of factors affect both internal and external. There are internal factors that influence non-cognitive academic achievement, namely Locus of Control (Drago et al., 2018). Locus of Control is related to Rotter's social learning theory (Hosseini et al., 2016; Roddenberry, n.d.; Roddenberry & Renk, 2010; J. Rotter, 1966). The concept of locus of control was put forward by a social learning theorist, Julian Rotter, who explained that where someone has a belief about the causes of success and failure they experience (Çoğaltay, 2017; J. Rotter, 1966). LOC refers to a person's belief in control over life events, in which a person with an internal LOC orientation attributes personal success or failure to his own efforts and abilities (Drago et al., 2018).

The division of the type of locus of control is based on several factors that cause the event to occur. There are several opinions regarding the type of locus of control saying, "Locus of control is divided into two types internal and external locus of control. Individuals who have an internal locus of control can affect the events by both negative and positive ways by considering their ego, concept and the individual who has a positive locus of control can affect the events by fortune, chance and fate as well as self-confidence" (Arinanda Yuni Fasari et al., 2021; Dewi, n.d.; Özen KutaniS et al., 2011). Internal locus of control assumes that the events that occur are under their own control, while external locus of control tends to reveal that the causes of events to themselves come from external factors (Drago et al., 2018; McGee & McGee, 2016; Okeke & Ukoh, 2020; J. Rotter, 1966).

If the internal locus of control is owned by an individual, then that individual will tend to have great ability and effort. When facing a failure in life, these individuals will tend to blame themselves because of the lack of effort they have done. In addition, if the individual achieves success, he will feel proud of his success and will appreciate his success (Alipio, 2020). On the other hand, if the external locus of control is owned by an individual, when facing failure, the individual will tend to blame the surrounding environment (Hwang, 2019). Individuals believe that their success and failure are caused by external factors (Okeke & Ukoh, 2020).

Some of the research Locus of Control (LOC) discussions are related to educational attainment (Barón & Cobb-Clark, n.d.; Coleman & DeLeire, n.d.; Piatek & Pinger, 2016). Uguak et al. revealed that LOC and academic achievement satisfaction have a significant positive relationship (Uguak et al., 2007). Students who have scored highest with an internal LOC show superior performance compared to those with an external LOC. Carden et al. obtained results by dividing students into two groups, groups formed based on internal LOC and external LOC. Internal LOC students show significantly lower academic procrastination and higher academic achievement than the external group (Carden et al., 2004). Desle conducted a study comparing high achieving junior students and underachieving students with their LOC scores and found that higher achievers had higher internal LOC than

low achievers (Desle, 2011). Low achievers were more affected by feelings, more compliant, and tenser than people who did. Since high achievement is associated with internal LOC, the implication is that students with internal LOC tend to be more intelligent and independent and have better social and emotional adjustment than students with external LOC (Carden et al., n.d.; Desle, 2011; Drago et al., 2018; Okeke & Ukoh, 2020).

LOC research on physics learning is important because it can identify students' internal factors which are determinants of student motivation and its impact on student achievement. However, there are still few who explore LOC for learning physics. This finding is one piece that will have more meaning when juxtaposed with other research especially in internal factors such as motivation, interest, etc. For further research, this instrument can also be used for other students' study levels. And can be an instrument analyzer for teachers if they have difficulty getting to know students internally.

The purpose of this study was to explore the profile of students in East Java in terms of their Locus of Control in physics learning. Given this statement, the objectives of the study can be write down into two points: to explore the level of Locus of Control for physics learning against physics learning and to test the relationship between the Locus of Control dimensions of physics learning.

METHOD

This research is a type of ex-post-facto research, which means it is a study of variables whose treatment events have occurred before the research was carried out (Denya Agustina et al., 2019). The quantitative survey method was used in data collection. Research using a questionnaire. Survey design is quantitative research in which the researcher conducts a survey to the sample to describe the opinions, attitudes or characteristics of the population (Creswell, 2012). Starting from February to March 2023, the first author distributed a survey questionnaire to students in senior high schools in East Java Province. The population used in this study were high school students (age range 16—18).

Table 1. Summary of Sample Demographics

Background	Subtotal	
	n	%
Male	101	46,98
Female	114	53,02
Grade		
10	29	13,52
11	125	58,13
12	60	27,90
Missing	1	0,46
Total	215	100

The data were obtained by using form of a questionnaire. The research instrument was a modified questionnaire from the four-item Rotter Internal-External Locus of Control Scale used in the 1966 NLSY79 Rotter (Wang & Lv, 2017) which referred to the Locus of Control indicators with the following details.

Table 2. Locus Of Control Indicators

Indicator	Number	Total
Locus of Control Internal		
Confidence in his ability to solve problems or assignments	1, 2, 3*, 4	4
Work hard and have more effort in solving problems or assignments and achievements	5, 6, 7	3
Have self-satisfaction in completing tasks without assistance	8, 9, 10*	3
Locus of Control External		
Do not like to try to achieve success and complete problems or tasks	11, 12, 13	3
Lack of initiative	14, 15, 16	3
Success and achievement are influenced by external factors (fate, luck, environment)	17, 18, 19*, 20*	4
Total		20

*negative statement

The questionnaire consists of 20 items which are divided into two sub-sections, namely Internal and External Locus of Control. The instrument is presented in the form of a Likert scale with five alternative answers with positive statements and negative statements that are arranged randomly, and the students only needs to give a sign (√) on the available answer choices.

The survey study analysis process is carried out by selecting various items and the scale of the survey research by reviewing literature reviews, adapting and developing statements. Then to make various statements in the questionnaire sheet items which are then validated to experts who provide various criticisms and suggestions in the questionnaire sheet instrument (Expert Validation). Then start retrieving data.

RESULTS

To validate the Locus of Control questionnaire, an exploratory factor analysis using varimax rotation was used to clarify the structure of the instrument. The results are obtained with the condition that the eigenvalue value is more than one (Suprpto, 2014, 2019). There are 20 items with a summary as follows:

Table 3. Summary Instrument Item

Name of Instrument	Type of survey	Partisipants	Number Factor	Number of Item	
				Initial	Final
Locus of Control Survey	C-SSD	215	3	20	12

Table 4. Kaiser Meyer-Olkin dan Bartlett's Test

KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	0,839
Approx. Chi-Square	876,239
Bartlett's Test of Sphericity	Df
	66
	Sig.
	,000

The result of the KMO coefficient value is 0.839 which has the Meritorius category. This is indicated by the range of correlation numbers between 0.800 and 0.899 (Wachidy, 2018). The results of Bartlett's test are significant ($\chi^2 = 876,239$, $df = 66$, $p < 0,000$). These results indicate that the sample can use factor analysis. However, there were 8 items that were removed because these items had a loading factor value below 0.4, including: L3, L10, L11, L12, L16, L17, L19 and L20 (Example Item L3: I don't have the initiative to be able to solve problems or assignments that have been given by the teacher, L10: I prefer to do physics questions or assignments together with friends). The reason that can be revealed (the results of the interview) from this result is that for L3: students do have the initiative to work on the problems either on the encouragement of others or themselves. For L10: students like to work on physics problems together with the teacher because if they have difficulty they can immediately ask teacher to find a solution. This result differs from the previous findings (reference).

Then the responses from the participants were divided and grouped into three factors: (1) Locus of Control I (LOC1: Self-confidence); (2) Locus of Control II (LOC2: External Factors / Initiatives); (3) Locus of Control III (LOC3: Self-Satisfaction). Locus of Control I: explores about his confidence in his abilities (five items). Locus of Control II: exploring about Lack of effort and lack of initiative (four items). Locus of Control III: exploring about self-satisfaction and hard work (three items). In the graph, there are 3 factors with the following details:

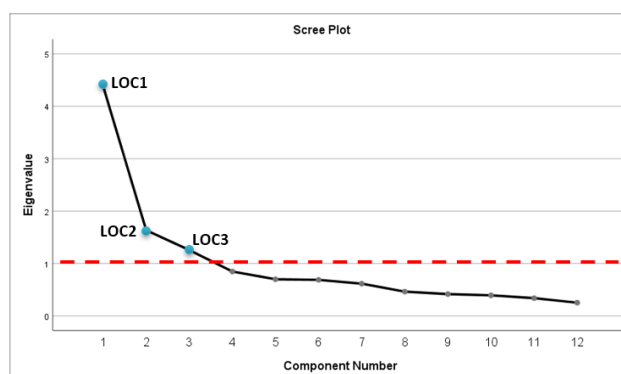


Figure 1. The Screen Plot of Three Factors Based on Eigenvalues

Table 5. The Eigenvalue of the Three Factors LOCPL

Component (Factor)	Initial Eigenvalues		
	Total	% of Variance	Cumulative of Variance %
1	4,388	36,567	36,567
2	1,636	13,629	50,197
3	1,257	10,478	60,674

The three-factor calculation result is 60.674% of the total variance explained, so that this result clarifies the structure of the instrument with a valid predicate. The loading factor that affects has a value above 0.400 according to Steven (Suprpto, 2014, 2019) and by adding the value of Cronbach's alpha coefficients at each loading factor, the following table can be made:

Table 6. Rotated factor loadings and Cronbach's alpha LOCPF questionnaire

Item	Loading Factor (λ)*			
	1 ($\alpha=0,825$)	2 ($\alpha=0,646$)	3 ($\alpha=0,712$)	
L1	0,672			
L2	0,738			
L4	0,779	(36,567% of Variance Explained)		
L7	0,769			
L9	0,782			
L13				0,753
L14	(13,629% of Variance Explained)			0,798
L15			0,719	
L18			0,415	
L5				0,613
L6	(10,478% of Variance Explained)		0,468	
L8			0,775	
Total variance explained = 60,674% and the overall Cronbach Alpha $\alpha=0,607$				
Note:	Extraction Method: "Principal Component Analysis (PCA)". Rotation Method: "Varimax with Kaiser Normalization". [1 = LOC1: Self-confidence; 2 = LOC2: External Factors/Initiatives; 3 = LOC3: Self-Satisfaction]			

The table represents the levels of the Locus of Control in physics learning. The LOC I dimension occupies the first position with a mean value of (4.72) and a standard deviation (1.03), followed by LOC II with a mean (3.95) and standard deviation (1.07) and for LOC III it has a mean (3.71) and a standard deviation of (1.05). LOC I has a mean value that is greater than the grand mean, which means it indicates that LOCI contains confidence in students' dominant self-efficacy in learning physics compared to other factors.

Table 7. Summary of the degree of LOC Dimensions

Dimension	M	SD	Rank
LOCI	4,724194	1,03322	1
LOCII	3,958065	1,071053	2
LOCIII	3,717742	1,056338	3
Total	4,133333	1,053537	

The relationship of each of the Locus of Control dimensions to physics learning is presented in the following varied results. A range of correlation coefficients from -0.346 to 0.826 will help limit predictions (Creswell, 2012). From the results it can be seen that students have mixed results. But it appears that students have a tendency to one of the LOC. The results for LOCI have a correlation (-0.315) with LOCII, (0.549) LOCIII and (0.826) with LOC itself. LOCII has a correlation (-0.346) with LOCIII and (0.139) with LOC itself and LOCIII has a correlation with LOC itself of (0.682). The LOCII result has a negative value, meaning that the LOCII correlation has a negative relationship, by considering the theory (rotter), this result is confirmed in accordance with the theory which says LOCII is an external factor that can reduce the value of the LOC as a whole.

Table 8. Interrelationship between LOC Dimension

Dimension	1	2	3	4
LOCI	-			
LOCII	-0,315	-		
LOCIII	0,549	-0,346	-	
LOC	0,826	0,139	0,682	-

DISCUSSION

The purpose of this study was to investigate the students' Locus of Control on physics learning in schools and to explore the students' level of Locus of Control and the interrelationship between each dimension. In general, the findings indicate that the Locus of Control instrument used in this study satisfactorily obtains valid and reliable instrument results. The instrument displays

well the explainable variant of (60.674%) and the Cronbach's alpha coefficient value of (0.607) this indicates that the instrument has an intermediate level of reliability. So that in the future the instrument can be used to research students at other levels.

Based on the first purpose, the LOCI dimension occupies the first level followed by LOCII and LOCIII. This indicates that LOCI which contains confidence in self-dominant abilities has an important role in students' physics learning compared to other factors. This result is in accordance with the findings of Andrew McGee and Peter McGee who were researched at Simon Fraser University, saying that LOCI is an internal factor found that students who have LOC internal factors and more belief, the student will be more competent and influential on student learning outcomes (Drago et al., 2018; Hosseini et al., 2016; McGee & McGee, 2016; Özen Kutani S et al., 2011; J. B. Rotter, 1966). In another study by Jie Chi Yang, Yi Lung Lin and Yi-Chun Liu said that LOCI is associated with students who have high academic achievement because individuals who have LOC internal values hold more initiative and persistence in learning goals (J. C. Yang et al., 2017). J. Jang, H. Shin, H. Aum, M. Kim, and J. Kim also get the result that students with more internal LOC have better learning performance than those with more external LOC. In life, someone who has Internal LOC will have a positive and progressive tendency towards their attitudes and experiences (Jang et al., 2016).

The next findings answer the second research objective, about how the relationship between the dimensions of LOC (three factors) and LOC itself. LOC as a whole has a significant influence on academic performance as the results of (Drago et al., 2018; F. Yang et al., 2023). LOCI and LOCIII have a positive correlation, while LOCII to other LOCs has a negative correlation. This result is in line with asserting that a person with external LOC will have a negative and passive tendency towards their attitudes and experiences (Jang et al., 2016). Jie Chi Yang, Yi Lung Lin and Yi-Chun Liu found that students who have external LOCs get low learning outcomes (J. C. Yang et al., 2017). Reinforcing these results it is said that internal LOC is more trusted to get high learning achievement and independent function than external LOC (Desle, 2011; Drago et al., 2018; Okeke & Ukoh, 2020; J. Rotter, 1966).

CONCLUSION

The results can be concluded that the LOC instrument used in this study is valid and reliable based on the statistical analysis of Exploratory Factor Analysis (EFA). The value of the construct validity of the LOC instrument varies from the number 0.415-0.782 with Total variance explained = 60,674%. Overall the value of Cronbach's alpha coefficient of the instrument was 0.607. The LOCI dimension occupies the first position in the LOC factor level, followed by LOCII and LOCIII. LOC research on physics learning is important because it can identify students' internal factors which are determinants of student motivation and its impact on student achievement. For further research, this instrument can be used for other student study levels. And can be an instrument analyzer for teachers if they have difficulty getting to know students internally.

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