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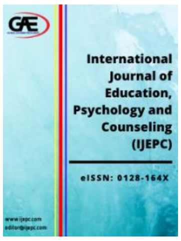

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ASSESSING THE VALIDITY AND RELIABILITY OF ADAPTED CLASSROOM CLIMATES INSTRUMENT FOR MALAYSIAN RURAL SCHOOLS USING PLS-SEM

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Abstract:

The association between classroom climate qualitity and students' academic achievement has been well researched. The relationship of a student to the classroom climate can be viewed from the seminal work of Moos (1974) in classifying the dimensions between individual relationship and the surrounding environment into "relationship", "personal growth" as well as "systems maintenance and change". Students' perspective on their classroom climate can be used as a mechanism for classroom assessment to provide useful information regarding the strengths and weaknesses as well as an opportunity for teacher's reflection in teaching practices. Hence, the main objective of this study is to produce empirical evidence of the validity and reliability of the item in Malay version of What is Happening in This Class? (WIHIC) questionnaire in the context of Malaysian rural secondary schools which is used to study students' perceptions of their mathematics learning experiences in the classroom. PLS-SEM approach with aided by Smart PLS version 3.2.8 software was used to examine the internal consistency reliability, convergent validity, discriminant validity. The translated questionnaire was administered to 338 students of rural secondary schools in Sabah, Malaysia by using the multi-stage cluster sampling. Results showed a PLS-SEM measurement model with 48-items demonstrating good convergent and discriminant validity and reliability. This finding concluded that all items in the Malay version of WIHIC are valid and reliable to be used in future study. Lastly, the current study supports the use of WIHIC for educational practices improvement that could be beneficial to stakeholders such as teachers, administrators and policy makers.

Keywords:

Validity, Reliability, PLS-SEM, Rural Schools, Translated Questionnaire

Introduction

Classroom is the central of organizing for most of the schools. The main reason to organize students into classes is to promote learning (Yerdelen & Sungur, 2019) by enabling teacher and students working together to improve students' learning outcomes. In a school setting, the most common evidence of student acquisition in mathematics skills is their mathematics grade and performance but other indicators of learning outcomes include active involvement in class activities, improved learning strategies, changes in study habits and increased motivation (Cayubit, 2021). These learning outcomes are affected by many factors and a plenty of studies highlighted the role of classroom climate quality (Lay, 2017; Mohammadi & Aliakbari, 2018; Reynolds *et al.*, 2017; Riaz & Asad, 2018) as crucial influencing factor.

In a classroom, students might encounter different experiences on the way that their teacher assess their emotional states and needs. Teacher, as an expert in a position very close to the students in a classroom, may have a role in shaping the nature of their classroom climate (Hendrickx *et al*., 2016). Moreover, the role of classroom climate quality is assosiated with improved students' learning such as students' cohesiveness (Ouyang & Chang, 2019), teacher-child interactions (Hu *et al.*, 2017), student involvement (Sedova *et al*., 2019), investigation (Maison *et al*., 2019), task orientation (Liu & Su, 2018), cooperation (Fischer et al., 2018; Tran *et al*., 2019) and equity (Lim & Yeo, 2019; Tang et al., 2017), but still few studies have been conducted in the context of Asian education specifically in rural schools.

There is no denial of the fact that the disparities between urban and rural schools regarding quality education and performance in public examination are widening at an alarming rate especially in developing countries (Yap & Siow, 2016). In Malaysian context, mathematics has been a critical subject in certain locations, especially in rural schools. Statistical evidence also showed that there is a significant difference of the TIMSS mathematics achievement among urban and rural schools in Malaysia. A summary of the mathematics performance by locality in TIMSS 2011 to TIMSS 2019 is provided in Table 1

Table 1: TIMSS Mathematics Average Score By Locality (Malaysia) from 2011 to 2019

Locality	2011	2015	2019
Urban	448	470	471
Rural	416	442	435

Source: Malaysia Ministry of Education (2020)

The gap in public examination performance of mathematics such as Malaysian Certificate of Education (SPM) between urban and rural students indirectly influences an individual state's performance in the national ranking. Both urban and rural schools are expected to show the same academic performance as they follow a common curriculum and syllabus. Thus, it is worth exploring students' perception on their mathematics classroom climate by considering the association between classroom climate qualitity and students' academic achievement has been well researched. This is also in line with the TIMSS 2019 report which found that school

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climate is among the non-cognitive predictors of Malaysian students' achievement in mathematics (Malaysia MOE, 2020).

It is apparent that teacher who wishes to promote a student-centred instruction, whereby she/he concerns on students' perspectives and also focuses on teaching and learning practices (Barr, 2016), needs to create a conducive classroom climate. Teachers often use achievement test and other methods of assessment such as project reports to evaluate student progress in learning, but the quality of a classroom climate especially on the psychometric structures of the classroom are often neglected (Khine *et al.*, 2018). Therefore, there is a possibility for teachers to improve their teaching practices by utilizing students' feedback from questionnaire such as the What is Happening in This Class? (WIHIC) (Fraser *et al*., 1996).

In genaral, the classroom climate scales of WIHIC is a leading instrument for measuring psychosocial aspects of classroom climate which enabling students to perceive their learning experinces has been used in research in many countries (i.e. Iran (Mohammadi & Aliakbari, 2018), Indonesia (Maison *et al.*, 2019), Myanmar (Khine *et al.*, 2018), Saudi Arabian (Alghamdi & Alanazi, 2020), USA (Stein & Klosterman, 2020). However, in Malaysia, little research exists on mathematics classroom climate specifically in rural schools because versions of the WIHIC have not been validated for the Malaysian rural students population.

This study used WIHIC that was translated into Malay language as well as adapted and modified to accomodate students' mathematics learning experiences to assess students' views on their mathematics classroom climate including students cohesiveness, teacher support, involvement, investigation, task orientation, cooperation as well as equity. Hence, the aim of this study is to validate, in mathematics classroom climate of rural schools in Malaysia, the Malay version of WIHIC. The validation of the WIHIC was measured by using the partial least square structural equation modelling approach (PLS-SEM). Through PLS-SEM approach, the aims of the study are to provide empirical evidence on: (i) the internal consistency reliability of the constructs (outer loading, Cronbach's alpha, rho_A (ρ_A) and composite reliability (CR), (ii) convergent validity (average variance extracted (AVE), and (iii) discriminant validity (heterotrait–monotrait criterion (HTMT)).

Literature Review

Classroom Climate

Classroom climate can be defined as reflection of students' views on their learning experience (Barr, 2016). This includes students' perception on their interaction with teacher and classmates, their involvement in the classroom activities as well as organizational structure of the classroom including teaching and learning practices. The student perception is a useful source of information for a teacher to create a conducive classroom climate because he/she has encountered many different learning environments to form an accurate impression. Hence, student's perceptions of the classroom climate as an important determinant of teacher's effort in establishing a conducive learning environment. In other words, if a student does not perceive his/her classroom climate in a positive way, he/she will lack of interest in learning process.

In order to understand the relationship of student to the classroom climate, this must be viewed from the seminal work of Moos (1974). According to Moos (1974) scheme, there are three dimensions to classify human environment. In the context of the current study, the dimension

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of relationship assessed the nature and strengths of personal relationships, the extent of involvement and assistance from teachers or classmates in the classroom climate. Meanwhile, the dimension of personal growth assessed the availability of opportunities for students' development and enhancement. The dimension of systems maintenance and change assessed whether the classroom climate is orderly, clear explanation on classroom rules as well as the classroom learning goals. Hence, conceptual framework of the classroom climate in this study (Figure 1) is rooted the Moos (1974) scheme whereas the dimension of relationship assessed student cohesiveness, teacher support and involvement. The personal growth dimension assessed students' investigation, task orientation, cooperation in mathematics classroom, meanwhile the systems maintenance and change dimension assessed equity, in accordance to seven constructs in WIHIC (Fraser *et al*., 1996).

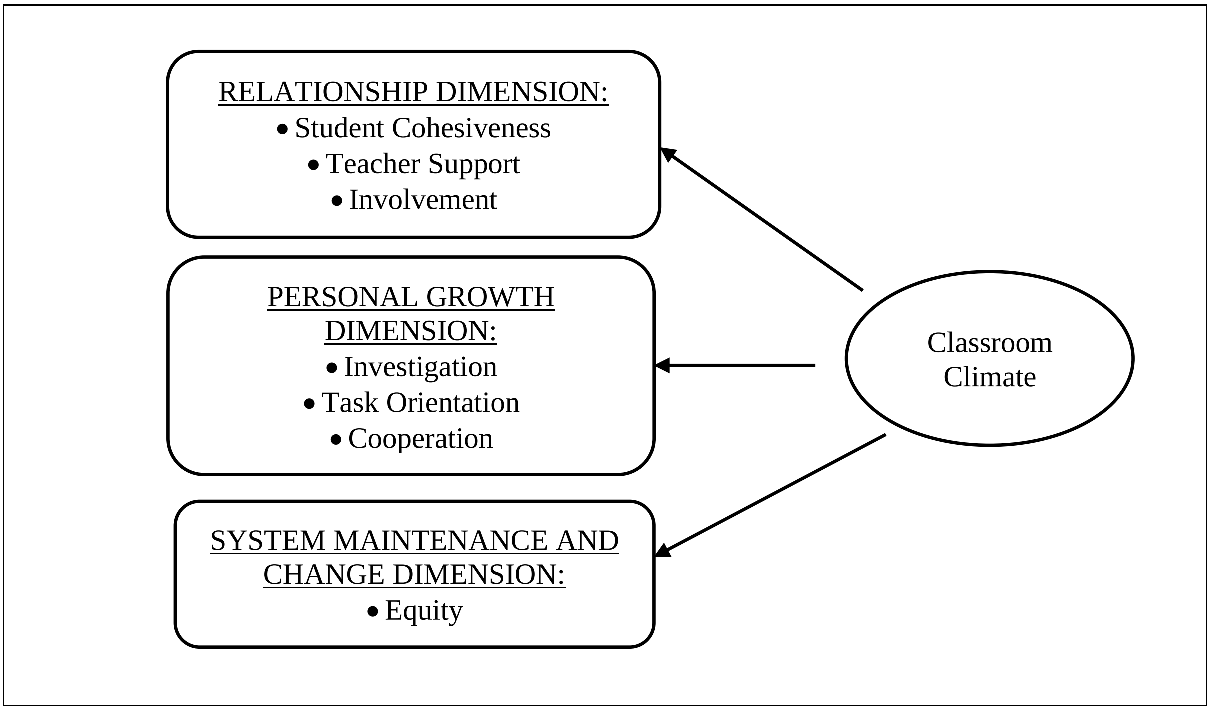

Figure 1: Conceptual Framework of Classroom Climate

Students' Perception on Classroom Climate

Classroom climate has been demonstrated to associate with individuals' various attributes and outcomes (Cayubit, 2021). When a student receives assistance from his/her classmates, this will provide opportunities for students to interact, exchange information and correct mistakes which can lead them to think more deeply about the learning process (Chan & Goh, 2020). These studies highlighted the potential of student cohesiveness can be developed when the teacher allows the students to work together or to interact during classroom activity.The students may retain more learning content when they are given an access to work in groups because they felt a sense of connectedness to achieve learning goals.

The global lockdown due to the COVID-19 pandemic has resulted in serious interruption in students' learning around the world. Numerous studies from Western (Niemi & Kousa, 2020; Long *et al.*, 2022; Ruiz-Robledillo *et al.*, 2022; Schwartz1 *et al.*, 2021) as well as Asia (Alawamleh *et al.*, 2021: Barrot *et* al., 2021; Foo *et al.*, 2021) showed that students preferred traditional classroom-based (face-to-face) to their online classes. These studies showed that the

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critical issue associated with online learning during COVID-19 pandemic is the absence of social interaction between teacher and students or among their classmates. The students feel isolated from teachers and their classmates and eventually lead to educational stress suffered by the students (Schwartz1 *et al.*, 2021).

The important role of teacher support has also been profoundly confirmed in the past studies (Hu *et al*., 2017; Zepeda *et al*., 2018). These studies highlighted that a warm and supportive teacher–student relationship forming a sense of security in students to participate actively in classroom activity, thus improving their academic performance. However, empical study showed that teachers in Malaysia facing problems such as lack of time and heavy curriculum that hinder teachers fostering a condusive classroom climate to teach High Order Thinking Skills (HOTS). This was also empirically supported by Işık and Balçıkanlı (2020) who showed that crowded classes and overloaded curriculum as the issues which hinder teachers' supportive practices in a classroom.

Numerous of studies highlighted the findings related to task orientation and investigation on students' learning outcomes (Asy'ari *et al*., 2019; Maison *et al*., 2019; Sabrila *et al*., 2019). In other words, students need to understand and aware that it is necessary to complete a learning task (task orientation) and stay focus on the learning process (investigation). These findings indicated that teachers should focus on students' learning objectives and ensure that students understand how to tackle the task confidently.

It is noteworthy that equity in a classroom climate also serves as an influential factor in determining teacher's teaching practices perceived by a student. This statement echoes previous findings from Schnell and Prediger (2017), Tang *et al*. (2017), Lim and Yeo (2019) as well as Ahmed and Indurkhya (2020) which indicated that when all students are free to participate in the classroom activities, there is an access point to learn since they have the opportunity to discuss and present their ideas on the learning tasks. As a result, students may engage in a learning content by participating and building knowledge on other classmates' contribution.

From the literature review, the students will learn better and enjoy their lessons if they perceive their classroom climate positively. However, the use of any psychometric structure of a scale in a different culture rather than its origin may need to adapt the measuring instrument properly (Mohd Dzin & Lay, 2021). Hence, it is important to validate the Malay version of WIHIC in rural secondary schools setting.

WIHIC As Classroom Climate Assessment

The questionnaire of WIHIC, which was developed by Fraser *et al*. (1996), is a combination of the most prominent scales from a variety of existing questionnaires such as Learning Environment Inventory and My Class Inventory (Anderson *et al.*, 1981), Classroom Environment Scale (Trickett & Moos, 1973), Individualized Classroom Environment Questionnaire (Rentoul & Fraser, 1979), etc.

The original version of WIHIC in English language has been exhibited strong reliability and validity in Australia (Giles & Fraser, 2017), Israel (Alt, 2015), Singapore (Peer & Fraser, 2015) and USA (Stein & Klosterman, 2020). It has been translated into other languages and used in foreign contexts such as Indonesia (Maison *et al.*, 2019), Myanmar (Khine *et al.*, 2018),

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Malaysia (Karpudewan & Chong, 2017) and Greece (Charalampous & Kokkinos, 2017). However, these studies used different statistical analysis to validate WIHIC. For example studies of Alt (2015), Khine *et al*, (2018) and Maison *et al*. (2019) used SEM approach, Stein and Klosterman (2020) used principal factor analysis, whereas Charalampous and Kokkinos (2017) used qualitative approach to examine the constructs of classroom psychosocial climate (CPSC) as defined by the seven scales in WIHIC based on the perception of both teachers and students.

PLS-SEM and Reflective Measurement Model

The method of SEM enables researchers to deal with unobservable variables which are measured indirectly by indicator variables (Hair *et al*., 2017). In general, there are two types of SEM: Covariance-Based SEM (CB-SEM) and PLS-SEM. According to Sarstedt *et al.* (2017), PLS-SEM is a predictive or causal modelling approach that maximises the endogenous latent variables' explained variance. This study used PLS-SEM approach to predict the latent variables (constructs) and observed variables (indicators of the latent variables) that used reflective constructs. The direction of causality is from the construct to the indicators; thus, observed measures are assumed to reflect variation in the latent variable. In other words, changes in the construct are expected to be manifested in changes in all of its indicators. In the context of this study, the indicators such as "*I make friendships easily among students in mathematics class"* (PK1) and "*I know other students in the mathematics class*" (PK2) are manifestations of the construct student cohesiveness (PK). Since a reflective measure dictate that all indicator items are caused by the same construct, hence, e.g. PK1 and PK2 associated with construct student cohesiveness should be highly correlated with each other. Fig. 2 shows a measurement model of the mathematics classroom climate in rural secondary schools in Sabah, Malaysia.

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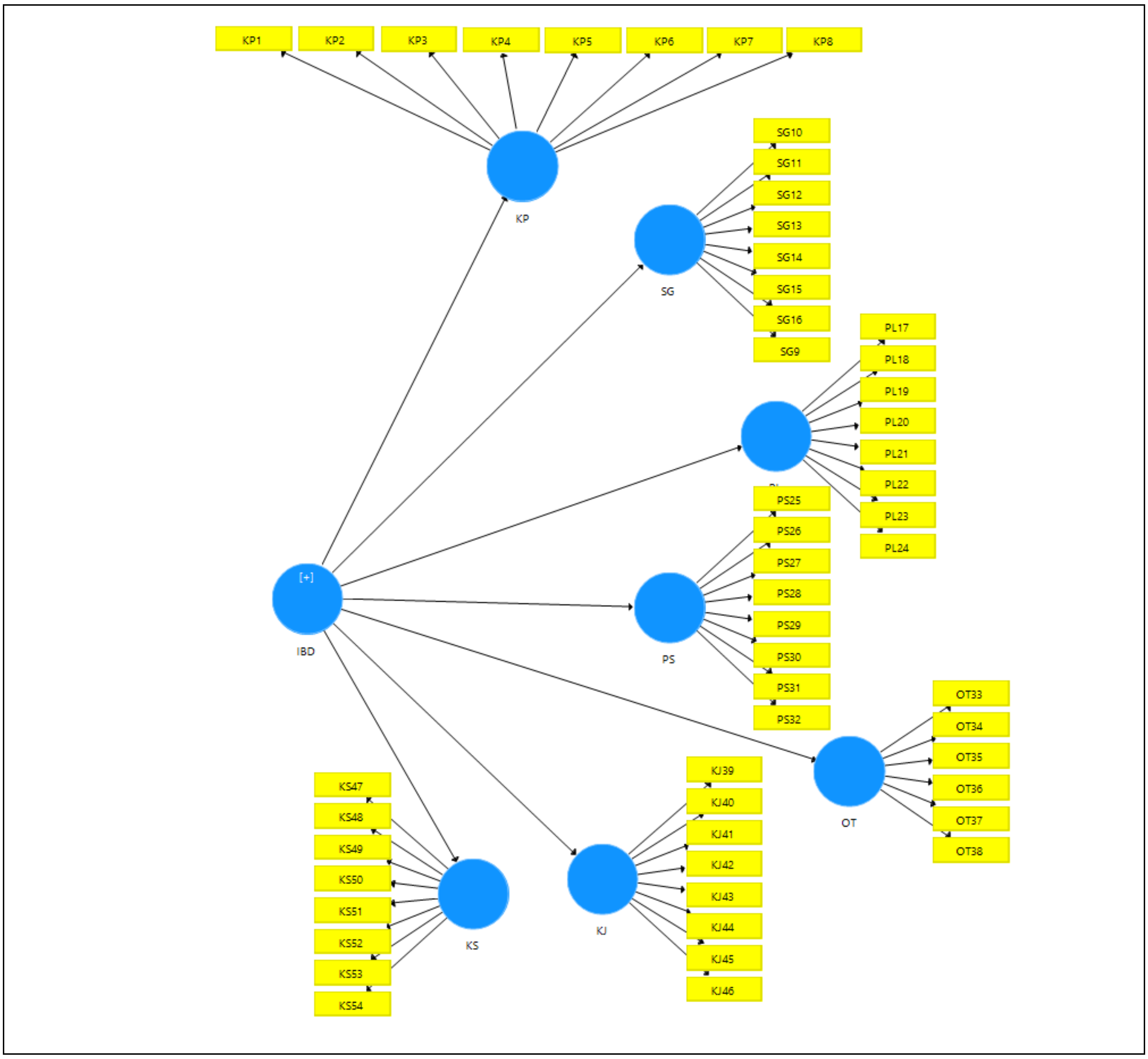

Figure 2: A Measurement Model with 54 Indicators of Classroom Climate

Note: IBD: Classroom Climate KP: Student cohesiveness, SG: Teacher Suport, PL: Involvement, PS: Investigation, OT: Task Orientation, KJ: Cooperation, KS: Equity

Method

Samples

The sample of the current study involved 338 students of rural secondary schools in Sabah, Malaysia. The students were drawn from five out of 12 schools by using the multi-stage cluster sampling. The distribution of respondent profiles according to gender and school name are given in Table 1.

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Table 1: The Distribution of Respondent Profiles According to Gender and School Name

Respondent Profile	Information	Frequency	Percentage
Gender	Boy	149	44.1
	Girl	189	55.9
School Name	A	84	24.9
	B	58	17.2
	C	82	24.3
	D	50	14.8
	E	64	18.9

Instrument

The WIHIC is used to measure the students' perception on their mathematics classroom climate. The back-to-back translation was performed to translate the original version of WIHIC from English into Malay language. Table 2 shows the codes and description of WIHIC used in this study.

All of the items in WIHIC were measured in a structured format on a five-point Likert scale. The five-point Likert scale ranging from "Never" to "Always". Since the nature of questions in the original version of WIHIC encompassing a general statement on classroom climate (eg: I give my opinions during class discussions"), researchers modified some of terms in the WIHIC questions to accommodate the students' mathematic learning experiences (eg: "I give my opinions during mathematics class discussions").

A pilot study was conducted prior to the PLS-SEM analysis. The pilot study was conducted on 20 students to examine the feasibility of WIHIC in Malay language whether the students interpreted the items correctly. After item analysis in the pilot study, two items were deleted while the other 54 items are suitable to be used for assessing validity and reliability of WIHIC by using PLS-SEM analysis.

Table 2: Construct, Codes and Description of the Adapted What is Happening In This Class? (WIHIC) Questionnaire

Construct	Codes	Description
Student Cohesiveness	KP	Extent to which students knows, help and are supportive of one another in mathematics classroom
Teacher Support	SG	Extent to which mathematics teacher assist, befriends, trust and shows concern on students
Involvement	PL	Extend to which students have attentive interest, participate in discussions, perform additional work and enjoy the mathematics class
Investigation	PS	Extend to which there is articulation on the skills to be beneficial for mathematics problem solving
Task Orientation	OT	Extend to which it is important for task completion
Cooperation	KJ	Extend to which students cooperate rather than compete with one another on mathematics tasks
Equity	KS	Extend to which the mathematics teacher attends to all students equally

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Common Method Bias Test

It is important to address the issue of common method bias (CMB) when the five-point Likert scale being used to measure each of the items in the WIHIC. Therefore, correlation matrix procedure was used to determine whether the variation in responses is due to the study instrument or the issue of CMB. Bagozzi *et al* (1991) proposed a method to overcome the issue of CMB, high correlation among the principal constructs indicated the existence of CMB (r > 0.9). Thus, the latent variable's correlations were examined among the principal constructs in the correlation matrix as shown in Table 3. There is none of the latent variable's correlations more than 0.9 between constructs in Table 3 which indicated that CMB is not an issue in this study.

Table 3: Common Method Bias Test

	KP	KJ	KS	PK	OT	PL	PS	SG
KP	1							
KJ	0.585	1						
KS	0.553	0.721	1					
PK	0.486	0.528	0.543	1				
OT	0.581	0.691	0.578	0.554	1			
PL	0.750	0.516	0.545	0.468	0.524	1		
PS	0.394	0.529	0.496	0.498	0.592	0.43	1	
SG	0.881	0.608	0.569	0.437	0.552	0.778	0.381	1

Data Analysis

Reflective Measurement Model Assessment

According to Hair *et al*. (2017), the assessment of reflective constructs including indicator reliability, internal consistency reliability, convergent validity as well as discriminant validity. Hence, the reflective measurement model assessment in this study will be reported based on the updated guidelines from Hair *et al*. (2019).

The assessment of internal consistency reliability of WIHIC referred to the index of composite reliability (CR) while indicator reliability through the outer loading values. Meanwhile, the convergent validity for WIHIC was assessed through the average variance extracted (AVE) values while discriminant validity through the HTMT criterion. In this study, consistent Partial Least Squares (PLSc) estimation had been used to assess reflective measurement model as recommended by Henseler *et al*. (2016). The use of PLSc is proven to help rectify the inconsistent results, generated by traditional PLS algorithm (Cheah *et al*., 2018).

The first step in reflective measurement model assessment involves examining the indicator loadings. Hair *et al*. (2019) suggested a loading above 0.708 is acceptable for item reliability. It indicates a construct explains more than 50 percent of the variance of the indicator.

Then, internal consistency reliability is examined through three indexes: Cronbach's alpha, rho_A (ρ_A) and composite reliability (CR). In general, higher values show good reliability. In exploratory research, the reliability values ranged from 0.60 and 0.70 are considered as "acceptable", meanwhile, values between 0.70 and 0.90 range from "satisfactory to good". However, value of 0.95 and above is not desirable because it is an indication of the items are redundant which will affect the construct validity (Diamantopoulos et al., 2012).

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Assessing internal consistency reliability via Cronbach's alpha is less precise measure of reliability because the items are unweighted compare to the composite reliability, whereas the items are weighted based on the construct indicators' individual loadings, hence, produces higher reliability than Cronbach's alpha (Jöreskog, 1971). As an alternative, Dijkstra and Henseler (2015) proposed reliability coefficient rho_A as an approximately exact measure of construct reliability, which usually lies between Cronbach's alpha and the composite reliability. Hence, coefficient rho_A may represent a good compromise if one assumes that the factor model is correct. Therefore, in this study, the report on the reliability of WIHIC scale will cover on the coefficient of Cronbach's alpha, rho_A and CR.

The next step in reflective measurement model assessment is to report on the convergent validity of each construct measure. Convergent validity concerns the extent to which the construct converges to explain the variance of its items. The metric used for evaluating a construct's convergent validity is the average variance extracted (AVE) for all items on each construct. The value of AVE can be calculated by squaring the loading of each indicator on a construct and compute the mean value. Hair *et al*. (2019) recommended the acceptable AVE is 0.50 and above which indicating the reflective construct explains at least 50 per cent of the variance of its items.

The fourth step is to assess discriminant validity through Fornell-Larcker criterion or heterotrait-monotrait (HTMT) criterion, which is the extent to which a reflective construct is different from other constructs in the structural model. In this study, HTMT criterion had been used to assess discriminant validity of WIHIC scales. The HTMT is defined as the mean value of the item correlations across constructs relative to the (geometric) mean of the average correlations for the items measuring the same construct. A threshold value for HTMT value for structural models proposed by Henseler *et al*. (2015) is 0.9 with the similar concept constructs whereas 0.85 for constructs with distinct concept.

To sum up, Table 4 summarizes the rules of thumb for evaluating the validity and reliability of the scale in WIHIC. In order to generate the PLS-SEM algorithm from SMART PLS software, PLSc test was conducted to assess the outer loadings for seven constructs in WIHIC.

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Table 4: Rules of Thumb in PLS-SEM for Reflective Measurement Model

Categories	Indexes	Criteria
Item Reliability	Reflective Indicator Loadings	≥ 0.708
Internal Consistency Reliability	Cronbach's alpha rho_A (ρ_A) Composite Reliability (CR)	Cronbach's alpha is the lower bound, CR is the upper bound for internal consistency reliability. rho_A usually lies between these bounds and may serve as a good representation of a construct's internal consistency reliability, assuming that the factor model is correct. > 0.70 (or 0.60 is acceptable for exploratory research) ≤ 0.95 to avoid redundant items which would compromise content validity The recomended values ranged from 0.7 to 0.90
Convergent Validity	Average Variance Extracted (AVE)	AVE ≥ 0.50
Discriminant Validity	Heterotrait-monotrait (HTMT)	For conceptually similar constructs: HTMT < 0.90 For conceptually different constructs: HTMT < 0.85

Source: Hair *et al*., (2019). When to use and how to report the results of PLS-SEM

Result and Discussion

Indicator Reliability (Outer Loadings)

Based on Table 5, the outer loading value for the entire indicator exceeds the threshold level of 0.708 proposed by Hair *et al.* (2019), except for the five indicators SG9 (0.604), SG11 (0.703), PL18 (0.669), PS25 (0.698) and OT38 (0.522). The four indicators (SG9, PL18, PS25 and OT38) were removed from the reflective measurement model of classroom climate in this study to improve the AVE values of the construct. Although outer loading for SG11 is below the 0.708 level, indicator removal should be initiated from the indicator with the lowest outer loading overall. Therefore, indicator SG11 is conditionally accepted by considering the values of CR and AVE, for the teacher support (SG) construct as the host of the indicator (SG11). To sum up, the remaining 50 indicators with a a loading above 0.708 indicates seven constructs in WIHIC explains more than 50 percent of the variance of the indicators respectively, thus providing acceptable indicators reliability.

Internal Consistency Reliability

Based on Table 5, the coefficient values of Cronbach's alpha, ρ_A and CR for all constructs in WIHIC are higher than 0.7 but less than 0.95 which passed the acceptance value for internal consistency reliability recommended by Hair *et al.* (2019) and no redundant items in each construct.

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Convergent Validity

After the removal of four items (SG9, PL18, PS25 and OT38), the values of outer loading, Cronbach's alpha, rho_A, CR and AVE for each construct and indicator reached an acceptable and satisfactory level as shown in Table 5. All seven constructs achieved the thresholds of AVE greater than 0.5 and were accepted in this study. All the constructs fulfilled the requirements for reliability and convergent validity.

Table 5: Summary of Outer Loading, Rho_A, Composite Reliability, Cronbach's Alpha and Average Variance Extracted of Indicators After Adjustment

Construct Code	Indicator	Outer Loading	Rho_A(ρ_A)	CR	*Cronbach's Alpha*	AVE
KP	KP1	0.817	0.948	0.947	0.947	0.690
	KP2	0.896				
	KP3	0.782				
	KP4	0.892				
	KP5	0.751				
	KP6	0.863				
	KP7	0.794				
	KP8	0.837				
SG	SG10	0.814	0.928	0.924	0.925	0.636
	SG11	0.703				
	SG12	0.726				
	SG13	0.802				
	SG14	0.929				
	SG15	0.820				
	SG16	0.769				
PL	PL19	0.744	0.921	0.917	0.917	0.648
	PL20	0.859				
	PL21	0.749				
	PL22	0.721				
	PL23	0.870				
	PL24	0.872				
PS	PS26	0.740	0.944	0.940	0.938	0.692
	PS27	0.828				
	PS28	0.839				
	PS29	0.909				
	PS30	0.824				
	PS31	0.731				
	PS32	0.931				
OT	OT33	0.832	0.914	0.912	0.911	0.674
	OT34	0.850				
	OT35	0.814				
	OT36	0.860				
	OT37	0.746				
KJ	KJ39	0.808	0.928	0.926	0.925	0.642
	KJ40	0.827				
	KJ42	0.754				
	KJ43	0.748				

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Construct Code	Indicator	Outer Loading	Rho_A(ρ_A)	CR	*Cronbach's Alpha*	AVE
	KJ44	0.871				
	KJ45	0.858				
	KJ46	0.730				
KS	KS47	0.805	0.933	0.930	0.929	0.627
	KS48	0.890				
	KS49	0.771				
	KS50	0.714				
	KS51	0.769				
	KS52	0.858				
	KS53	0.796				
	KS54	0.715				

Discriminant Validity

Before the discriminant validity test was carried out, two more indicators (items): KJ41 and PL17 need to be removed from the reflective measurement model to improve the internal consistency reliability and convergent validity of the construct. After the elimination process, all constructs exhibited satisfactory discriminant validity. The HTMT values for all constructs in WIHIC were below the threshold level of acceptance with the highest HTMT value, 0.881 (SG, KP) as shown in Table 6. This result indicated that there was no correlation within and between the constructs. Therefore, all the constructs in WIHIC meet the requirement of discriminant validity in Malaysian rural schools setting.

Table 6: The Result of Discriminant Validity for HTMT ratio

	KJ	KP	KS	OT	PL	PS	SG
KJ							
KP	0.590						
KS	0.719	0.552					
OT	0.691	0.578	0.578				
PL	0.532	0.752	0.552	0.527			
PS	0.528	0.394	0.495	0.585	0.443		
SG	0.610	0.881	0.566	0.551	0.790	0.379	0.352

The work of Moos (1974) has been widely used in literature to explain human relationship with the environment. To create a conducive classroom climate, teachers need to develop and reinforce the dimensions of relationship, personal growth as well as systems maintenance and change in classroom teaching practices which is in line with the work of Moos (1974). Classroom climate has been considered as an influential factor in students' learning. It is noteworthy that how students view their classroom climate is essential to provide teachers with feedback on their teaching practices.

The results of the current validation study for WIHIC in Malay language with the data drawn from 338 students, representing 1319 students of rural secondary schools across Sabah state, Malaysia supported its internal consistency reliability as well as convergent and discriminant validity for this population. This result is in line with the findings of Stein and Klosterman (2020) as well as Charalampous and Kokkinos (2017), which proved that the WIHIC is

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consistent in psychometric features across validation using principal factor analysis to qualitative approach. Although the statistical analysis in previous studies were distinctly different, but both analyses indicated that WIHIC met the requirement of psychometric properties, which can be used as an instrument to assess the classroom climate.

The validation of WIHIC's seven constructs proved the items are valid and reliable through SEM approach which would replicate recent studies by Khine *et al*, (2018) and Maison *et al*. (2019). However, to solve the gap in previous studies, the issue of CMB while using the five-point Likert scales is addressed in the current study. Moreover, the current findings provide empirical evidence regarding the seven constructs in WIHIC can be used in mathematics domain as well as in the context of rural secondary school students which in line with previous Malaysian study in science domain (Karpudewan & Chong, 2017). Therefore, the Malay version of WIHIC as a measuring instrument to assess students' view on their learning experiences is suitable for samples with the similar context to the Malaysian rural schools setting. To sum up, indicators of a good quality of classroom climate are: high level of student-student and teacher student relationship, participate actively in classroom activities, do more investigation, task oriented, working together with other students in completing learning tasks as well as their mathematics teacher attends to all students equally.

Limitation and Implications

This study has three limitations that need to be addressed to clarify the state of the study. First, students' feedback on their classroom climate are limited to their honesty and sincerity when answering the WIHIC submitted. Hence, it would be useful for future study to conduct in depth interviews with students to guarantee the truthfulness of the respondents.

Second, the samples are differ in backgrounds, cultures, learning achievement, cognitive abilities as well as learning styles under the same classroom. By considering these differences, students' feedback are constrained by the way that the students perceived individual role within the classroom climate.

On the other hand, all the students in this study were drawn from a single state (Sabah) in Malaysia and within five rural secondary schools, the findings cannot be generalized to other country. In order to draw broader generalization about mathematics classroom climate in Malaysia, it is necessary to select students from urban schools for future study to test the feasibility of WIHIC used in the current study.

Conclusion

The classroom climate as a reflective measurement model in the current study had satisfied the requirements of indicator reliability, internal consistency reliability, convergent and discriminant validity by using the PLS-SEM approach. The WIHIC questionnaire exhibited good validity and reliability after the elimination of six indicators (SG9, PL17, PL18, PS25, OT38 and KJ41). Hence, the remaining 48 items in WIHIC can be used as an instrument to assess students' feedback on their mathematics classroom climate in Malaysia setting especially rural schools. The current study supports the use of WIHIC for educational practices improvement that could be beneficial to stakeholders such as teachers, administrators and policy makers.

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Volume 7 Issue 47 (September 2022) PP. 383-401
DOI 10.35631/IJEPC.747033

References

Abdul Rabu S. N. & Badlishah., N., S. (2020). Peer Interaction Patterns in a Collaborative Learning Environment Using Google Docs. *ASM Science Journal*, 13(3), 50-55

Ahmed, M. M. H., & Indurkhya, B. (2020). Investigating cognitive holding power and equity in the flipped classroom. *Heliyon*, *6*(8), e04672. https://doi.org/10.1016/j.heliyon.2020.e04672

Alawamleh., Al-Twait, L., M., Al-Saht., G., R. (2020). The effect of online learning on communication between instructors and students during Covid-19 pandemic. *Asian Education and Development Studies*. 11(2). 380-400. https://doi.org/10.1108/AEDS-06-2020-0131

Alghamdi, A. K., & Alanazi, F. H. (2020). Process-Oriented Guided-Inquiry Learning in Saudi Secondary School Chemistry Instruction. Eurasia Journal of Mathematics, Science and Technology Education, 16(12), 1–16. https://doi.org/10.29333/ejmste/9278

Alt, D. (2015). Using structural equation modeling and multidimensional scaling to assess students' perceptions of the learning environment and justice experiences. *International Journal of Educational Research*. 69. 38-49.

Anderson, G., J., Walberg, H., J., & Fraser, B., J. (1981). *Assessment of learning environments: Manual for Learning Environment Inventory (LEI) and My Class Inventory (MCl). Sydney*, Australia: Macquarie University, 3rd version

Barr, J. J. (2016). Developing a Positive Classroom Climate. IDEA Paper, 61, 1-9.

Bagozzi, R. P., Yi, Y., & Phillips, L. W. (1991). Assessing Construct Validity in Organizational Research. *Administrative Science Quarterly*, 36(3), 421–458. https://doi.org/10.2307/2393203

Barrot, J. S, Llenares I., I, Del Rosario L., S. (2021). Students' online learning challenges during the pandemic and how they cope with them: The case of the Philippines. *Education and Information Technologies*. 26(6):7321-7338. https://doi.org/10.1007/s10639-021-10589-x

Cayubit, R. F. O. (2021). Why learning environment matters? An analysis on how the learning environment influences the academic motivation, learning strategies and engagement of college students. *Learning Environments Research*, 1-19. https://doi.org/10.1007/s10984-021-09382-x

Chan C. T. & Goh. J. (2020). Social and cognitive dimensions of collaboration in informal learning spaces: Malaysian social science students' perspectives. Interactive Learning Environments, 1–15. https://doi.org/10.1080/10494820.2020.1799029

Charalampous, K., & Kokkinos, C. M. (2017). The "What Is Happening in This Class" Questionnaire: A Qualitative Examination in Elementary Classrooms. *Journal of Research in Childhood Education*, 31(3), 379–400. https://doi.org/10.1080/02568543.2017.1310153

Cheah, J., H., Memon, M., A. Chuah, F., Ting., H. & Ramayah, T. (2018). Assessing reflective models in marketing research: A comparison between pls and plsc estimates. *International Journal of Business and Society*. 19(1), 139-160.

Diamantopoulos, A., Sarstedt, M., Fuchs, C., Wilczynski, P. and Kaiser, S. (2012), Guidelines for choosing between multi-item and single-item scales for construct measurement: a predictive validity perspective, *Journal of the Academy of Marketing Science*, 40(3), 434-449.

Dijkstra, T.K. & Henseler, J. (2015), Consistent partial least squares path modeling, *MIS Quarterly*, 39 (2), 297-316.

International Journal of Education, Psychology and Counseling
EISSN : 0128-164X
IJEPC
Volume 7 Issue 47 (September 2022) PP. 383-401
DOI 10.35631/IJEPC.747033

Fischer, P., Camba, L., Ooi, S. H., & Chevalier, N. (2018). Supporting cognitive control through competition and cooperation in childhood. *Journal of Experimental Child Psychology*, 173, 28–40. https://doi.org/10.1016/j.jecp.2018.03.011

Foo, Cc., Cheung, B. & Chu, Km. A (2021). Comparative study regarding distance learning and the conventional face-to-face approach conducted problem-based learning tutorial during the COVID-19 pandemic. BMC Med Educ 21, 141. https://doi.org/10.1186/s12909-021-02575-1

Fraser, B., McRobbie, C., & Fisher D. (1996). Development, validation and use of personal and class forms of a new classroom environment questionnaire. *WAIER (1996). Proceedings Western Australian Institute for Educational Research Forum 1996.* http://www.waier.org.au/forums/1996/contents.html

Giles, R. M., & Fraser, B. J. (2017). *Learning environment and attitudes in middle-school mathematics*. Paper presented at the annual meeting of the American Educational Research Association, San Antonio, TX

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. 2nd Edition. Los Angeles: SAGE Publications.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, 31(1), 2-24. https://doi.org/10.1108/EBR-11-2018-0203

Hendrickx, M. M. H. G., Mainhard, M. T., Boor-Klip, H. J., Cillessen, A. H. M., & Brekelmans, M. (2016). Social dynamics in the classroom: Teacher support and conflict and the peer ecology. *Teaching and Teacher Education*, 53, 30–40. https://doi.org/10.1016/j.tate.2015.10.004

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, 43(1), 115-135. https://doi.org/10.1007/s11747-014-0403-8

Hu, B. Y., Fan, X., Wu, Z., LoCasale-Crouch, J., Yang, N., & Zhang, J. (2017). Teacher-child interactions and children's cognitive and social skills in Chinese preschool classrooms. *Children and Youth Services Review*, 79, 78–86. https://doi.org/10.1016/j.childyouth.2017.05.028

Işık, T., & Balçıkanlı, C. (2020). Efl teachers' autonomy supportive practices for out-of-class language learning. *IAFOR Journal of Education*, 8(4), 63–78. https://doi.org/10.22492/ije.8.4.04

Jöreskog, K.G. (1971), Simultaneous factor analysis in several populations, *Psychometrika*, 36 (4), 409-426

Karpudewan, M. & Chong, K., M. (2017). The effects of classroom learning environment and laboratory learning environment on the attitude towards learning science in the 21st-century science lessons. *Malaysian Journal of Learning and Instruction*, Specialissue, 25–45. https://doi.org/10.32890/mjli.2017.7795

Kementerian Pendidikan Malaysia. (2020). *Laporan Kebangsaan TIMSS 2019: Trends in Mathematics and Science Study*. Putrajaya: Kementerian Pendidikan Malaysia.

Khine, M. S., Fraser, B. J., Afari, E., Oo, Z., & Kyaw, T. T. (2018). Students' perceptions of the learning environment in tertiary science classrooms in Myanmar. Learning Environments Research, 21(1), 135–152. https://doi.org/10.1007/s10984-017-9250-0

Lay Yoon Fah. (2017). The Relationship between Form 4 Students' Perceptions of Science Classroom Environment and Attitudes towards Science. *Jurnal Pemikir Pendidikan*, 8 , 1-42.

International Journal of Education, Psychology and Counseling
EISSN : 0128-164X
IJEPC
Volume 7 Issue 47 (September 2022) PP. 383-401
DOI 10.35631/IJEPC.747033
Lim, S. L., & Yeo, K. J. (2019). Students' perceived learning environment for self regulation. *Indian Journal of Public Health Research and Development*, 10(4), 1454–1459. https://doi.org/10.5958/0976-5506.2019.00919.7

Liu, H. H., & Su, Y. S. (2018). Effects of using task-driven classroom teaching on students' learning attitudes and learning effectiveness in an information technology course. Sustainability, 10(3957), 1–14. https://doi.org/10.3390/su10113957

Long, C.S., Sinclair, B.B., Fraser, B.J., Larson, T.R., Harrell, P.E. (2022) The use of metacognitive strategies for undisrupted online learning: Preparing university students in the age of pandemic. *Learning Environments Research*, 25, 343-357. https://doi.org/10.1007/s10984-021-09376-9

Luria, S. R., Sriraman, B., & Kaufman, J. C. (2017). Enhancing equity in the classroom by teaching for mathematical creativity. *ZDM - Mathematics Education*, 49(7), 1033–1039. https://doi.org/10.1007/s11858-017-0892-2

Maison, Syahrial, Syamsurizal & Tanti. (2019). Learning environment, students' beliefs, and self-regulation in learning physics: Structural equation modeling. Journal of Baltic Science Education, 18(3), 389–403. https://doi.org/10.33225/jbse/19.18.389

Manwaring, K. C., Larsen, R., Graham, C. R., Henrie, C. R., & Halverson, L. R. (2017). Investigating student engagement in blended learning settings using experience sampling and structural equation modeling. *Internet and Higher Education*, 35, 21–33. https://doi.org/10.1016/j.iheduc.2017.06.002

Mccleary, D. F., Mccreary, B., & Coles, J. (2019). Cognitive Variables, Classroom Behaviors, and a Participation Intervention on Students' Classroom Participation and Exam Performance. *International Journal of Teaching and Learning in Higher Education*, 31(2), 184–194. http://www.isetl.org/ijtlhe/

Mohammadi, S., & Aliakbari, M. (2018). Students' Perceived Classroom Climate and Their Achievement Goal Orientations in an Iranian EFL Context. *International Journal of Foreign Language Teaching and Research*, 6(23), 129–145.

Mohd, Dzin, N., H. & Lay. (2021). Validity and Reliability of Adapted Self-Efficacy Scales in Malaysian Context Using PLS-SEM Approach. *Education Sciences*. 11. 676. https://doi.org/10.3390/educsci11110676

Moos, R. H. (1974). *The social climate scales: An overview*. Palo Alto, CA: Consulting Psychologists Press.

Moos, R., H., & Trickett, E., J. (1974). *Classroom environment scale manual*. Palo Alto, CA: Consulting.

Niemi, H. M., & Kousa, P. (2020). A case study of students' and teachers' perceptions in a Finnish high school during the COVID pandemic. International Journal of Technology in Education and Science (IJTES), 4(4), 352-369.

Ouyang, F., & Chang, Y. H. (2019), The relationships between social participatory roles and cognitive engagement levels in online discussions. British Journal of Educational Technology, 50(3). 1396-1414. https://doi.org/10.1111/bjet.12647

Peer, J., & Fraser, B. J. (2015). Sex, grade-level and stream differences in learning environment and attitudes to science in Singapore primary schools. *Learning Environments Research*, 18(1), 143–161.

Rentoul, A. J., & Fraser, B. J. (1979). Conceptualization of enquiry-based or open classroom learning environments. *Journal of Curriculum Studies*, 11, 233-245

Reynolds, K. J., Lee, E., Turner, I., Bromhead, D., & Subasic, E. (2017). How does school climate impact academic achievement? An examination of social identity processes.

Volume 7 Issue 47 (September 2022) PP. 383-401
DOI 10.35631/IJEPC.747033
School Psychology International, 38(1), 78–97. https://doi.org/10.1177/0143034316682295

Riaz, H. M., & Asad, A. R. (2018). Effect of Classroom Learning Environment on Students' Academic Achievement in Mathematics at Secondary Level. *International Journal of Academic Research*, 40(2), 207–218.

Ruiz-Robledillo, N.; Vela-Bermejo, J.; Clement-Carbonell, V.; Ferrer-Cascales, R.; Alcocer-Bruno, C.; Albaladejo-Blázquez, N. (2022). Impact of COVID-19 Pandemic on Academic Stress and Perceived Classroom Climate in Spanish University Students. International Journal of Environmental Research and Public Health, 19(7), 4398. https://doi.org/10.3390/ijerph19074398

Sabrila, A., I., T., P., Dafik, Tirta, I., M. & Malik, R., S. (2019). Investigation the effect discovery based learning on students metacognition in solving rainbow 2-connection numbers. *Earth and Environmental Science*, 243, 1-18. http://dx.doi.org/10.1088/1755-1315/243/1/012053

Sarstedt, M., Ringle, C., M. & Hair, J., F. (2017). *Partial Least Squares Structural Equation Modeling*. Springer International Publishing.

Schnell, S., & Prediger, S. (2017). Mathematics enrichment for all - noticing and enhancing mathematical potentials of underprivileged students as an issue of equity. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(1), 143–165. https://doi.org/10.12973/eurasia.2017.00609a

Schwartz K., D., Exner-Cortens D, McMorris C., A., Makarenko, E., Arnold, P., Bavel, M., V., Williams, S., Canfield, R. (2021). COVID-19 and Student Well-Being: Stress and Mental Health during Return-to-School. *Canadian Journal of School Psychology*. 36(2), 166-185. https://doi.org/10.1177%2F08295735211001653

Sedova, K., Sedlacek, M., Svaricek, R., Majcik, M., Navratilova, J., Drexlerova, A., Kychler, J., & Salamounova, Z. (2019). Do those who talk more learn more? The relationship between student classroom talk and student achievement. Learning and Instruction, 63, 1-11. https://doi.org/10.1016/j.learninstruc.2019.101217

Seman. S. C., Yusoff. W., M., W. & Embong. R. (2017). Teachers Challenges in Teaching and Learning for Higher Order Thinking Skills (HOTS) in Primary School. *International Journal of Asian Social Science*, 7(7), 534–545. https://doi.org/10.18488/journal.1.2017.77.534.545

Stein, S., & Klosterman, P. (2020). Nature of learning environment in concurrent enrollment mathematics classrooms: a cluster analysis. Learning Environments Research, 23(2), 217–234. https://doi.org/10.1007/s10984-019-09295-w

Tang, G., Cilli-turner, E., Savic, M., Karakok, G., & Plaxco, D. (2017). Inquiry as an entry point to equity in the classroom. *International Journal of Mathematical Education in Science and Technology*, 48(S1), S4–S15. https://doi.org/10.1080/0020739X.2017.1352045

Tran, V. D., Nguyen, T. M. L., De, N. Van, Soryaly, C., & Doan, M. N. (2019). Does cooperative learning may enhance the use of students' learning strategies? *International Journal of Higher Education*, 8(4), 79–88. https://doi.org/10.5430/ijhe.v8n4p79

Trickett, E. J., & Moos, R. H. (1973). Social environment of junior high and high school classrooms. *Journal of Educational Psychology*, 65(1), 93–102

Yap. M. K. C., & Siow. H. L. (2016). A Preliminary Study of Educational Leadership in the Rural Context in Malaysia. Asian Journal of University Education, 12(2), 1–19.

Yerdelen, S., & Sungur, S. (2019). Multilevel Investigation of Students' Self-regulation Processes in Learning Science: Classroom Learning Environment and Teacher

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 7 Issue 47 (September 2022) PP. 383-401
DOI 10.35631/IJEPC.747033

Effectiveness. *International Journal of Science and Mathematics Education*, 17(1), 89–110. https://doi.org/10.1007/s10763-018-9921-z

Zepeda, C. D., Hlutkowsky, C. O., Partika, A. C., & Nokes-malach, T. J. (2018). Identifying Teachers ' Supports of Metacognition Through Classroom Talk and Its Relation to Growth in Conceptual Learning. *Journal of Educational Psychology*, 111(3), 522-541. https://doi.org/10.1037/edu0000300