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Validation of a culturally adapted SACQ in Vietnamese higher education: evidence from a technological university

Lan Hoang Thi Quynh, Hanh Pham Hong, Ha Tran Thi Thanh
Faculty of Education, Hanoi University of Science and Technology, Hanoi, Vietnam

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ABSTRACT

Grounded in Tinto's theory of student integration, this study examines the structure of the student adaptation to college questionnaire (SACQ) in Vietnam higher education context, employed a cross-sectional quantitative approach. Data from 363 students at a technological university in Northern Vietnam were analyzed using exploratory and confirmatory factor analyses. Results yielded a refined 29-item scale (SACQ-29) with a five-factor structure, diverging from the original four-factor model. Most notably, social adjustment (SA) is separated into two distinct factors: one comprising positively worded items and another consisting predominantly of reverse-coded items, suggesting distinct adaptation mechanisms in digitally enhanced learning environments. Results revealed that students adapted most effectively to academic demands (M=5.77), but showed weak institutional attachment (IA) (M=3.14). Male students demonstrating significantly better overall adaptation than female students, and living arrangements also influenced adaptation levels, with students living with family showing poorer adaptation compared to others. Comparative analysis revealed high consistency between the SACQ-29 and the original SACQ-67 ($r=0.925^{**}$). This study provides first validated Vietnamese SACQ, offering a practical tool for early identification of at-risk students and intervention design in contemporary higher education contexts.

Corresponding Author:

Lan Hoang Thi Quynh
Faculty of Education, Hanoi University of Science and Technology
No. 1 Dai Co Viet Street, Hai Ba Trung District, Hanoi, Vietnam
Email: lan.hoangthiquynh@hust.edu.vn

1. INTRODUCTION

Vietnam's university sector has expanded considerably over the last 30 years with increasing enrollment rates and diversification of institutional types [1]. Technological universities in Vietnam face particular challenges as they strive to maintain academic excellence while adapting to changing labor market demands and student demographics [1]. The advent of Industry 4.0 has prompted universities to prioritize skill development beyond traditional academics. Critical thinking, problem-solving abilities, and workplace adaptability have become essential components of modern curricula [2]. Meanwhile, today's students find themselves developing cross-cultural skills as their learning environments become more diverse and globally connected [3]. Navigating university life now involves juggling complex institutional systems, adapting to various teaching methods, and forming genuine relationships within highly competitive academic spaces [4], [5]. First-year students experience these adaptation hurdles most intensely. Moving from the regimented structure of high school to university's independent learning environment creates significant adjustment difficulties [6], [7]. This educational transition marks a pivotal moment in young people's development, frequently bringing psychological stress, academic uncertainty, and social adjustment issues [6].

University life demands that students handle numerous developmental challenges simultaneously. How well they adapt affects not just their grades [8], but also how often they attend classes [9], their motivation to learn, and their overall mental wellbeing [10], [11]. Given these connection, researchers have identified adaptive capacity as one of the strongest indicators of whether student will thrive during their move from high school to university [4], [7]. It also plays a crucial role in determining how satisfied students feel about their educational journey [12]. Baker and Siryk in Rienties and Tempelaar [8] developed the student adaptation to college questionnaire (SACQ) based on Tinto's theory of student integration and persistence. Students are more likely to stay when they connect well with both the academic side of university (classes, learning) and the social side (friends, campus activities) [8]. The model also highlighted institutional commitment as critical factor in determining whether they persist or withdraw [13]. The SACQ by Baker and Siryk translates these theoretical concepts into measurable subscales. Academic adjustment (AA) and social adjustment (SA) directly capture Tinto's two integration domains. Personal-emotional adjustment (PEA) extends the framework by addressing psychological wellbeing. This dimension acknowledges that emotional struggles can prevent students from integrating successfully. Institutional attachment (IA) captures how committed students feel toward their university. For Tinto, this commitment reflects successful integration and reinforces.

The SACQ tool evaluates students' adaptability across four key dimensions: AA, SA, PEA, and attachment to educational institutions. What makes SACQ particularly valuable is its solid theoretical grounding and proven reliability across multiple research settings [11], [14], the tool serves a dual purpose: it provides researchers with reliable data while helping practitioners design effectively intervention programmed to boost student adaptation in university settings. Statistical analysis consistently shows strong internal consistency with Cronbach's alpha values exceeding 0.80 [14]–[16]. Moreover, validated studies have confirmed its effectiveness across different educational systems and cultural backgrounds [11], [14], [17]. Researchers worldwide have translated and adapted SACQ for their local contexts, creating versions in Spanish [18], [19], Romanian [20], Persian [21], among others. Through its four core domains— AA, SA, PEA, and IA [22]—the questionnaire offers a thorough approach to understanding how student adapt to university life.

Extensive research evidence supports SACQ's effectiveness as a comprehensive, multi-faceted assessment tool for university student adjustment across different student populations. First-year students represent a primary focus for SACQ applications [13], [18], [21], which makes sense given the substantial challenges they encounter when transitioning to higher education. The scale also proven particularly useful for evaluating adaptation among student groups that typically struggle more in academic environment, including international students [15], and those from disadvantaged backgrounds [9].

However, when researchers examine SACQ's factor structure using exploratory and confirmatory factor analysis (CFA) across different countries, they do not always reach the same conclusions. Some studies confirm that Baker and Siryk's original four-factor model works well [14]–[16], [18], but others have found different patterns in their data [23], [24]. For example, study by Feldt *et al.* [13] discovered that a six-factor model better explained their results. Similarly, study by Taylor and Pastor [24] reported that the traditional four-factor model structure simply did not match what they observed in their sample. Conversely, Dominguez-Lara *et al.* [25] developed a shortened 27-item version preserving the original structure, and researchers have created a computerized adaptive testing version (SACQ-CAT) [26]. Several shortened versions have been developed with varying numbers of items [9], [16], [17], [21], and response scales have been modified, including 7-point [17], [18], 5-point [9], [14], [17], [21], and 4-point [11] formats. These adaptations highlight the importance of considering cultural factors and specific contexts when applying SACQ.

SACQ's most valuable aspect is its predictive validity regarding educational outcomes. Its concurrent validity has been established through associations with academic performance [15], [18], [27], learning motivation [11], class attendance [9], and mental health [13], [18]. Krotseng [28] found that SACQ strongly predicts student attrition and distinguishes between persistent and non-persistent individuals. These findings reinforce SACQ's utility as a standardized assessment tool and support for intervention design, particularly for first-year students.

Despite SACQ's widespread international use, its application in Vietnamese higher education remains limited. While some local studies have employed SACQ [29], comprehensive validating studies published in international outlets are notably absent. This gap is particularly significant given Vietnam's unique educational context, characterized by Confucian heritage culture [30]–[32], rapid educational modernization [1], and the specific challenges faced by students in technological universities.

Cultural background plays a fundamental role in shaping how students experience and express their adaptation struggles [18], [19], [33]. The fact that SACQ has remained relevant for over three decades speaks to its effectiveness in capturing the complex, multifaceted nature of student adjustment. Given Vietnam's rapidly evolving digital education landscape, how might traditional face-to-face adaptation models need to be reconceptualized for online and blended learning environments where social and institutional connections are

fundamentally altered? Validating and culturally adapting SACQ for Vietnamese students would give educators and administrators a powerful tool for early identification, monitoring, and intervene ultimately improving both education quality and student learning experiences.

The challenge is that Vietnam's cultural context and higher education system differ dramatically from the Western settings where SACQ was originally developed. Research consistently shows that cultural factors can significantly alter how measurement scales perform across different contexts [18], [19], [33]. This reality makes it essential to verify the structure, reliability, and validity of SACQ specifically within non-Western cultures frameworks. This study tackles this gap head-on with three specific objectives:

- To evaluate whether the original SACQ model is an adequate model for measuring Vietnamese students' adaptation to contemporary university environments.
- To examine the adaptation levels of students in a learning environment at a science and technology university in Northern Vietnam.
- To identify how socio-demographic factors influence adaptation levels among Vietnamese students at a science and technology university in Northern Vietnam.

2. METHOD

2.1. Participants procedure and ethical considerations

2.1.1. Ethical considerations

The study followed ethical guidelines for human participant's research. However, Hanoi University of Science and Technology (HUST) does not currently operate a centralized Institutional Review Board (IRB) specifically for social science or educational research involving minimal risk. Therefore, the review and approval process were delegated to the Faculty of Education, HUST. Prior to participation, all students were clearly informed about the purpose, benefits, and voluntary nature of the study. Their informed consent was obtained through voluntary completion of an anonymous online survey via Google Forms. Throughout the data collection and analysis process, the anonymity and confidentiality of all participants were strictly maintained, with no personal identifying information collected. This study fully complies with national ethical guidelines for scientific research in Vietnam and HUST institutional guidelines.

2.1.2. Participants and procedure

Participants were recruited from 700 students who were enrolled in blended learning courses at HUST. Students voluntarily participated by completing an anonymous online survey through Microsoft Forms. Over an 8-week period, the survey link was distributed to potential participants, resulting in 363 fully completed responses with no missing information. This number strengthens the stability of parameter estimates, minimizes error, and supports the reliability of the model. The sample consisted of students from various academic units at HUST. The average enrollment period of participants was approximately in the second year (M=2.0, SD=0.793). However, the survey was conducted in the first month of the first semester of 2024, so students' learning experiences primarily focused on their first and second year.

2.2. Measures

The SACQ, developed by Baker and Siryk, is a 67 items self-report instrument using a 9-point Likert scale (1=strongly disagree to 9=strongly agree). The instrument assesses four dimensions of college adjustment: i) AA (24 items); ii) SA (20 items); iii) PEA (15 items); and iv) IA (15 items). Nice items load on multiple subscales: items 1, 4, 16, 26, 42, 56, 57, and 65 contribute to both SA and IA, while item 36 appears in both the AA and IA. Two additional items (53 and 67) assess overall adjustment to the learning environment. The total adjustment scores combine the four subscale scores with these two overall items.

Prior to conducting exploratory factor analysis (EFA), the item refinement process was carried out through three stages. First, based on an extensive theoretical review and existing measurement scales, we selected the Vietnamese version of the scale proposed by Việt [29] for this study. Second, expert validation was performed by two psychologists, two pedagogical specialists, and one linguist at HUST. The experts evaluated the scale based on three criteria using a 5-point rating scale: relevance, conceptual clarity, and comprehensiveness. The results yielded mean scores ranging from 3.4 to 4.2, demonstrating the content validity of the scale. Third, pilot testing was conducted with 100 students. The testing revealed that Cronbach's alpha coefficients reached acceptable levels across all items, confirming the necessary consistency for large-scale implementation.

2.3. Data analysis

To refine the SACQ for Vietnamese cultural context and develop a parsimonious yet and psychometrically sound measurement tool, a systematics analytical procedure was employed to identify and

remove inappropriate items based on multiple psychometric criteria as in Figure 1. In the first step, missing data was removed and outliered from the dataset. The reliability of the scale was established from the data collection and processing stage. With a sample size of 363, combined with careful data screening to remove univariate and multivariate outliers, the input data were sufficiently robust for subsequent factor analysis. The reliability of the scale was assessed using Cronbach's alpha to determine whether the observed variables were positively correlated and jointly explained the underlying construct being measured. A cut-off points of 0.7 for Cronbach's alpha value was used as it reflects adequate internal consistency [34].

Subsequently, EFA was conducted on the 67 SACQ items for verifying the factor structure' suitability. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were examined. Items were selected for factor inclusion based on a factor loading cutoff of 0.45 [35]. Cronbach's alpha coefficients were then recalculated to assess the internal consistency reliability of each identified factor.

CFA was performed using AMOS version 24 to evaluate the model fit of the SACQ. In the Chi-square test (χ^2), a model fit is considered acceptable if $p>0.05$. However, p-values are usually less than 0.05 due to the χ^2 value being sensitive to sample size, which would lead to a model fit being rejected if $p<0.05$. Therefore, additional fit indices were considered: a χ^2/df ratio up to 5.0, root mean square error of approximation (RMSEA) values between 0.05 and 0.07, and comparative fit index (CFI) and Tucker–Lewis index (TLI) values exceeding 0.95 [36].

After CFA analysis, if the model structure does not achieve desired fit, individual item evaluation is necessary to refine the scale. This step focuses on eliminating inappropriate items based on criteria: standardized factor loadings-items with low factor loadings will be considered for removal (loadings lower than 0.5 or ideally lower than 0.7), as they do not adequately represent the factor they are intended to measure. Furthermore, items with significant cross-loadings on more than one factor or loading on theoretically unexpected factors should also be removed to maintain discriminant validity between factors. Internal reliability assessment continues to be performed, items with corrected item-total correlations (below 0.3) or if their removal significantly improved the internal consistency (Cronbach's alpha) of the respective subscale. After evaluation, if any items are removed, the process will repeat steps 2 and 3 with the remaining items. This process continues until achieving a model structure with desired fit in the final step.

Finally, after variable reduction, the new scale is comprehensively evaluated for reliability and validity. The internal consistency reliability of the scale is tested through Cronbach's alpha coefficient (when $\alpha \geq 0.7$, item-total correlation≥ 0.3), indicating that each item contributes appropriately to the total scale score. The convergent and discriminant validity of the SACQ was examined through the average variance extracted (AVE). Finally, practical contextual factors are considered with three important criteria: item content aligns with cultural characteristics and research context, the scale is designed to be concise and user-friendly, while maintaining the original measurement purpose.

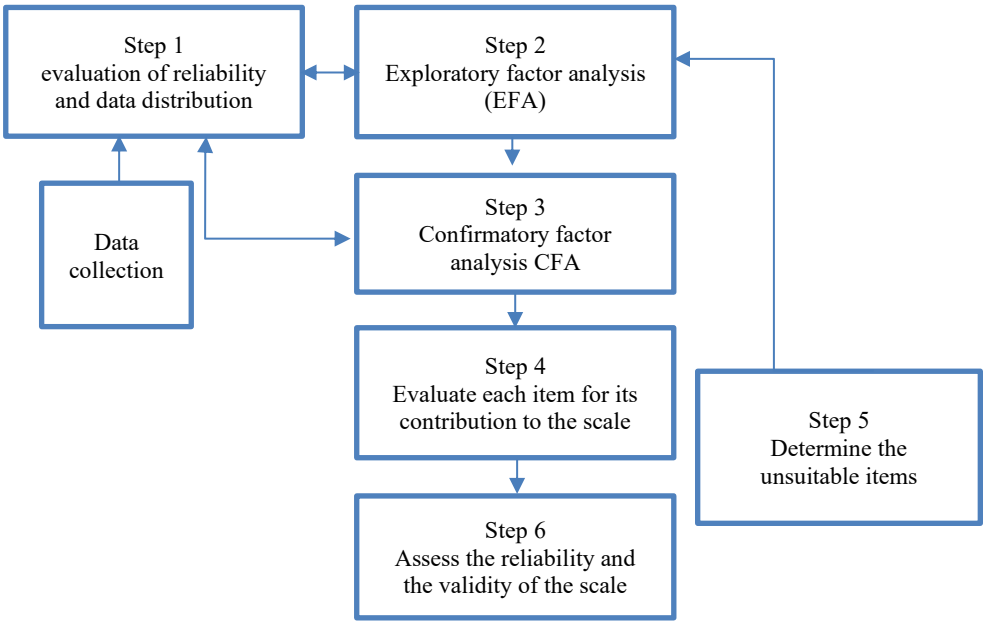

Figure 1. Item removal procedure for the original SACQ scale

Additionally, one-way ANOVA analysis was used to test differences in university adaptability between different student groups. In cases where the Levene statistic of sig index was >0.05, the ANOVA. Sig. test was considered, which had to be less than 0.05. Conversely, if the Levene statistic sig index was <0.05, the sig. of the welch test in the robust tests table had to be <0.05 to indicate significant differences. Pearson's coefficient (r) conventional guidelines were calculated between subscales and interpreted using conventional guidelines: weak (r<0.35), moderate (0.36-0.67), strong (0.68-0.89), and very strong (r≥0.90) [35].

3. RESULTS AND DISCUSSION

3.1. Reliability analysis

The scale's reliability was assessed using Cronbach's alpha to determine whether the observed variables were positively correlated and jointly explained the underlying construct being measured. The analysis yielded Cronbach's alpha coefficients above 0.8 for each factor, and the corrected item-total correlation coefficients of each item were all greater than 0.3, as seen in Table 1. The α results in all cases showed that all collected data were internally consistent within the overall scale and for each component. These results suggest that the data collected demonstrates strong internal consistency, both across the overall scale and within each individual component. The mean score of the SACQ scale in the selected sample was 335.7 (SD=78.53). The skewness (-1<skewness=0.458<1) and kurtosis (-2<kurtosis=1.750<2) were within acceptable ranges. Based on these values, it can be concluded that this is a normal distribution. The distribution graph with a normal curve has a bell shape, and the data is fairly evenly distributed on both sides, as shown in Figure 2.

Table 1. Reliability test results of the official scale (N=363)

Factor	67-item original version	
	Items	Cronbach's alpha
AA	24	0.913
SA	20	0.907
PEA	15	0.936
IA	15	0.826
SACQ	67	0.954

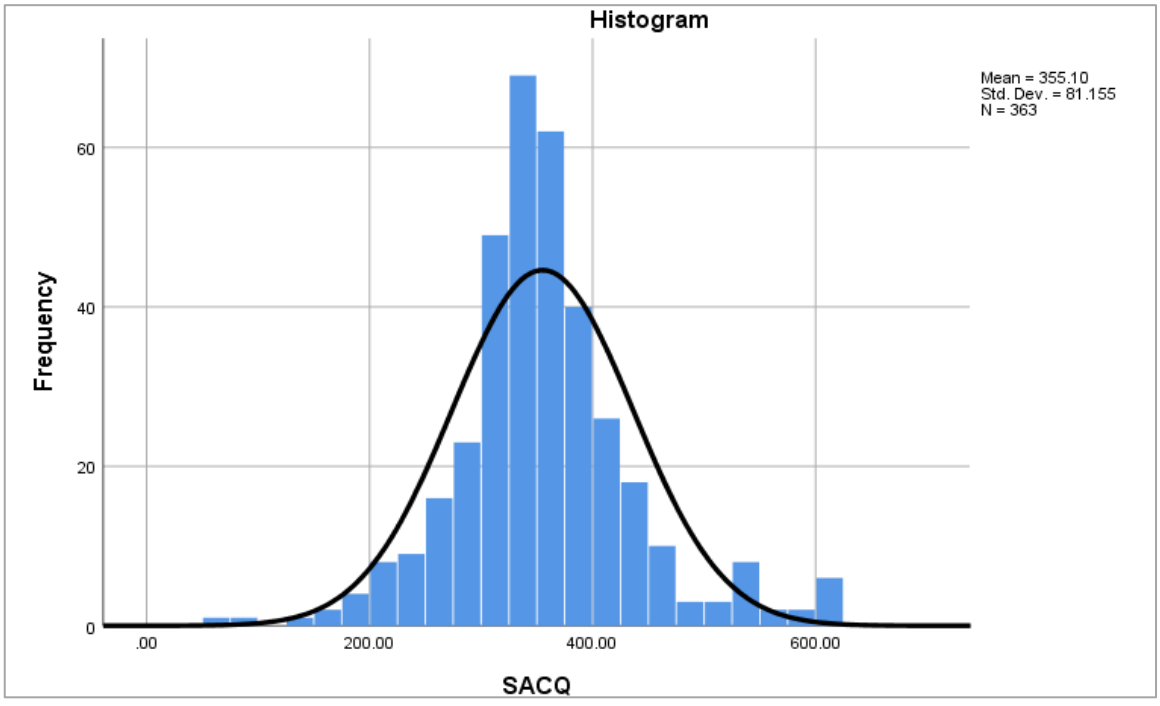

Figure 2. Distribution of the SACQ scale

3.2. Results

3.2.1. Construct validity of the SACQ

Factor analysis was conducted to identify the underlying structure of the scale. Preliminary test indices confirmed data suitability, with KMO>0.45 and Bartlett's test of sphericity significant at p<0.05. Multiple shortened versions of the SACQ were tested to find the optimal version, as seen in Table 2. All versions achieved KMO indices >0.90 and explained 65.5% to 68.1% of variance. The 47-item version was selected for CFA as it fully satisfied all criteria, including no items loading on multiple factors, factor loadings >0.5, and corrected item-total correlations >0.3.

Table 2. Results from a factor analysis of the SACQ

Model	Item	KMO	P	Total	Cumulative (%)	α	Item removed
SACQ-67	67	0.919	.000	0.92	65.5	0.954	8*
SACQ-59	59	0.915	.000	0.72	65.9	0.947	4**
SACQ-55	55	0.915	.000	0.89	65.8	0.945	3***
SACQ-52	52	0.914	.000	0.87	66.0	0.940	3****
SACQ-49	49	0.913	.000	0.84	66.8	0.941	2*****
SACQ-47	47	0.913	.000	0.80	68.1	0.940	

Note: *AA27, AA41, AA39, AA52, SA33, SA01, SA26, PE31; **AA23, AA25, AA17, SA16; ***AA44, AA21, PE55; ****AA32, AA62, AA42; *****AA58, AA29

CFA was conducted to assess the fit of the original model to the actual data. The results showed that the scale met the criteria for composite reliability (CR>0.6) and convergent validity (AVE>0.5), confirming the reliability and convergent validity of the measurement model. However, to improve model fit, as TLI and CFI were both less than 0.9, as shown in Table 3, items with low estimation coefficients (estimate) below 0.6 were proposed for removal, including PE49 (0.599), SA63 (0.55), I15 (0.57), and I47 (0.51). After adjustment, the new shortened scale was returned to the EFA step to identify the underlying structure and evaluate internal consistency using Cronbach's alpha. The analysis results showed that items T53, T57, AA13, and AA66 did not meet the factor loading criteria, while items AA05, AA03, AA19, AA50, AA43, AA36, AA54, and SA09 had corrected item-total correlation <0.3, and were therefore removed from the scale. To ensure that the five factors in the new scale (31 items) operated independently within the scale structure, correlation analysis between factors with few variables (less than 2 variables), and the remaining factors was conducted. The correlation coefficients obtained were all less than 0.8, indicating that the 5-factor structure was reasonable and acceptable instead of the originally proposed 4-factor model.

Table 3. Model fit of originally hypothesized models

Model	Item	χ2	Df	TLI	CFI	RMSEA	α
SACQ-47	47	2993	1034	0.854	0.866	0.072	0.940
SACQ-31	31	1276	414	0.893	0.905	0.076	0.939
SACQ-30	30	1183	387	0.898	0.910	0.075	0.938
SACQ-29	29	1122	360	0.900	0.911	0.077	0.936

To further improve the fit of the 31-item shortened model, item SA30 (estimate=0.615) – the item with the lowest estimate – was proposed for removal from the scale. The structure of the 30-item model showed significant improvement in fit but was still not optimal, as seen in Table 4. Following the removal of item PE35 (estimate=0.618), a 29-item version was proposed. EFA examined the factor structure, yielding KMO=0.913 and p<0.00, confirming statistical adequacy. The rotated solution identified a five-factor structure with all item loadings exceeding 0.5. The original items retained all loaded onto the correct factors: PE, commitment/institutional, and AA. Meanwhile, the items from the SA factor loaded onto two new categories, one for positive adaptation and one for negative adaptation. Cronbach's alpha analysis showed that the five new factors all had values ranging from 0.8 to 0.94, and the corrected item-total correlations were all greater than 0.3, confirming they met the conditions to proceed with CFA analysis.

The 29-item SACQ model demonstrated adequate fit when covariance links were specified between PE11 and PE24, PE45 and PE65, PE20 and PE38, PE28 and PE40, SA04 and SA18, GCIA34 and SA57R, SA56R and SA48R, as presented in Figure 3. The SACQ-29 model fit the data well, achieving indices of $\chi^2/df=3.119<5.0$, TLI=0.9, CFI=0.911 (both≥0.9), and RMSEA=0.077≤0.08. Analysis of model validity measures showed that the scale has high reliability with CR ranging from 0.858 to 0.944 (>0.85), good convergence with AVE all greater than 0.5 and greater than maximum shared variance (MSV), indicating clear discriminant validity.

Table 4. Results from a factor analysis of the SACQ

Item description	Factor loading*				
	1	2	3	4	5
Factor 1: PEA					
PE11	0.941				
PE45	0.853				
PE02	0.839				
PE64	0.814				
PE24	0.811				
PE20	0.777				
PE07	0.747				
PE38	0.720				
PE28	0.715				
PE40	0.651				
PE12	0.575				
Factor 2: SA					
SA18		0.858			
SA65		0.849			
SA37		0.839			
SA46		0.829			
SA08		0.750			
SA04		0.749			
SA14		0.644			
Factor 3: IA					
IA59R			0.994		
IA34R			0.944		
IA61R			0.833		
IA60R			0.829		
SA57R			0.569		
Factor 4: SAR					
SA22R				0.858	
SA51R				0.826	
SA56R				0.707	
SA48R				0.675	
Factor 5: AA					
AA10R					0.937
AA06R					0.771
KMO	0.913				
Cronbach's alpha	0.936	0.946	0.917	0.928	0.896
Total	1.055				
Cumulative (%)	66.87				

*Extraction method: principal axis factoring

Notably, the AA subscale, initially comprising 24 items, was reduced to only two items – "I am finding academic work at college difficult" (AA06R) and "I have not been functioning well during examinations" (AA10R). This retention was supported by high standardized factor loading analyses (λAA06R=0.893; λAA10R=0.908), confirming the strong contribution of these two items to the AA subscale. The composite reliability indices (CR=0.896 and AVE=0.812) of the reduced AA subscale both reached acceptable levels, demonstrating the robustness of the structure. The reduced AA subscale has a Cronbach's alpha of 0.896, only slightly decreased from the original scale (0.911), providing clear evidence that reliability, and internal consistency were effectively maintained after reduction.

Similarly, with SA, our analysis revealed that the SA dimension split into two distinct factors: one comprising positively worded items (SA) and another consisting predominantly of SA reverse-coded items (SAR). The SA group (items 18, 65, 37, 46, 08, 04, 14) focuses on integration ability, building positive relationships, and satisfaction with one's social life. In contrast, SAR (22, 51, 56, 48) mainly consists of SAR, reflecting negative experiences often related to feelings of loneliness, homesickness, and difficulties in establishing relationships with others.

Table 5 describes the adaptation levels of students in the study group when assessed on both the original scale and the shortened 29-item scale. Specifically, student adaptation on both scales achieved medium levels (mean in the range of over 4 to 5.99). The factor with the lowest mean was IA. Conversely, the factors with the highest means in the two scales were AA (SACQ-29 with mean=5.77) and PEA (SACQ-67 with mean=5.75).

Comparison between the two scales shows that the shortened scale has a lower mean (M) and higher standard deviation (SD) than the original scale. However, the coefficient of variation (CV) is almost equivalent in the two datasets, with values ranging from 0.0027 to 0.00275. To confirm this more definitively, the correlation between the two scales was assessed, with the Pearson correlation between

SACQ-67 and SACQ-29 being 0.925, indicating they have a strong and reliable connection. This suggests that the factors surveyed have a high degree of consistency in data dispersion, allowing the conclusion that the shortened scales are suitable for rapid screening purposes, while the 67-item scale maintains its role as a more comprehensive assessment tool.

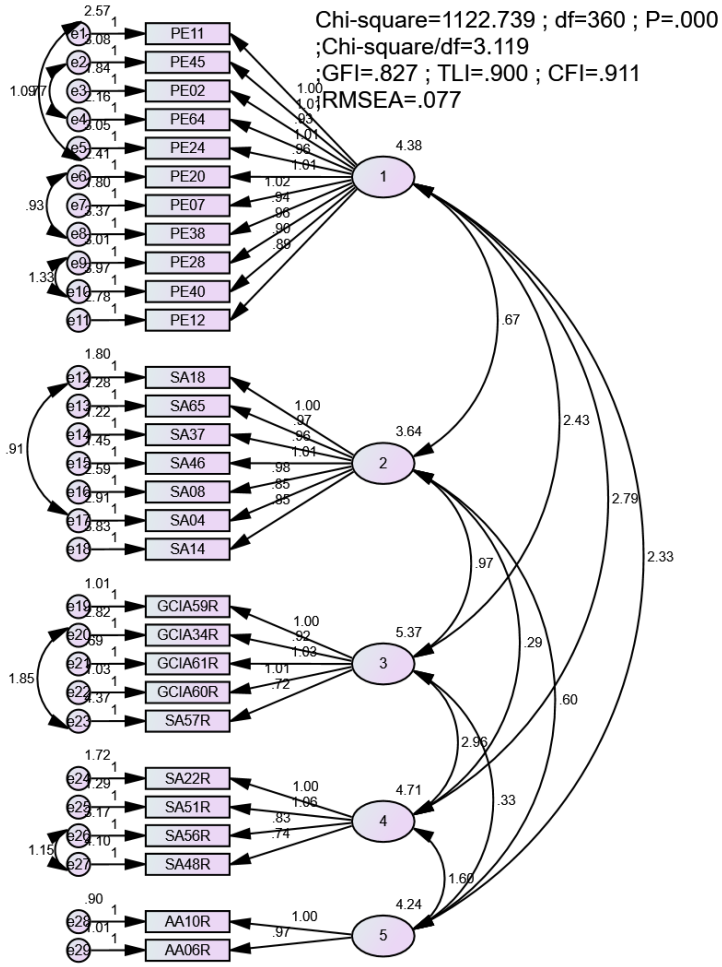

Figure 3. Results from the CFA for SACQ-29 scale

Table 5. Students' level of adaptation to the digital learning environment

Factor	SACQ-29					If use SACQ-67				
	Item	M	Raw score	SD	CV	Item	M	Raw score	SD	CV
PEA	11	4.99	54.89	2.1	0.002752	15	5.75	86.25	1.3	0.002752
SA	07	5.54	38.78	1.9	0.00274	20	5.23	104.6	1.4	0.00275
IA	05	3.14	15.7	2.2	0.00275	15	4.83	72.45	1.3	0.00275
AA	02	5.77	11.54	2.1	0.0027	24	4.95	118.8	1.9	0.0028
SAR	04	4.29	17.16	2.1	0.00275					
Total	29	4.77	138.3	1.4	0.00275	67	5.19	347.7	1.2	0.00275

3.2.2. Socio-demographic factors and psychological impact

This study used the adjusted version of SACQ to survey first-year students at HUST. Differences according to demographic variables such as gender and accumulated credits were assessed to compare and analyze factors influencing these differences. The data presented in Table 6 demonstrate that, among the participants, 64.7% were male, 35% were female, and 0.3% identified as others. The majority of students (43.5%) reported living in shared accommodation, such as a motel room with others. In terms of academic progress, most students had completed fewer than 32 credits, indicating that the majority of the research sample consisted of first-year or second-year students.

Statistical analysis revealed that male students demonstrated a higher level of academic adaptation, as reflected in their higher mean scores (M=4.91, sig<0.05). Similarly, students living with relatives showed significantly better adaptation to the learning environment. In contrast, those living in family houses showed lower adaptation (M=4.38). Although they represented the smallest subgroup (3.3%), students residing in relatives' houses reported the highest adaptation score (M=5.58).

Table 6. Comparison of college adjustment by student characteristics

Factor	N	%	Mean	Levene (sig)	ANOVA (sig)/T-test (sig)
Gender				0.00	0.13
Male	235	64.7	4.91		
Female	127	35	4.52		
Current residence status				0.03	0.11
Dormitory	63	17.4	4.86		
Motel room with others	158	43.5	4.92		
Motel room alone	36	9.9	4.76		
Relatives' house	12	3.3	5.58		
Family house	94	25.9	4.38		

3.3. Discussion

Our purpose was to examine the construct validity of the SACQ by identifying the factor structure, item content, and relationships with gender, current residence status, and total accumulated credit hours at a Vietnamese university of technology. Although the five-factor solution differs from the recommendations of Baker and Siryk in Rienties and Tempelaar [8], the item composition remains consistent with the theoretical framework. The refinement process of the original SACQ scale illustrated in Figure 1 resulted in a concise and reliable 29-item shortened version, as shown in Table 7 (detailed information about the questionnaire items). These attributes are consistent with previous studies that reported high internal consistency across diverse student populations [16].

Table 7. The validated student adaptation questionnaire (SACQ-29)

Serial number	Topic
PE02	I have been feeling tense or nervous lately.
SA04	I am meeting as many people, and making as many friends as I would like at college.
AA06	I am finding academic work at college difficult.
PE07	Lately, I have been feeling blue and moody a lot.
SA08	I am very involved with social activities in college.
AA10	I have not been functioning well during examinations.
PE11	I have felt tired lately.
PE12	Being on my own, taking responsibility for myself, has not been easy.
SA14	I have had informal, personal contacts with college professors.
SA18	I have several close social ties at college.
PE20	I haven't been able to control my emotions very well lately.
SA22	Lonesomeness for home is a source of difficulty for me now.
PE24	My appetite has been good lately.
PE28	I have been having a lot of headaches lately.
IA34	I wish I were at another college or university.
SA37	I feel that I have enough social skills to get along well in the college setting.
PE38	I have been getting angry too easily lately.
PE40	I haven't been sleeping very well.
PE45	Sometimes my thinking gets muddled up too easily.
SA46	I am satisfied with the extent to which I am participating in social activities at college.
SA48	I haven't been mixing too well with the opposite sex lately.
SA51	I have been feeling lonely a lot at college lately.
SA56	I feel I am very different from other students at college in ways that I don't like.
IA57	On balance, I would rather be home than here.
IA59	Lately I have been giving a lot of thought to transferring to another college.
IA60	Lately I have been giving a lot thought to dropping out of college altogether and for good.
IA61	I find myself giving considerable thought to taking time off from college and finishing later.
PE64	I am experiencing a lot of difficulty coping with the stresses imposed upon me in college.
SA65	I am quite satisfied with my social life at college.

Exploratory analysis indicated that the SA dimension split into two distinct factors: one comprising positively worded items (SA) and another consisting predominantly of SAR. This split not only provides deeper insights into the specific difficulties students encounter during social adaptation but also reflects

challenges when examining model fit with the original four-factor scale [23], [24]. Nevertheless, the CFA results for our shortened 29-item scale demonstrated strong model fit (CFI=0.911, TLI=0.9, RMSEA=0.077), with high reliability (Cronbach's alpha>0.8) for all subscales. Convergent validity was confirmed by AVE values>0.5, and discriminant validity was supported by MSV values lower than respective AVE values. These psychometric properties align with previous studies reporting high internal consistency across diverse student populations [16].

Regarding internal structure, the positive SA factor comprises 11 items, of which 5 items (SA18, SA65, SA37, SA46, and SA08) correspond to the 'general' aspect according to Volodavchyk *et al.* [37] classification. Meanwhile, the SAR aspect has 4 items (SA22R, SA51R, SA48R, SA56R), with 2 items (SA22R, SA51R) belonging to the loneliness aspect [37]. Notably, 4 items (SA4, SA14, SA48R, SA56R) were classified by Volodavchyk *et al.* [37] as relationship with other people, but in this study, these items were divided into two positive and negative groups based on content wording. This adjustment shows similarities with previous studies, specifically items SA22R, SA48R, and SA56R were proposed for removal from the SA subscale in the Spanish SACQ-50 version due to low factor loadings [19]. Additionally, another study also noted that these 4 items loaded more strongly on the personal-emotional factor, despite supporting the 4-structure model [13]. These findings contribute to reinforcing the argument for reconsidering the internal structure of the SA subscale when applied in different academic cultural contexts.

To further assess the validity of this separation, we examined the correlations of the new factors with the original subscales. The correlation analysis between these two social adjustment factors (SA and SAR) revealed a moderate correlation coefficient ($r=0.42$, $p<0.01$), which supports their conceptual relationship while confirming their distinct nature. According to the classification by Volodavchyk *et al.* [37], the SA factor showed strong correlations with the original SA (r=0.83**) and SA general (r=0.91**). Similarly, SAR showed very strong correlation with SA loneliness (r=0.88**) as per the same classification, although correlation with the original SA was lower (r=0.55**). These correlation results provide strong empirical evidence supporting the two-factor structure of SA and suggest that SA and SAR represent distinct but related aspects of SA. This finding is particularly meaningful in the context of digital learning environments, where students may simultaneously experience high levels of digital social connectivity while feeling a lack of meaningful personal connections. The relatively independent operation of these two dimensions challenges the traditional unidimensional conceptualization of SA and suggests the need for more nuanced assessment approaches.

The emergence of two distinct SA factors may be particularly relevant in digitally enhanced learning environments. Digital platforms create unique social dynamics where quantity and quality of interactions can be dissociated in ways not typically experienced in traditional learning environments. For instance, students may engage actively in online learning communities, discussion boards, and virtual group work (reflected in high SA scores) while simultaneously experiencing feelings of isolation due to reduce in-person contact, challenges in forming deeper connections online, or digital communication barriers (reflected in high SAR scores). Additionally, the technological mediation of social interactions in these environments may create different thresholds and expressions of social integration. The separation between SA and SAR dimensions may reflect how Vietnamese students navigate the cultural transition between traditional collective educational values and the more individualized nature of digital learning. This finding suggests that support services for students in digitally enhanced learning environments should address both dimensions separately, focusing on both increasing positive social engagement and specifically addressing feelings of isolation or disconnection.

This study found that the reduced AA comprises 2 items- "I am finding academic work at college difficult" (AA06R) and "I have not been functioning well during examinations" (AA10R). This decision is justified by the analytical procedure outlined in Figure 1 and aligns with Volodavchyk *et al.* [37] categorization of the AA subscale into four domains: motivation–questions, application–questions, academic environment–questions, and performance–questions [21]. With this classification, the two retained items (AA06R and AA10R) belong to the performance aspect and have sufficiently strong correlations ($r\geq0.6$ and $p\leq0.001$) with the original AA scale, and 8 items proposed for removal belong to performance when conducting Pearson correlation analysis.

This suggests that the reduced version of the AA scale, with only two items, primarily reflects the performance aspect of AA. Therefore, more careful interpretation is needed when evaluating content beyond performance in the Vietnamese context, to avoid misunderstanding the scope of the AA scale after reduction. Although the scope is somewhat narrowed, the reduction of the AA subscale in this study is consistent with previous structural validation studies of the original SACQ scale [11], [16], [18], [27], which often tend to reduce AA more than other subscales. This suggests the possible existence of a more refined structure for the concept of AA in specific research contexts.

The reduction of the AA subscale to two items focusing on performance aspects shows that in this study, AA is understood more narrowly as students' ability to cope and demonstrate competence effectively

in response to academic requirements and challenges, particularly related to learning outcomes and examination pressure. The two retained items, AA06R and AA10R, precisely reflect this core aspect of the definition. In fact, success in facing academic difficulties and performing well in examinations are the strongest and most essential indicators of effective AA, especially in an outcome-focused educational context like Vietnam [38]. Therefore, these two items not only meet statistical requirements but also carry profound theoretical significance, optimally representing the concept of AA we aim to measure within the scope of research in the Vietnamese context.

The model fit indices and reliability measures support the validity of our shortened 29-item scale with a five-factor structure. Similar to our findings, several previous studies have encountered challenges confirming the fit of the original four-factor structure, as shown in Table 8. The PE factor demonstrates the highest retention of original scale items across studies, indicating its relative conceptual stability, which our study confirms in the Vietnamese context.

The adaptation level of the students participating in the research was assessed as moderate (mean=4.77, SD=1.4), with IA scoring the lowest. Notably, gender and current residence status significantly predicted differences in adaptation levels. Male students reported higher scores in adaptation to the university academic environment than females, consistent with findings from studies of Romanian students [20]. Additionally, students living with family demonstrated lower adaptation scores, while students living with relatives - representing a small proportion of the sample—reported the highest adaptation.

Table 8. Versions of SACQ across different studies

Version	Author	Structure of scales	AA	SA	PE	IA	New factor
SACQ-47	[24]	4 factors	13, 19, 21, 27, 29, 32, 41, 43, 44, 50, 52, 54, 58, 62	1, 4, 8, 9, 18, 30, 37, 42, 46, 51, 63, 65	2, 7, 11, 12, 20, 28, 31, 38, 40, 45, 55, 64	15, 34, 47, 59	
SACQ-38	[18]	4 factors	54, 43, 36, 62, 50	63, 9, 4, 1, 37, 65, 18, 57	7, 20, 64, 11, 29, 28, 45, 2, 12, 40, 55, 38, 21, 41, 31	60, 47, 59, 15, 34, 5, 58, 61, 19, 32	
SACQ-12	[11]	3 factors	17, 29, 13, 25	18, 37, 63, 65			36, 43, 54, 62*
SACQ-38	[27]	4 factors	10, 21, 23, 26, 29, 35, 37, 48, 54	1, 4, 9, 16, 18, 27, 33, 38, 42, 59, 61	2, 7, 11, 12, 20, 25, 28, 34, 36, 41, 60	15, 16, 32, 43, 55, 56, 57	

Note: *Satisfaction with curriculum

4. CONCLUSION

This study adapted and validated the SACQ for Vietnamese technological university student. We worked with 363 participants and developed a refined 29-item version (SACQ-29) with strong psychometric properties. All dimensions showed Cronbach's alpha coefficients between 0.85 and 0.90. The first significant finding was how SA split into distinct factors. One captures positive social engagement (SA), while the other reflects feelings of alienation and disconnection (SAR). It reveals something deeper about how Vietnamese students experience university life today that emphasize group harmony and the increasingly individualistic nature of digital learning environments.

The data showed moderate adaptation levels overall, but IA scores surprisingly low (M=3.14) compared to AA (M=5.77). This makes sense within Vietnamese educational culture where academic performance has always mattered more than loyalty to any particular institution. SACQ-29 enables early identification of at-risk students and can be integrated into formative assessment systems, learning analytics platforms, and adaptive intervention design to support institutional development.

Several limitations need acknowledgment. The cross-sectional design and single-institution sample from Northern Vietnam limit both causal inference and generalizability. In addition, online self-report surveys may introduce bias. Moreover, the study did not specifically measure digital adaptation dimensions or compare students across different learning formats.

Future research should pursue longitudinal tracking, cross-cultural validation across diverse institutions and Confucian heritage cultures, and comparative studies examining different learning modalities. The SACQ-29 should be validated across other educational levels and disciplines to establish broader applicability. Despite these limitations, this study provides the first rigorously validated instrument for assessing Vietnamese students' adaptation in contemporary learning environments. It offers both theoretical insights into how culture shapes adaptation and practical tools for evidence-based support in Vietnam's rapidly evolving higher education landscape.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Lan Hoang Thi Quynh	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	✓
Hanh Pham Hong	✓		✓	✓		✓	✓			✓	✓		✓	
Ha Tran Thi Thanh		✓					✓	✓	✓	✓	✓	✓	✓	

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors state there is no conflict of interest.

INFORMED CONSENT

Informed consent was obtained from all participants before data collection.

ETHICAL APPROVAL

This study was conducted in accordance with the ethical principles for research involving human participants. As there is no specific Institutional Review Board (IRB) or dedicated ethics committee at Hanoi University of Science and Technology (HUST) for this type of educational/social science research involving minimal risk. The studies involving human participants were reviewed and approved by the Faculty of Education, HUST. We confirm that all procedures in this study, including obtaining informed consent from participants and ensuring their anonymity and confidentiality, were conducted in full compliance with the ethical guidelines for research involving human participants, as well as the national ethical guidelines for scientific studies in Vietnam and the institutional guidelines of HUST.

DATA AVAILABILITY

The authors confirm that the data supporting the findings of this study are available in the article.

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BIOGRAPHIES OF AUTHORS

Lan Hoang Thi Quynh is a lecturer at Hanoi University of Science and Technology. Her experience in teaching and research in the fields of educational science and psychology. She studied Ph.D. in psychology from the Graduate Academy of Social Sciences, Vietnam Academy of Social Sciences. She has made significant contributions to teacher education, curriculum development, and student support services. Her research interests include higher education, educational psychology, teacher professional development, student skill education, academic advising, and adaptive support in learning environments. She is particularly passionate about enhancing the quality of teaching and learning in technical and technological educational settings. She can be contacted at email: lan.hoangthiquynh@hust.edu.vn.

Hanh Pham Hong is a lecturer at the Faculty of Education, Hanoi University of Science and Technology (HUST). Her current research areas include higher education, teacher training, applied psychology, academic advising, and adaptive support in learning environments. She can be contacted at email: hanh.phamhong@hust.edu.vn.

Ha Tran Thi Thanh holds a Ph.D. in education from Western Sydney University (2021) and currently serves as a lecturer at Hanoi University of Science and Technology. Her expertise spans educational management, school administration, and educational research with a focus on equality in education, community participation, and instructional leadership. She has contributed to undergraduate and graduate programs, published research internationally, and co-authored educational materials including textbooks for Vietnam's national curriculum. She can be contacted at email: ha.tranthithanh@hust.edu.vn.