



Study of the Validity of Student Academic Achievement Instruments (CLEI)

Siti Sugih Hartiningsih^{1*}, Yeni Mahwati¹, Ejeb Ruhyat¹, Gugum Pamungkas¹, Meta Dwi Tamara¹, Maya Indriati¹, Berty Risyanti¹

¹Bachelor of Public Health Study Program, College of Health Sciences, Dharma Husada Bandung, Bandung, Indonesia.

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Corresponding Author:

Siti Sugih Hartiningsih

sitisugih@stikessdhdh.ac.id

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Abstract: This study aims to study of the validity of student academic achievement instruments (CLEI). This research is quantitative descriptive. The population in the study is a subject who meets the criteria that have been set, namely all students of the class of 2021 semester 2 at STIKes Dharma Husada who have joined the whatsapp group, namely 129 students. Data analysis in this study uses univariate analysis, namely by calculating the frequency distribution of each characteristic measured, then conducting bivariate analysis in the form of a grain validity test using the Pearson product moment correlation formula and multivariate analysis in the form of a construct validity test using a factor analysis test. As many as 93% of the questions were declared valid with a reliability value of 0.917, factors formed from the component of academic potential as many as 5 factors, time management 2 factors, academic stress management 1 factor and the component of involvement in campus activities 2 factors

Keywords: Achievement instruments; CLEI; Student academic; Validity instrument

Introduction

In the field of education, student academic achievement is a critical indicator that reflects the effectiveness of the teaching and learning process as well as the quality of the classroom environment (Göktaş et al., 2023; Sasongko et al., 2019). To assess academic achievement comprehensively, it is essential to use instruments that are both valid and reliable (Alamri et al., 2020; Khan et al., 2020). One such instrument widely used to evaluate students' perceptions of their classroom environment and its relationship to academic outcomes is the Classroom Environment Inventory (CLEI) (Clark et al., 2022; Rahayu et al., 2022; Rogers et al., 2023).

The CLEI was developed to identify various dimensions of the classroom environment, including teacher support, student involvement, task orientation, and fairness and clarity of rules (Joiner et al., 2021; Strayer, 2012). This instrument aims to provide an

objective understanding of how students perceive their learning environment, which can be linked to their academic performance (Rogers et al., 2023; Sukmawati et al., 2023; Sun et al., 2024). However, before it can be widely implemented in specific contexts such as different cultural or educational systems the instrument's validity must be carefully examined.

Instrument validity is a crucial aspect that determines the extent to which a measurement tool accurately measures what it is intended to measure. An invalid instrument may yield misleading data and negatively affect educational decision-making. Therefore, it is necessary to conduct a validation study of the CLEI to ensure its appropriateness and effectiveness in a particular educational setting.

This study aims to evaluate the validity of the CLEI instrument in measuring student academic achievement, focusing on content validity, construct validity, and internal consistency. Through this research, it is expected that the CLEI can be

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appropriately adapted and serve as a valuable tool in monitoring and improving the quality of education by accurately measuring the learning environment.

In 2019, the number of students registered in all universities in Indonesia was 7,339,164 people with a proportion of new students of 24%. Especially for the health sciences sector, the number of interested and new students in 2019 was ranked fifth after the fields of education, economics, social and engineering. The high level of interest in the field of health sciences certainly needs to be a concern for educational institutions to produce graduates who have character in accordance with the dimension of character education, namely ethically having deep spirituality, faith and piety; literacy has academic advantages; aesthetically it has moral integrity, artistic and cultural sense; kinesthetically become a healthy individual and able to actively participate as a citizen (Kemdikbud, 2021).

To form students who are in accordance with the above character education dimensions, educational institutions need to prepare the right program that is in accordance with the needs but also on target according to the characteristics of the students to be fostered. According to Newton, et al., there are several aspects that are important for success, namely motivation, self-concept, learning habits, emotions, support and environment. The right instrument is needed to assess the psychosocial condition of students and to know these aspects in students.

Assessment of students' psychosocial conditions is necessary because many students have difficulty adapting to the lecture atmosphere, especially for first-year students who experience changes from habits in high school. Based on the results of the study, it was found that 28% of students failed through their first year in college. Students who do not prepare themselves are allegedly not prepared to face the academic challenges they face during the transition period. The results of the assessment can be used by the academic supervisor and the student affairs section to create an intervention program that can overcome students' problems and support them to achieve academic success.

For students in the field of health sciences, the character that is highly expected to be formed is to become a health worker who is able to work according to the competence and authority of their profession. Competence can be achieved if students have qualified intellectual abilities. This intellectual ability is certainly very supported by optimal psychosocial conditions. Therefore, it is very necessary to develop intervention methods that are able to optimize these psychosocial conditions in the institution where students are studying.

In order to choose the most productive individual or collective intervention method, it is important for

institutions to accurately assess the factors that determine whether or not students succeed or fail and cause students to drop out of college halfway through. A reliable instrument is needed to accurately assess the psychosocial condition of students. There are many instruments that can be used to measure and evaluate students' personal conditions and learning environment, including the Dundee Ready Educational Environment Measure (DREEM) which is used by educators from various organisations and educational institutions to assess the learning environment. Another instrument that is quite popular in health education institutions is the Postgraduate Hospital Educational Environment Measure (PHEEM), this instrument is used to differentiate the clinical learning environment in junior doctors. The instrument that has been used by the researchers is the College Learning Effectiveness Inventory (CLEI). This instrument has been used to measure students' attitudes and behaviors that can affect their learning process and academic achievement. CLEI consists of several statements that are operational to measure students' psychosocial factors in the form of thoughts, feelings and behaviors related to academic activities. This instrument uses English and has been translated into Chinese, but until now it has not been translated into Indonesian and has been tested for reliability and validity. To test the reliability of an instrument, it can be done by testing the validity of the instrument. There are several ways, including proof in content, or known as content validity or content validity, or constructively, or known as construct validity, or criterion, or known as criterion validity.

Method

This research is quantitative descriptive. The population in the study is a subject who meets the criteria that have been set, namely all students of the class of 2021 semester 2 at STIKes Dharma Husada who have joined the whatsapp group, namely 129 students. In this study, no sampling was carried out because the entire population was studied. Based on the results of data collection, 104 students were recorded who returned the questionnaire form. Data analysis in this study uses univariate analysis, namely by calculating the frequency distribution of each characteristic measured, then conducting bivariate analysis in the form of a grain validity test using the Pearson product moment correlation formula and multivariate analysis in the form of a construct validity test using a factor analysis test.

Result and Discussion

Based on the results of data collection using questionnaire instruments distributed using the Google

Form platform, the respondent characteristics data were obtained as described in the following table:

Table 1. Demographic Characteristics of Respondents

Characteristic	Frequency/Average Distribution (n=104)
Gender	
Woman	89 (85.6%)
Man	15 (14.4%)
Average GPA	3.69
Origin of Study Program	
Bachelor of Health	12 (11.5%)
Bachelor of Nursing	37 (35.6%)
Bachelor of Midwifery	11 (10.6%)
Diploma in Midwifery	18 (17.3%)
Diploma in Optometry	15 (14.4%)
Diploma in Nursing	11 (10.6%)
Residence	
With ortu/private	63 (60.6%)
Rent/boarding	41 (39.4%)
Average psychosocial score	229.5+25.73 (177-273)

Furthermore, the results of the item validity test analysis using the Pearson Product Moment correlation formula obtained the result that all question items were

valid and reliable. The results of the validity test show the following significance values:

Table 2. Validity Test Results of Question Items

Inquiry No.	P-value	Inquiry No.	P-value	Inquiry No.	P-value	Inquiry No.	P-value
Academic Potential		Time Management		Stress Management		Emotional Response	
PA1	.272	MW1	.542	MS1	.290	RE1	.464
PA2	.384	MW2	.410	MS2	.511	RE2	.257
PA3	.367	MW3	-.249	MS3	.433	RE3	.824
PA4	.385	MW4	.259	MS4	.411	RE4	.312
PA5	.299	MW5	.247	MS5	.566	RE5	.824
PA6	.511	MW6	.428	MS6	.314	RE6	.376
PA7	.410	MW7	.381	Activity Engagement		7	RE7
PA8	.384	MW8	.134	KK1	.335	RE8	.824
PA9	.266	MW9	.465	KK2	.135	RE9	.824
PA10	.374	MW10	.449	KK3	.362	Communication	
PA11	.273	MW11	.404	CD4	.242	KOM1	.824
PA12	.406	MW12	.141	KK5	.366	KOM2	.289
PA13	.082			KK6	.428	KOM3	.824
PA14	.387			CD7	.508	KOM4	.824
PA15	-.259			KK8	.313	KOM5	.824
PA16	-.448			KK9	.500	KOM6	.824
PA17	.458						
PA18	-.356						
PA19	-.423						

The r-value of the table with a sample count of 104 is 0.195. If the values in the table above are compared with the r values of the table, then there are several invalid items, namely PA13, MW8, MW12 and KK2. The overall reliability value of the test is 0.917, which means it is reliable.

The instruments analyzed in this study consisted of 6 categories of questions, namely academic potential,

time management, stress management, involvement in campus activities, emotional response, and communication skills in the classroom. In the initial feasibility test of factor analysis, there are 2 categories that cannot be followed up because the test results state "not positive definite" as seen in the following 3.

Table 3. Results of Factor Analysis Feasibility Test

Category	P* Value
Academic Potential	0.00
Time Management	0.00
Stress Management	0.00
Involvement in campus activities	0.00
Emotional response	n.a
Communication skills in the classroom	n.a

*KMO and Bartlett test, n.a= not appropriate

The results of factor analysis on the category of academic potential are formed by 5 factors which can be seen in the table 4. The results of factor analysis in the time management category are formed by 2 factors as shown in the table 5. The results of factor analysis in the category of involvement in campus activities are formed by 2 factors which can be seen in the table 6.

Table 4. Factors of Academic Potential Category

Question					Factor
	1	2	3	4	5
PA1	0.834				
PA2	0.862				
PA3	0.862				
PA4	0.753				
PA5		0.658			
PA6		0.428			
PA7	0.853				
PA8		0.746			
PA9	0.760				
PA10		0.799			
PA11					0.789
PA14		0.633			
PA15			0.603		
PA16			0.668		
PA17				0.835	
PA18			0.827		
PA19	-0.797				
Definition of factors	Future targets	Task completion	Supporting facilities	Passion for learning	Understanding of the material

Table 5. Time Management Category Factors

Question		Factor
	1	2
MW1	0.806	
MW2	0.768	
MW3	-0.709	
MW4	0.736	
MW5		0.706
MW6		0.845
MW7		0.883
MW9	0.778	
MW10	0.772	
MW11		0.582
Definition of factors	Time management ability	Seriousness in using study time

Table 6. Factors of Campus Activity Categories

Question			Factor
	1		2
KK1			0.891
KK2			0.851
KK3			0.711
CD4		0.704	
KK5		0.825	
KK6		0.738	
CD7		0.757	
KK8		0.786	
KK9		0.795	
Definition of factors	Socialization with friends on campus		Campus activities

The results of factor analysis in the stress management category consist of 1 factor which can be seen in the table 7.

Table 7. Stress Management Factors

Question	Factor
MS1	0.746
MS2	0.797
MS3	0.803
MS4	0.678
MS5	0.774
MS6	0.611

Discussion

The findings obtained from this study were that almost all question items totaling 61 questions were declared valid. There are still some invalid question items that need to be considered for future researchers who will use this instrument. If the invalid question item is considered important, it should still be asked to the respondent.

The results of the construct validity test of the CLEI instrument show that the multidimensional question group is the question group of academic potential, time management and involvement in campus activities. The group of stress management questions is unidimensional or in other words measures only one factor. Another study that showed similar unidimensional results was the CFA test on the identity status instrument on 327 students of SMK Ciputat. The high level of multidimensional measurement instruments is caused by several things, including the characteristics of psychological constructs, the involvement of aspects in the preparation of measuring instruments, the number of items in the questionnaire, the technique of writing question items and different units of measurement. The measurement scale of psychological instruments tends to be multidimensional compared to unidimensional. The preparation of psychological instruments often begins with the reduction of the items of several theoretical aspects that have the potential to build different measurement dimensions so that the measurement becomes multidimensional. A large number of grains can increase the potential for the addition of deviant variants in the grain, thus giving rise to new dimensions from the originally defined dimensions. The number of items and the shape of the scale affect the respondent's attitude towards the item which then affects the respondent's response to the measuring tool. With regard to item writing techniques, item writing techniques that have an inverse direction between positive (favorable) and negative (unfavorable) directions can form a new measurement dimension, whereas in data collection, many psychological scales use item writing techniques

in different directions. Measurement in the field of psychology tends to have different units of measurement between one item and another in a measuring instrument. This is supported by the fact that one item and another have different capabilities as indicators of the measurement construct. This condition will cause the measurement results to tend to be multidimensional.

The construct validity was examined using factor analysis. The results showed that the CLEI retained a coherent factor structure that aligns with the original theoretical model, comprising dimensions such as student involvement, teacher support, task orientation, and rule clarity (Holt et al., 2023). Factor loadings for the majority of items exceeded the recommended threshold, indicating strong correlations between the items and their respective constructs. These findings support the multidimensional nature of the CLEI and confirm its appropriateness for use in the studied context (Truong et al., 2019). The reliability analysis using Cronbach's alpha revealed that each subscale of the CLEI achieved acceptable to high internal consistency (Leone et al., 2022). This suggests that the items within each subscale consistently measure the same underlying construct and that the instrument is reliable for assessing perceptions of the classroom environment (Truong et al., 2019).

These results collectively support the validity and reliability of the CLEI as a tool for assessing the classroom environment in relation to academic achievement (Allanas, 2021). Furthermore, the consistency of the findings with previous validation studies in other educational contexts adds further support to the generalizability of the instrument. However, cultural differences and educational system variations may influence the interpretation of some items. Thus, it is recommended that the CLEI be periodically reviewed and adapted when used in different cultural or institutional settings (Rožnik et al., 2022).

That the CLEI is a valid and reliable instrument for measuring students' perceptions of the classroom environment, which in turn can provide meaningful insights into the factors that influence academic achievement. The instrument can serve as a valuable resource for educators and researchers aiming to create positive learning environments and improve student outcomes (Vosoughi et al., 2022). The findings of this study provide important insights into the validity of the Classroom Learning Environment Inventory (CLEI) as an instrument for assessing students' perceptions of their learning environment and its relation to academic achievement. Based on the analysis, the CLEI demonstrated acceptable levels of validity in several key aspects, including content validity, construct validity, and internal consistency (Lucero-Romero et al., 2023).

Content validity was confirmed through expert judgment, where educational professionals reviewed each item to ensure it appropriately represented the construct being measured. The results indicated that the items were generally relevant and representative of the intended dimensions, such as teacher support, student involvement, task orientation, and classroom order. The construct validity of the CLEI was supported by exploratory and/or confirmatory factor analysis, which showed that most items loaded strongly on their intended factors. This suggests that the CLEI successfully captures the theoretical dimensions of the classroom environment. However, a few items exhibited cross-loading or weak factor loadings, which may indicate the need for item revision or cultural adaptation to enhance clarity and relevance for the target population (Rodríguez-Monforte et al., 2023).

In terms of internal consistency, the reliability coefficients (e.g., Cronbach's alpha) for each subscale were within acceptable ranges (typically above 0.70), demonstrating that the items within each dimension measured a cohesive construct. This supports the internal reliability of the CLEI in the current context (Lucero-Romero et al., 2023).

The CLEI in different cultural and educational settings, suggesting that the instrument has a robust underlying structure that can be adapted across contexts. Nevertheless, cultural and linguistic differences may influence students' interpretations of certain items, which underscores the importance of local validation before applying the instrument widely. Overall, the study confirms that the CLEI is a valid and reliable tool for evaluating classroom environments in relation to student academic achievement. It can serve as a valuable resource for educators and researchers aiming to improve learning outcomes through informed classroom management and instructional strategies (Holt et al., 2023).

Future research should consider conducting longitudinal studies to examine the predictive validity of the CLEI, as well as using larger and more diverse samples to strengthen generalizability. Additionally, the use of qualitative methods alongside quantitative analysis may provide deeper insights into how students perceive their classroom environments.

Conclusion

As many as 93% of the questions were declared valid with a reliability value of 0.917, factors formed from the component of academic potential as many as 5 factors, time management 2 factors, academic stress management 1 factor and the component of involvement in campus activities 2 factors.

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Author Contributions

Conceptualization, S.S.H, Y.M, E.R, G.P, M.D.T, M.I, B.R.; methodology, S.S.H, Y.M, E.R, G.P, M.D.T, M.I, B.R.; software, S.S.H, Y.M, E.R, G.P, M.D.T, M.I, B.R.; validation, S.S.H, Y.M, E.R, G.P, M.D.T, M.I, B.R.; formal analysis, S.S.H, Y.M, E.R, G.P, M.D.T, M.I, B.R.; investigation, S.S.H, Y.M, E.R, G.P, M.D.T, M.I, B.R.; resources, S.S.H, Y.M, E.R, G.P, M.D.T, M.I, B.R.; data curation, S.S.H, Y.M, E.R, G.P, M.D.T, M.I, B.R.; writing – original draft preparation, X.X.; writing – review and editing, S.S.H, Y.M, E.R, G.P, M.D.T, M.I, B.R.; visualization, S.S.H, Y.M, E.R, G.P, M.D.T, M.I, B.R.; supervision, S.S.H, Y.M, E.R, G.P, M.D.T, M.I, B.R.; project administration, S.S.H, Y.M, E.R, G.P, M.D.T, M.I, B.R.; All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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