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Psychometric properties of learning environment diagnostics instrument

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ABSTRACT

The rise and growing prevalence of juvenile delinquency is a matter of concern for many parties. This study aims to establish a research instrument in the form of a questionnaire that can be deployed to assess the learning environment perceived by high school students. This research endeavor constitutes a developmental study, wherein the outcomes are a single survey instrument encompassing six variables, nineteen indicators, and forty questions. The data-collecting process involved the utilization of a Google Form across five schools in five districts, containing a total of 1615 participants. The analysis of expert data was conducted utilizing V. Aiken and field trials employing confirmatory factor analysis (CFA) Second Order. The findings of this study indicate that the diagnostic survey instrument used to assess the learning environment's impact on the mental health of high school students demonstrated validity, as evidenced by loading factor values exceeding the established minimal threshold. The reliability of the instrument remains insufficient. This survey can be utilized to detect adolescent persistent tendencies carried out by students or other school members that interfere with mental health: the emergence and significant raising of juvenile delinquency.

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1. INTRODUCTION

The rise of crime, juvenile delinquency, and drug abuse in the school environment is a government concern, especially the Ministry of Education and Culture and Technology in overcoming it. One of the leading causes is an unsafe and comfortable school environment. The learning environment is one of the leading indicators that support student learning success in school [1], [2]. If the learning environment is not good, it will impact students' mental health [3], [4]. Research in the United States estimates that annually, 20-25% of children and adolescents experience mental health problems, and 40% of them meet diagnostic criteria for various types of mental disorders, not including children and adolescents who are at risk and have not been diagnosed but whose conditions affect daily functioning and wellbeing [5], [6]. Epidemiological research in the United States shows that 1 in 10 children show symptoms of depression before the age of 14, and 20% of children aged 16-17 experience anxiety, mood, behavioral disorders, and acute mental disorders [7], [8].

Most mental disorders begin in adolescence and early adulthood (10 to 24), and poor mental health is associated with adverse educational, health, and social outcomes [9], [10]. School is said to be a context for the positive promotion and prevention of mental health problems. Mental health includes mental, emotional, and spiritual [11]. Students with good mental health are characterized as building and developing resilience in

the face of stresses in life [12]. This resilience must be developed through family life and the school environment [13]. So, creating a positive school environment is urgently needed.

Causes of unhealthy student mentality at school include acts of bullying, sexual violence, corporal punishment, and even drug abuse. Some juvenile delinquency has reached criminal cases, such as murder by piracy, which is rife in Yogyakarta [14]. It tremendously impacts students who are victims of mental and psychological hazards. A sense of security and comfort for students at school will be able to optimize their mental health well. Students with good mental health will give birth to psychologically prosperous individuals to achieve national education goals and produce quality and outstanding students.

The main problems that cause trauma disorders to psychosocial post-traumatic stress disorder cause various social issues. Identification as early as possible can be made with the innovative construction of survey instruments that assessment centers in developed countries are now developing. A good survey instrument can prevent mental hazards in schools [15]. In addition, this learning environment survey is a diagnostic assessment used to determine student learning readiness. The follow-up survey results developed are knowing the mapping of students' abilities and whether there are indications of mental and psychological hazards in schools [16], [17]. Once identified through these instruments, schools can take action by providing guidance and counseling services to foster students, for example, information services, content mastery services, group guidance services, and individual counseling services [18], [19]. Thus, the products developed can increase preventive efforts in keeping the student learning environment safe and conducive to learning.

Mental health in schools is crucial for students and staff, encompassing emotional balance, stress coping, healthy interpersonal relationships, and effective learning. The American Psychological Association (APA) and World Health Organization (WHO) emphasize the importance of mental health in schools, promoting access to services and security and removing stigma. The National Alliance on Mental Illness (NAMI) underscores the need for staff education and support. Educational psychologists play a vital role in understanding and supporting mental health, providing counseling, training, and strategies for creating a supportive environment. Educators and counselors play a critical role in fostering a supportive learning environment.

The literature indicates a high prevalence of mental health issues among senior high school students [20], [21]. In aggregate, the publications suggest that mental health issues pose a substantial concern among the population of senior high school students, hence warranting increased focus on their mental well-being several risk variables are associated with mental health problems among senior high school students. In a study conducted by Kim [20], it was seen that females exhibited lifestyle-related behaviors that were less conducive to good health and were more susceptible to experiencing adverse mental health outcomes. The findings above indicate that it is imperative to devise and execute treatments targeting several domains, such as educational institutions, familial units, social networks, and the individual adolescent, to mitigate the occurrence of mental health problems among senior high school students.

Some experiences triggering mental health issues by senior high school students based on literature consist of some variables. The first is bullying. Bullying is a pervasive concern inside educational institutions, impacting students across various age groups, genders, and ethnic backgrounds. Oliveira *et al.* [22] reveal that the predominant factor contributing to bullying incidents in Brazilian schools was related to physical attractiveness. Zych *et al.* [23] opines that bullying is a multifaceted psychosocial phenomenon characterized by a hierarchical power dynamic and a culture of silence. Conversely, the presence of positive relationships with both instructors and classmates, as well as a perceived sense of academic achievement, were identified as characteristics that offer protection against such behaviors. The scholarly articles indicate that bullying is complex, necessitating a comprehensive school-wide intervention strategy for prevention and resolution. Consequently, it is recommended that anti-bullying initiatives incorporate cognitive-motivational aspects in their design and implementation.

The scholarly literature posits that manifestations of intolerance inside educational institutions encompass various phenomena, such as racism, xenophobia, and religious intolerance. According to Juwita *et al.* [24] study, there is evidence to suggest that male pupils enrolled in a religious-based elementary school exhibit a higher degree of ignorance towards differences, while their female counterparts demonstrate a greater sensitivity towards diversity. It must be addressed that this mindset will fully grow as time goes on and age adds. It has to be anticipated by implementing some ways at home and school. In general, the scholarly articles indicate that intolerance inside educational institutions is a multifaceted matter necessitating a comprehensive strategy for effective resolution. A preventive way to detect intolerance at schools is by spreading the diagnostic intolerance questionnaire toward the experiences that students directly experienced or witnessed.

Sexual violence is a pervasive concern within educational institutions, wherein distinct manifestations of such abuse transpire across various contexts. According to the research of Pereira *et al.* [25], the lack of educational environments addressing the issue of sexual violence is a contributing cause to its prevalence within educational institutions. The implementation of efficient measures aimed at avoiding sexual violence within educational institutions is a matter of great importance. However, further research is required to ascertain the optimal tactics that yield the highest efficacy. According to the study conducted by Lester [26],

many programs, such as cognitive-behavioral therapies, social-emotional interventions, and peer mentorship and mediation programs, can be implemented to reduce the acts of sexual violence at schools. However, further investigation is required to ascertain the enduring impacts of these interventions and identify the essential components of effective interventions. As a solution, the author suggests including sexual education in the regular school curriculum, including conducting a diagnostic test for all parties of schools, with the participation of families.

Drug abuse has adverse short- and long-term effects on students' mental health. Mental health that is damaged by drug abuse are mental disorders [27], physical and emotional damage [28], symptoms of anxiety and posttraumatic stress [29], and depressive symptoms [30]. Not only that, drug abuse in schools can have adverse effects on academic performance. Zemba [31] found that drug abuse led to poor academic performance, absenteeism, and low concentration in class among pupils. Teresia [32] also highlights the adverse effects of drug abuse in schools, including poor academic performance. Pereira *et al.* [33] found that implementing drug abuse prevention programs in schools was associated with the manager's experience in education and with the teaching strategies of the school. Handrianto *et al.* [34] emphasize the importance of teachers in drug abuse prevention in schools, as students spend most of their quality time at school, and teachers' roles have resulted in their being the critical factor in the prevention of drug consumption.

Gender equality lately tends to be an essential issue in all fields of business, including education. In the educational field, gender equality can be achieved by realizing gender parities. The promotion of gender equality within educational institutions can be achieved by employing gender-responsive learning strategies, incorporating gender considerations into lesson planning, organizing classrooms in a manner that is sensitive to gender dynamics, utilizing inclusive terminology, and fostering gender-inclusive classroom interactions [35]. Educators must make much effort to promote gender equality in the school environment, including in the classroom during teaching and learning activities.

Physical punishment is associated with the development of mental health disorders. Duran and Ensom apply Eriksonian theory to explain how physical punishment may disrupt the successful resolution of psychosocial crises in childhood and adolescence, leading to mental health problems [36]. Three research studies from Afifi *et al.* [37]–[39] suggest that physical punishment is harmful to psychological and physical health and should be avoided.

After several exposures, an instrument is needed to formulate the following problem: i) What is the learning environment diagnostic survey (LEDS) constructed to improve mental health in senior high school? ii) What is the validity and reliability of the LEDS constructed to improve mental health in senior high school?

2. METHOD

This study is a development research utilizing instrument development procedures. This research aims to explain the methods of instrument development and prove the quality of the instruments to measure the learning environment that supports mental health in senior secondary schools in a province in Indonesia. The development procedures conducted in this research are determining objectives, collecting supported theories, designing a blueprint of the instrument based on related theories and research, composing the indicators and items of the instrument, validating the instrument (content validity and construct validity), and finalizing the instrument.

2.1. Participants

This study engaged 1615 students of senior secondary school from 5 regencies in Indonesia. Because of the size of the population and the researcher's inability to draw a representative sample of it at random, convenience sampling was used in this study [40]–[43]. The participants' grades are not restricted to gaining more comprehensive data from new senior secondary school students, first graders, or third graders. The participants' demography is clearly illustrated in Table 1.

Table 1. The demographic data of the participants

Category	Frequency	Percentage
Regency		
Sleman	415	26
Bantul	170	10
Gunung Kidul	373	23
Kota Yogyakarta	405	25
Kulonprogo	252	16
Grade		
X	566	35
XI	569	35
XII	480	30

2.2. Data collection

The data collection is done through a survey. Participants from five regencies were invited to fill out the questionnaire spread from the WhatsApp application in the form of Google Forms. The collection of the data was in a classroom accompanied by the teachers.

2.3. Data analysis

In analyzing the data gained from content validity, V Aiken was utilized. The range score from 1-5 given by the experts to each item of the instruments was calculated. For construct validity, the result of tryouts from Google Forms was analyzed using SmartPLS to test the validity and estimate the reliability. The quality of the instrument's items was calculated using item response theory assisted by jMetrik.

3. RESULTS AND DISCUSSION

After the instrument's construction is done in composing, the instrument's quality is tested by proving the validity and reliability as well as the item quality of the instruments. Validity can be divided into three categories: criterion validity, content validity, and construct validity [44]. All sources of validity, however, are optional to be fulfilled or confirmed for validity. According to Lissitz and Samuelson [45], an analysis of the test's content and an empirical analysis of the test results on the test instrument can reveal information about a test device's reliability. Therefore, construct and content validity are used to examine the validity of this instrument. The ability of an instrument to measure the content or scope of the material as intended at the outset is referred to as the instrument's content validity. Correct values and appropriate sampling methods are two crucial components of content validity [46]. Focus group discussions (FGDs) can be used to test the content validity of an article [47].

3.1. Content validity

The FGD was carried out in these stages: i) brainstorming, conveying an explanation from the chief of researchers about the concept; ii) presentation by a resource person from the FGD members; and iii) conclusions from the discussion results. The FGD consisted of eight people: two policyholders, two educational evaluation experts, two classroom learning experts, and two educational psychology experts. There were 71 instruments in the FGD consisting of 55 direct question (DQ) instruments and 16 situational judgment test (SJT) instruments. The results of the brainstorming showed that: i) it was necessary to reduce the items because they were deemed to be too many, at least to 50%; ii) the SJT instrument has a statement that is too long, so it must be summarized; and iii) change the instrument indicator from DQ to SJT because it is difficult to measure that point directly. The following are the results of the FGD, which will be analyzed using the V-Aiken method to prove the validity of the instrument content. From Table 2, it can be concluded that all items of the instruments are valued highly by the experts. It is assumed that the instrument is ready to be tested in the next step: to test the construct validity.

Table 2. The results of content validity by eight experts

Instrument	Indicator	V-Aiken	Instrument	Indicator	V Aiken
Bullying	Physical bullying	0.96875	Sexual violence	Rape	0.9375
Bullying	Physical bullying	0.90625	Sexual violence	Rape	0.875
Bullying	Verbal bullying	0.84375	Sexual violence	Rape	0.9375
Bullying	Verbal bullying	0.84375	Sexual violence	Sexual intimidation	0.96875
Bullying	Social bullying	0.96875	Sexual violence	Sexual intimidation	0.9375
Bullying	Social bullying	0.96875	Sexual violence	Sexual intimidation	0.90625
Bullying	Cyberbullying	1	Sexual violence	Sexual harassment	1
Bullying	Cyberbullying	1	Sexual violence	Sexual harassment	0.96875
Bullying	Sexual bullying	0.96875	Sexual violence	Sexual harassment	1
Bullying	Sexual bullying	1	Drug abuse	Drug use	0.84375
Intolerance	Religious intolerance	0.96875	Drug abuse	Drug use	0.71875
Intolerance	Religious intolerance	0.9375	Drug abuse	Drug trafficking	0.78125
Intolerance	Religious intolerance	0.96875	Drug abuse	Drug trafficking	0.90625
Intolerance	Economic intolerance	0.96875	Gender equality	Equality of treatment in learning	0.96875
Intolerance	Economic intolerance	0.9375	Gender equality	Educational equality	0.96875
Intolerance	Economic intolerance	0.96875	Gender equality	Equality of treatment outside the classroom	1
Intolerance	Cultural intolerance	0.9375	Gender equality	Right to obey the same rules	0.96875
Intolerance	Cultural intolerance	0.96875	Physical punishment	Light punishment	0.9375
Intolerance	Cultural intolerance	0.96875	Physical punishment	Light punishment	0.9375
			Physical punishment	Severe punishment	0.9375
			Physical punishment	Severe punishment	0.96875

3.2. Construct validity

The construct validity is done through a tryout. The tryout was carried out at five high schools in five districts in Yogyakarta Province. The sample obtained was a total of 1615 students. Data were analyzed using confirmatory factor analysis (CFA) in second order. Using the help of the SmartPLS application in analyzing trial data of a learning environment diagnostic survey instrument to determine the mental health quality of 1615 high school students in grades X, XI, and XII in Yogyakarta City and Regency, the construct of a learning environment diagnostic survey instrument was obtained. The construct of the learning environment diagnostic survey instrument consists of 6 variables, namely the variables of bullying (bullying), intolerance, sexual violence, drug abuse, gender equality, and corporal punishment. Each variable has an indicator that explains these variables. The bullying variable has five indicators: physical, verbal, social, cyberbullying, and sexual. Intolerance has three indicators: religious intolerance, economic intolerance, and cultural intolerance.

Meanwhile, sexual violence is represented by three indicators, namely rape, sexual intimidation, and sexual harassment. Next, the drug abuse variable is defined by two indicators, namely drug use and distribution. The gender equality variable is defined by four indicators: equality of treatment in learning, equality of education, equality of treatment outside the classroom, and the right to obey the same rules. The last is the physical punishment variable, which has two indicators, namely indicators of light punishment and severe punishment. The learning environment diagnostic survey instrument consists of 6 variables, which are reduced to 19 indicators, 40 questions, and statements are formulated as DQ), 28 items, and a SJT with 12 items. The analysis results show quality in the form of validity and reliability of the learning environment diagnostic survey instrument, learning environment diagnostic survey instrument variables, and loading factors for each learning environment diagnostic survey instrument item. From the data analysis process, the composite reliability (CR) value is obtained, which can determine internal consistency reliability, with a standard CR value > 0.7 (adequate internal consistency) [48]. Other values obtained from SmartPLS analysis in Cronbach's Alpha should be > 0.7.

3.3. Validity

The validity standard is met by looking at the internal consistency reliability analysis value using CR, which meets the standard. Internal consistency reliability answers whether the statement items used in the questionnaire can measure the construct to be studied [48]. Nunnally [44] determined the internal consistency Reliability value with CR values ranging between 0.6 and 0.7 to be acceptable for exploratory studies. Another way to interpret an instrument construct is with Cronbach's Alpha. The alpha coefficient that should be obtained on an excellent predicate is > 0.7 [44].

Analysis of pretesting results uses convergent validity to see how well an item can measure the same construct in a study [48]. Convergent validity can be analyzed by calculating three tests: factor loading (factor loading/outer loading), CR, and average variance extracted (AVE). The first is an assessment of external loading or what is usually called a loading factor. Table 3 shows the loading factors from the analysis process using smartPLS.

Table 3 shows the analysis results of each indicator on the learning environment diagnostic instrument variable. According to Kamis *et al.* [49], the loading factor must be greater than 0.7, and CR must be greater than 0.5. Of the 40 loading factors from the 40 items of the learning environment diagnostic survey instrument, 31 had a loading factor of > 0.7, 7 had a loading factor value of > 0.7, and even two items had a minus score. Factor loading values in the range of 0.4 to 0.7 should be considered for removal because if small loading factors are removed, it is likely that the AVE value will increase.

However, several theories differentiate the lowest factor loading value. Mardapi [47] states that the minor factor loading value that can still be mentioned by finger is the loading factor with a value of 0.3, which is still acceptable. Thus, based on Mardapi [47], the 38 loading factors of the 40 construct items of the learning environment diagnostic survey instrument have met the valid standard, namely, they are more significant than 0.3. Two items with a minus loading factor value must be considered to be eliminated or reviewed. These two items come from the variable sexual violence with indicators of sexual intimidation and sexual harassment. It could be because discussions related to this topic are still very taboo, so respondents' openness to this matter still needs to be improved. Apart from that, another possibility that causes this is the type of statement or question made into favorable and unfavorable forms. The two minus loading factors are good statements/questions on the sexual violence variable. It allows for ambiguity among respondents.

Table 3. Loading factors of each item in the instrument

Indicator	Cronbach's Alpha	Rho_A	CR	AVE	Items	Outer loading
Physical bullying	0.471	0.482	0.789	0.652	FSK1	0.764
					FSK2	0.849
Verbal bullying	0.396	0.403	0.767	0.622	VBL1	0.830
					VBL2	0.745
Social bullying	0.541	0.542	0.813	0.685	SSL1	0.818
					SSL2	0.837
Cyberbullying	0.538	0.596	0.806	0.677	CBY1	0.742
					CBY2	0.896
Sexual bullying	0.091	0.104	0.674	0.521	SKL1	0.864
					SKL2	0.545
Religious intolerance	0.427	0.468	0.728	0.484	ITA1	0.468
					ITA2	0.787
					ITA3	0.783
Economic intolerance	0.710	0.722	0.840	0.638	ITE1	0.845
					ITE2	0.858
					ITE3	0.682
Cultural intolerance	0.499	0.500	0.750	0.502	ITB1	0.638
					ITB2	0.765
					ITB3	0.716
Rape	0.638	0.645	0.807	0.584	PMK1	0.775
					PMK2	0.677
					PMK3	0.832
Sexual intimidation	-0.487	0.750	0.429	0.667	IDS1	-0.792
					IDS2	0.677
					IDS3	0.832
Sexual harassment	-0.777	0.727	0.353	0.644	PCS1	-0.820
					PCS2	0.841
					PCS3	0.743
Drug use	0.261	0.265	0.729	0.574	PMN1	0.711
					PMN2	0.802
Drug trafficking	0.163	0.163	0.705	0.544	PDN1	0.718
					PDN2	0.757
Equality of treatment in learning	1.000	1.000	1.000	1.000	KPP	1.000
Educational equality	1.000	1.000	1.000	1.000	KMP	1.000
Equality of treatment outside the classroom	1.000	1.000	1.000	1.000	KPL	1.000
Right to obey the same rules	1.000	1.000	1.000	1.000	HMP	1.000
Light punishment	0.222	0.222	0.720	0.562	HKR1	0.747
					HKR2	0.752
Severe punishment	0.158	0.162	0.701	0.542	HKB1	0.804
					HKB2	0.661

3.4. Reliability

After obtaining conclusions regarding the construct validity of the learning environment diagnostic survey instrument, which is included in the valid category for most items, the reliability estimates need to be studied further to show the quality of the learning environment diagnostic survey instrument. The assessment regarding reliability estimates can be seen from several values presented in Table 4. The rules for determining whether the reliability of an instrument construct is good or not have been explained at the beginning.

Table 4. Construct reliability estimation and learning environment instrument variables

Instrument	Variable	Cronbach's Alpha	Rho_A	CR	AVE
Learning environment		0.380	0.869	0.310	0.154
	Bullying	0.709	0.736	0.792	0.287
	Intolerance	0.721	0.727	0.801	0.312
	Sexual violence	0.316	0.790	0.613	0.372
	Drug use	0.372	0.378	0.679	0.347
	Gender equality	0.221	0.230	0.629	0.301
	Physical punishment	0.284	0.290	0.649	0.318

From Table 4, it can be concluded that overall, judging from the values of CR (should be > 0.7), Cronbach's Alpha (> 0.7), Rho_A (> 0.7), and AVE (> 0.5), the construct of a learning environment diagnostic survey instrument to assess the mental health of high school students does not yet have high reliability. The recorded Cronbcah's Alpha value was 0.380 and CR 0.310 (< 0.7), which is still very far from the standard. Even though it has a good Rho_A value, the AVE value also does not meet the standard > 0.5, namely only 0.154.

Low-reliability estimates are also owned by several latent variables in the construct of the learning environment diagnostic survey instrument, where the variables of sexual violence, drug abuse, gender equality, and corporal punishment have Cornbcah's Alpha, CR, and AVE values, which are below standard (> 0.7 and > 0.5). Meanwhile, two variables, bullying and intolerance, have Cr values that meet the standard, namely > 0.7. However, it is not followed by Cornbach's Alpha and AVE values. Thus, it can be concluded that the learning environment diagnostic survey instrument has low reliability. Even though each item is valid and can measure each indicator studied, this instrument still needs to provide steady or reliable research results when used in different research settings. The implications of research on the development of learning environment surveys provide less than optimal results, especially in the reliability coefficient. The variety of research subjects indicates this. Of the five schools that were the main objects, it turned out that they could still not provide adequate results. However, the instrument will be better developed if integrated with broader learning environment indicators.

4. CONCLUSION

The highlight of this study was to test the quality of content, construct quality, validity and reliability of a questionnaire-based survey instrument to measure a learning environment that supports students' mental health. The learning environment tool to support student mental health has six variables: bullying, harassment, violence, drug abuse, gender equality, and corporal punishment. There are at least two points that support these six variables. The final variable is corporal punishment which is presented in two categories, namely light punishment and heavy punishment. The survey instruments are direct questionnaires and situation assessment tests. There are 28 DQ related to bullying, intolerance, and violence. For the remaining three variables, there are 12 items as decision tests. The instrument's validity is low because the CR, Cronbach's alpha and calculated variance are below normal values (> 0.7 and > 0.5). This tool can be used periodically at all academic levels to assess patterns that may negatively impact students' mental health. This situation makes responding to questions and comments difficult for students with different skill levels.

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