PSYCHOMETRIC PROPERTIES ANALYSIS OF STUDENT CLASSROOM ENGAGEMENT SCALE IN THE ACADEMIA OF PAKISTAN

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ABSTRACT

The aim of this study was to design a classroom engagement scale for undergraduate students at the higher education level. Classroom engagement was divided into three dimensions: cognitive engagement, relational engagement, and social media engagement. The target population of this research has consisted of undergraduate students, including social sciences, business sciences, and pure sciences—the participants of this research comprised 305 students as a sample. The questionnaire was distributed among undergraduate students; only 305 useable questionnaires were returned with a response rate of 20.33%. The item pool was developed for the scale after examined an extensive literature review. Three factors were identified such as cognitive engagement, relational engagement, and social media engagement for classroom engagement. The SnmartPLS 3.2.2 statistical software was used to analyze the relationships drawn in the conceptual model. The 23 items were identified on a 7-point Likert-Type scale (1, strongly disagree, to 7, strongly agree). Based on the factor analysis results, all three subscales proved reliable and valid and significantly positively correlated with classroom engagement. Therefore, it was concluded that the classroom engagement scale was also reliable and valid.

INTRODUCTION:

Student classroom engagement is one of the essential research areas of higher education and educational psychology. The education system cannot work correctly if the students are not engaged in the classroom appropriately. This factor affects academic performance. Student classroom engagement positively influences student academic performance (Delfino, 2019; Kahu & Nelson,

2018; Lee, 2014; Zhoc, 2015). Student engagement, either inside the classroom or out of the classroom, is considered to be necessary for learning, achievement, retention, determination, performance, and understanding (Appleton, Christenson, Kim, & Reschly, 2006; Lei, Cui, & Zhou, 2018; Mohammad, Said, Ibrahim, Faridahwati, & Darwina, 2018). Classroom engagement is also constructive for student efficacy, achievement, socialization, welfare, satisfaction with life, and effective learning (Li et al., 2010). Kahu and Nelson (2018), explained that student classroom engagement is a psychological and sociological concept. Most of the researches has concentrated on examined the concept as the quality of effort (Pace & Swayze, 1999), time task on (Kuh, 2009), theory of student involvement (Astin, 1999), social and academic integration (Davidson & Wilson, 2013), outcomes (Roksa et al., 2017), good practices in undergraduate education (Seifert, Pascarella, Goodman, Salisbury, & Blaich, 2010), student interactions (Vandenbroucke, Spilt, Verschueren, Piccinin, & Baeyens, 2018), and student engagement (Kahu & Nelson, 2018; Kuh, 2009). Student classroom engagement is defined as the students' quality effort inside the classroom to accelerate purposeful contribution towards their desired learning outcomes in their educational institution (Axelson & Flick, 2010; Groccia, 2018). The student classroom engagement is also defined as the time to be assigned for such activities by Kuh (2009). Students use energy, time, and sources to engage the students in activities to enhance their academic performance at university (Menekse, Stump, Krause, & Chi, 2013). The main focus of the definition mentioned above of student engagement is on in-class and students' involvement in academic activities. Moreover, it can be concluded that student classroom engagement is a vital factor in higher education. This current study, psychometric properties, was assessed as a tool designed to measure student classroom engagement in higher education, covering the various dimensions such as cognitive engagement, relational engagement, and social media engagement. A complete and comprehensive definition was required for different dimensions. We defined student classroom engagement as the concept of intellectually engaging students inside the classroom, their relationship with their teachers and peers, and the effective use of social media in the learning process to achieve successful desired learning outcomes in university. These constructs are more focused on higher education than elementary and secondary education; their main focus is on the activities performed by the student inside the classroom at the university level. The results were extracted by applying the factor analysis on taken responses using a 7-point Likert scale from undergraduate students as participants. It described that the construct of classroom engagement should be studied within the scope of classroom engagement factors.

Dimensions of Classroom Engagement

Student classroom engagement has been explored as a multidimensional concept in recent years. This can be cover cognitive engagement, emotional engagement, behavioral engagement, social engagement, academic engagement, and psychological engagement with other combinations. (Appleton et al., 2006; Delfino, 2019; Groccia, 2018; Kahu & Nelson, 2018; Zhoc, 2015). In most of the researches, classroom engagement has been studied with these dimensions either separately or collectively like students motivation,

behave (behavioral engagement), think (cognitive engagement), feel (emotional engagement), and socialize (campus engagement) (Büchele, 2021; Gunuc & Kuzu, 2015). Student classroom engagement may vary with different educational levels. This present study focused on investigating student classroom engagement in the context of higher education. This research focused on three subscales of student classroom engagement: cognitive engagement, relational engagement, and social media engagement. After extensive literature review, we find the need to develop the holistic classroom engagement concept for the recent time, with respect to these three sub-dimensions of classroom engagement at higher education level, each of these components presented in Figure 1.
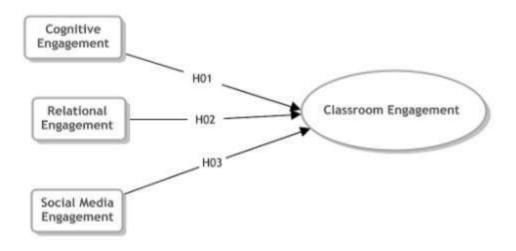

Figure 1. *Conceptual framework*

Classroom Engagement: This study has examined student classroom engagement in the context of higher education in Pakistan. Student classroom engagement covers three main constructs: cognitive engagement, relational engagement, and social media engagement. All these three dimensions have been explained below.

Cognitive Engagement: In the classroom, students engage intellectually and truly understand a topic and relate this topic with real-life problems over a long time (Rotgans & Schmidt, 2011). Cognitive engagement is an approach where the student tries to comprehend their own learning. It is referred to as student invest their energy, motivation, setting goals, self-regulation, and planning for learning (Appleton et al., 2006; Gunuc & Kuzu, 2015). Cognitive engagement defines as efforts, willingness, commitment, and spend energies on their learning task made by the students (Richardson & Newby, 2006; Rotgans & Schmidt, 2011). Appleton et al. (2006) defined the student cognitive engagement as it has traditionally been operationalized by evaluating the extended student engaging in homework completion, extra-curricular participation in activities, class attendance, their interaction with their peers and teachers in the classroom, and their level of motivation to participate in classroom discussion. Cognitive engagement is considered a stable trait of students in their independence to determine the performing any activity in the

class. Rotgans and Schmidt (2011) explained cognitive engagement very comprehensively as students working with their peer group, participating in discussions, searching online information on the internet, and attending the lecture carefully is likely to result from various cognitive engagement levels of different levels of autonomy. Attending lectures is arguably the least cognitively engagement because the student has less independence there, on the other hand, student searches the information through online browsing, this shows the level of autonomy may be relatively high, this may be lead towards more cognitive engagement (Reeve, Cheon, & Jang, 2019). Group assignment and participation in discussion could be the results, either high or low feelings of autonomy depending on the group dynamics. It was concluded that autonomy level depends on the activity or task and largely determines where students engage cognitively in their tasks (Wang, Deng, & Du, 2018).

Relational Engagement: Student relational engagement is referred to as the. Efforts students made to interact with the peer and teachers to build relationships with them, contributing to students' engagement (Cappella, Kim, Neal, & Jackson, 2013). The primary context for peer relationship is classrooms where the students are engaged in their educational institution. Most of the studies used the classroom as a unit of analysis and identified the peer context, particularly peer norms that contribute to student behavioral aspects. Very few of the studies investigated the associations between the classroom relational engagement and student desired quality engagement. The classroom environment provides the students opportunities to connect to one another and may provide access to engagement (Dotterer & Lowe, 2011). Weizheng (2019), explored the teacher strategies for interaction between teacher and student in English teachers' classroom teaching in China. The results revealed that a significant relationship was found between teacher-student interaction and teacher used the strategies. Bickle and Rucker (2018), conducted a study to examine the student-to-student engagement of 228 undergraduate students enrolled in online course at higher education level. The results shown that group assignments significantly influence students' ability to learn effectively. Therefore, it is concluded that student relationship with their teacher and peers help them engage well in their classroom, leading to better learning opportunities in their higher education classroom.

Social media engagement: The storm of social media takeover every sector of life, including higher education (Chawinga, 2017). The literature is still confused regarding the definition and classification of social media (Azab, Abdelsalam, & Gamal, 2013); some researchers used social media for Twitter, blogs, and Facebook as Web 2.0 technologies, whereas other researchers classify them as social media. In fact, both are Web 2.0, and social media facilitates each other. They publish the content in a participatory and collaborative way—both terms used interchangeably in different researches. Chawinga (2017), conducted a study of 64 students at Mzuzu University to explore the use of blogs and Twitter in a classroom environment. The results revealed that it appropriately deployed Twitter and blogs, and it emerged as the students shared and discussed course materials quickly. It also showed some problems like insufficient computers and the cost of internet data bundles are challenges students face. Atat, Kala, and Jean (2018), conducted the exploration

of the impact of social media on student performance in Cameroon. They described that social media for academic purposes creates enjoyment, helps connect with the other students and faculty, and creates a learning environment (Kircaburun, Alhabash, Tosuntaş, & Griffiths, 2020). Therefore, it is concluded that social media has also become essential to create better learning opportunities at the higher education level.

The purpose of this current research was to design a holistic scale for various others existing literature. In this regard, we studied various dimensions that have a relationship with classroom engagement but were not considered separate classroom engagement scales in literature. These were taken into consideration in this current research. The construct of student classroom engagement was assessed as a holistic perspective with cognitive engagement components, relational engagement, and social media engagement is taken into consideration together. Student classroom engagement with multidimensional construct examined by Zhoc (2015) and Gunuc (2013). Therefore, it is essential to consider that student attitudes and behavior lead them to higher education and psychological engagement. These factors are very significant, and the purpose was to design a reliable and valid classroom engagement scale for undergraduates. The current study is very vigorous because it exposes the various classroom engagement dimensions at the higher education level in Pakistan. The dimensions of classroom engagement are covering cognitive engagement, relational engagement, and social media engagement in university education.

The Motivation of The Study:

Despite significant concentration among practitioners and researchers, few gaps remain needed in designing a reliable and valid instrument on student classroom engagement. First, most of the instruments on student classroom engagement have been designed with overall student engagement, such as campus engagement. Second, we could find no exclusive instrument on classroom engagement in higher education. Third, we could not find the most of instrument with its psychometric analysis, so this is the motivation of our study to design instrument on student classroom engagement in the local context.

RESEARCH METHOD:
This study applied the questionnaire survey approach. The survey questionnaire technique is famous and widely used in large data collection of data and analysis from the target population (Heeringa, West, & Berglund, 2017; Rasool, Wang, Zhang, & Samma, 2020). This survey design analysis approach starts with designing a research instrument (Gu & Guo, 2011).

INSTRUMENTATION:
This research used three dimensions of classroom engagement and subscales: cognitive engagement, relational engagement, and social media engagement. The first part of the instrument has comprised the information regarding the purpose of the study and demographic of the population such as gender, background, sectors, age, and field of education, anonymity, and privacy, and contained instructions for replying. Part two explained the statements of

subscales: 23 statements were used with a 7-point Likert scale type. The response range was strongly disagreed, 1 to strongly agree, 7. Before collecting the final data, the authors have done a pilot study to ensure the instrument's pilot reliability and validity. We conducted this pilot study on 80 participants of undergraduate program students with similar demographics as the final data to the foundation of analysis. All respondents of the pilot study were aware of the research topic and purpose. They suggested a few changes and modifications to the questionnaire. We revised and modified the questionnaire based on their feedback. After revisions, the questionnaire was distributed among participants for final data collection.

Variable Measures:

Cognitive engagement: The statements related to cognitive engagement were adopted from Gunac and Kuzu's work (2015). The cognitive engagement scale comprised six items with a 7-point Likert scale. The response range was strongly disagreed, 1 to strongly agree, 7. The sample of statements used in this questionnaire was such as "I can relate the lessons learned in the classroom with a solution to the real-life problem," "I engage myself in frequent debates and discussions about problems that arise in the class during a lesson." The Alpha value for cognitive engagement was $\alpha=0.816$ (see Table 2). This value is considered higher than the standard value of 0.70. Therefore, this measure was reflected appropriately.

Relational engagement: The statements related to relational engagement were adopted from Gunac and Kuzu's work (2015). The relational engagement scale comprised six items with a 7-point Likert scale. The response range was strongly disagreed, 1 to strongly agree, 7. The sample of statements used in this questionnaire was such as "I give importance to studying together with my classmates (in a group)," "I have teachers that I can share my problems." The Alpha value for relational engagement was $\alpha=0.824$ (see Table 2). This value is considered higher than the standard value of 0.70. Therefore, this measure was reflected suitably.

Social media engagement: The statements related to social media engagement were adopted from the work of Gunac and Kuzu (2015) and Zhoc (2015). The social media engagement scale comprised six items with a 7-point Likert scale. The response range was strongly disagreed, 1 to strongly agree, 7. The sample of statements used in this questionnaire was such as "I engage in academic discussions on social media," "I use social media to disseminate knowledge to my classmates." The Alpha value for social media engagement was $\alpha=0.706$. This value is considered higher than the standard value of 0.70. Therefore, this measure was reflected appropriately.

Target Population and Sample Characteristics:

This survey research is intended to confirm the reliability and validity of an instrument of undergraduate student engagement in the academia of Pakistan. The participants were selected using a stratified random sampling technique.

This method of sampling encompasses the division a

] \ [Pof a population into smaller sub-groups called strata. This method also provides greater precision than a simple random sample of the same size and saves money. This research's target population consisted of undergraduate students of public and private universities in Lahore, Pakistan. We conducted a pilot study on 80 students before the collection of final data. We distributed 1500 questionnaires among the participants; only 305 useable questionnaires returned with a response rate of 20.33%. The sample demographics in detail have been presented in Table 1.

Table 1. *Sample Distribution*

Measure	Items	Frequency (n)	Percentage (%)
Gender	Male	173	56.7
	Female	132	43.3
	Total	305	100.0
Sector	Public	99	23.9
	Private	206	76.1
	Total	305	100.0
Field of Study	Social Science Education	141	46.2
	Business Education	67	22.0
	Physical Sciences	97	31.8
	Total	305	100.0

ANALYSIS AND RESULTS:

Confirmatory Factor Analysis:

The researchers applied confirmatory factor analysis (CFA) to analyze the model in relation to structural equation modeling (SEM). CFA was applied to measure the convergent validity measured through applying the factor loading, Alpha, rho_A, composite reliability, and AVE (average variance extracted). The discriminant validity measure through HTMT analysis. These indicators of each construct and to determine the fitness of the overall measurement model. The model was improved up to the proposed threshold level. We removed the statements, and various trials were executed to achieve the threshold values recommended by Hair, Risher, Sarstedt, and Ringle (2019). We followed the reliability criteria, which was more than 0.70 for Alpha, rho_A, and composite reliability. The factor loading and AVE are appropriate at the threshold value of 0.60 and 0.50, respectively. Factor loading is accepted more than 0.50 if AVE is approperiate. Table 2 the threshold values of Cronbach Alpha, rho_A, composite reliability, factor loading, and AVE meet the criteria.

Table 2. *Reflective Measurement Scales Analysis.*

Measures	Loading	Alpha	rho_A	Composite Reliability	AVE
Cognitive Engagement		0,816	0,823	0,867	0,523
CoE1	0.777				
CoE2	0.723				
CoE3	0.720				
CoE4	0.766				
CoE5	0.730				
CoE6	0.611				
Relational Engagement		**0,832**	**0,838**	**0,875**	**0,502**
RE1	0.746				
RE2	0.723				
RE3	0.609				
RE4	0.612				
RE5	0.674				
RE6	0.763				
RE7	0.809				

The heterotrait-monotrait (HTMT) is defined as the covariance across constructs related to the mean of the average correlations for the items measuring the same construct. HTMT approach tests the discriminant validity problems that are present when HTMT values are high in the reflective scales Henseler et al. (2015). The threshold value of HTMT should be less than 0.90 for structural models with conceptually very similar (Henseler et al., 2015). Table 3 indicated the value of HTMT, which meets the acceptable standard.

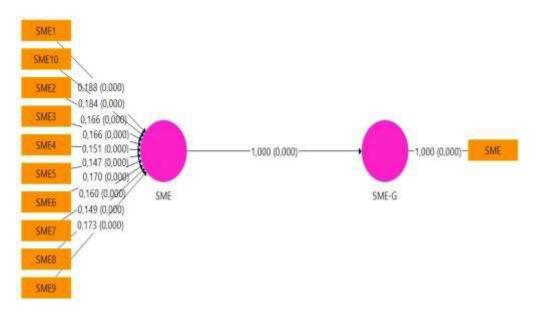**Table 3.** *Discriminant Validity of Reflective Scales (HTMT)*

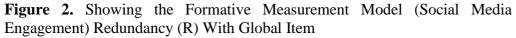| Measures	Cognitive Engagement	Relational Engagement
Cognitive Engagement		
Relational Engagement	0,749	

PLS-SEM researchers recommended the next step for measuring the formative measurement model in terms of the discriminant and convergent validity assessment (Hair et al., 2019; Hair Jr, Sarstedt, Ringle, & Gudergan, 2017; Tehseen, Ramayah, & Sajilan, 2017). First, the researcher applied the Smart-PLS Algorithm in order to know about collinearity issues. Inner Variance Inflation Factor (VIF) values were assessed in the next step. In the final step, the researcher performed Bootstrapping to get the weights' value and t-values of each item to know whether the weights were significant.

Table 4. *Formative Measurement, Redundancy (R) Analysis, Collinearity (VIF), Indicator Weights and Statistical Significance Of SME, And Decisions*

Formative Constructs	Redundancy (r)	VIF	Indicator Weights	P Values	Decision
SME -> SME-G	1.000	1.000	1.000	0.000	Valid

The threshold value of calculating the convergent validity (redundancy analysis) is 0.70 Collinearity (VIF ≥ 3-5). Potential collinearity problem exists when VIF ≥ 3-5, preferably indicate that VIF < 3. Statistical significance of weights p-value < 0.05. The indicators for non-significant weight loadings of 0.50 or more are considered important to the formative measurement model. Above table 4 shows the formative measurement analysis of redundancy, collinearity, statistical significance, and indicator weight meeting threshold value, and all measures found to be reliable and valid.

Figure 2. Showing the Formative Measurement Model (Social Media Engagement) Redundancy (R) With Global Item

Descriptive Statistics:
We applied descriptive statistics in this study to measure the mean and standard deviation. The results were extracted from the participants' responses on a 7-point Likert scale. The mean values range from 4.720 to 5.319, and the standard deviation range value was from 1.017 to 1.230.

Table 5. *Descriptive Statistics.*

Measures	*N*	Min.	Max.	Mean	Std. Dev.
Cognitive engagement	305	1.17	7.00	4.720	1.230
Relational engagement	305	1.00	7.00	5.319	1.142
Social media engagement	305	1.90	7.00	4.893	1.017

Regression Analysis

We used statistical software SmartPLS 3.2.2 to analyze the associations of subscales of student engagement scale derived from the conceptual model 42. PLS-SEM is a variance-based structural equation modeling (VB-SEM). This approach facilitates the concurrent evaluations of the measurement model, which assesses the reliability and validity of the measures of the conceptual framework). Moreover, this technique assesses the structural model, where it measures the relationships of constructs comprising the model (Hair et al., 2019; Rasool, Wang, Tang, Saeed, & Iqbal, 2021). Table 3 indicates the results of three subscales (cognitive engagement, relational engagement, and social media engagement) direct relationship with student engagement scale. Table 6 indicated that cognitive engagement ($\beta=0,339$, $p < 0.05$), relational engagement ($\beta=0,347$, $p < 0.05$), and social media engagement ($\beta=0,485$, $p < 0.05$) were significant positively associated with overall classroom engagement.

Table 6. *Shows the Relationship of Constructs with The Student Engagement Scale.*

Relations	Coefficients	Mean	SD	T Statistics	P Values	Results
CoE -> CE	0,339	0,333	0,018	18,726	0,000	Sig
RE -> CE	0,347	0,342	0,022	15,914	0,000	Sig
SME -> CE	0,485	0,490	0,014	35,232	0,000	Sig

All possible relations are shown in the given Figure 3.
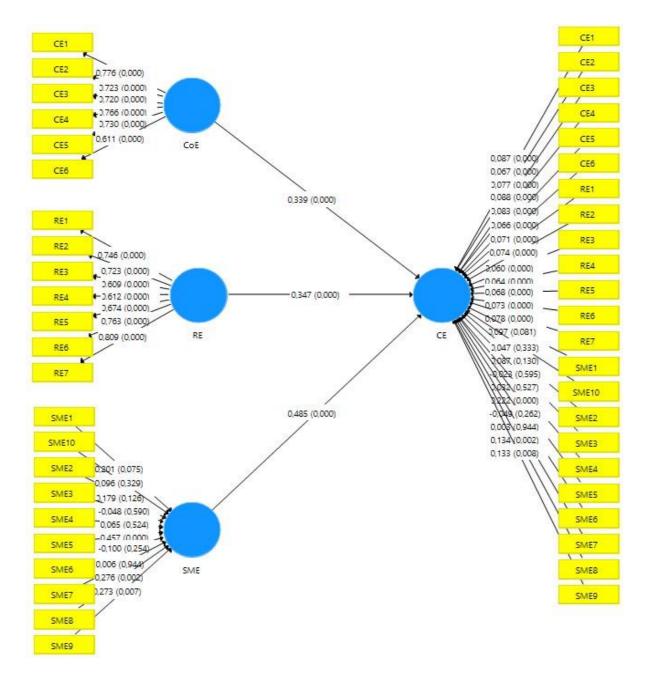
Figure 3. Strucutral Equation Model for All Possible Relations

DISCUSSION:

Student classroom engagement is getting more attention gradually and has a wider scope in higher education, though more work is required to be done. More results have been achieved regarding the factors that influence student classroom engagement. This study finds more new indicators related to measuring student classroom engagement at the undergraduate level. This developed the reliable and valid measurement of undergraduate student classroom engagement. This current study aimed to develop a classroom engagement scale for undergraduate students at the university level. The scale was developed based on the comprehensive examination of literature, found that there was needed to examine the classroom engagement with a wider and comprehensive structure was the consequences of the construction of classroom engagement scale. This research is very significant as it creates the classroom

engagement scale constructs in the higher education setting. Similarly, authors found the student engagement scales from the existing literature (Gunuc & Kuzu, 2015; Zhoc, 2015), it was seen that the proper classroom engagement scale for the undergraduate student was needed to develop with the dimensions of cognitive engagement, relational engagement, and social media engagement. Therefore, the classroom engagement scale (CES) countenances the various classroom engagement dimensions and reports the relationship between cognitive engagement, relational engagement, and social media engagement with undergraduate students' overall classroom engagement. This would be more valuable if we consider the various dimensions of classroom engagement in our future researches. Moreover, student classroom engagement is considered separate from overall student engagement, such as embedded with the campus engagement or university engagement. This scale will provide a more detailed understanding to the evaluators regarding cognitive engagement, relational engagement, and social media engagement are the sub-factors of classroom engagement. The pool of items for the scale was generated via examined the existing literature in detail. Some of the items were adopted from previously developed scales, such as from the scales of Zhoc (2015), and Gunuc and Kuzu (2015). Some of the items had not existed in other related scales used in the previous researches. We used some items related to the local specific context of higher education in Pakistan.

The main factors of CES were determined as cognitive engagement, relational engagement, and social media engagement. Similarly, Gunuc and Kuzu (2015) also stated that cognitive and relational engagement factors related to classroom engagement, while Zhoc (2015) added online learning as another factor in student engagement. This study's findings reported and confirmed the items' significance related to classroom engagement at the undergraduate level in higher education. The conceptual framework developed before the factor analysis, sub-factors related to cognitive engagement, relational engagement, and social media engagement. Some of the items related to cognitive engagement and relational engagement were deleted based on low reliability and validity results. Besides, it was observed that all items related to the social media engagement factor were found significantly correlated with the classroom engagement. In literature indicates the same factors related to classroom engagement (Axelson & Flick, 2010; Fredricks, Blumenfeld, & Paris, 2004; Gunasekare, 2015; Kauser & Awan, 2019; Lau, 2017; Rasool, Samma, Wang, Zhao, & Zhang, 2019; Zhoc, 2015). Therefore, the scale established in the present study reflected as different from other scales in the related literature.

CONCLUSIONS:
The exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were applied to different sample groups. The EFA was applied in the pilot study, so it was not reported in this research. Based on the results of three factors 7-point Likert type scale developed 23 items. The results factor loading, Cronbach's Alpha, roh_A, composite reliability for internal consistency reliability coefficient presented in Table 2 (reflective scales; cognitive engagement and relational engagement). The AVE for convergent validity is presented in Table 2. The discriminant validity measure through HTMT

analysis (reflective scales; cognitive engagement and relational engagement). All indicators of CFA showed values above than threshold value. Therefore, it is concluded that the scale was valid and reliable. Formative measurement (social media engagement), redundancy (r) analysis, collinearity (VIF), indicator weights, and statistical significance of SME and decisions were measured and presented in Table 4. All indicators were meeting the threshold value, so, therefore, the SME scale was also found valid and reliable.

Future Researches:

This study involved the undergraduate students as participants from the three main fields of education: social sciences, business sciences, and pure sciences. The medical field students were not incorporated in this study, so future research may include them as a participant to confirm the validity and reliability of this scale applying the confirmatory factor analysis at large sample size. In this scale, classroom engagement was considered a separate construct from student engagement (combined with classroom engagement and campus engagement). Social media engagement as a subscale of classroom engagement has also been established in this scale which is also the novelty of this scale. Relational engagement jointly measures peer's relationship and teacher-student relationship, future studies can be considered them to investigate as separate indicators.

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