

-RESEARCH ARTICLE-

DEVELOPING A HAPPINESS INDEX FOR HIGHER EDUCATION: A MULTI-STAGE APPROACH AT SAIGON UNIVERSITY USING DELPHI, PILOT TESTING, PLS-SEM, AND ANN

Nguyen Thi Tuyet Nga

Business Administration Faculty, Saigon University

ORCID: <https://orcid.org/0009-0003-2115-6805>

Email: nttnga_11551@sgu.edu.vn

Nguyen Thi Thanh Tam

Business Administration Faculty, Saigon University

ORCID: <https://orcid.org/0009-0001-9792-3885>

Email: ntttam@sgu.edu.vn

***Tran Ngoc Tu (Corresponding Author)**

Business Administration Faculty, Saigon University

ORCID: <https://orcid.org/0009-0000-1376-3320>

Email: tntu@sgu.edu.vn

—Abstract—

This research introduces and rigorously validates a multidimensional Happiness Index for Higher Education (HIHE) employing a systematic four-phase scale development approach. The initial phase utilised a Delphi survey to establish the principal variables of student satisfaction through expert consensus. This was succeeded by pilot testing to verify that the measurement items were contextually relevant and unambiguously understood. Partial Least Squares Structural Equation Modelling (PLS-SEM) was applied to assess the linear interrelationships among the components, while Artificial Neural Networks (ANN) were employed to identify the most salient predictors and to capture intricate non-linear patterns. Data were obtained from SGU students using purposive sampling administered via an online questionnaire. The findings indicate that

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Respect (RES), Student Feedback and Suggestions (SF), and Life Satisfaction (LIS) represent the most significant determinants of student satisfaction, whereas Learning, Arts, and Culture (LAC) exhibited no meaningful effect. These results substantiate the scale's reliability and theoretical validity, providing practical guidance for higher education institutions seeking to foster student well-being through a respect-oriented culture, participatory governance, and comprehensive support systems.

Keywords: Happiness Index, Higher Education, Scale Development, Delphi Method, Pilot Testing, PLS-SEM, Artificial Neural Networks (ANN), Student Well-Being.

INTRODUCTION

The development of a HIHE exposes several underexamined research gaps. While student happiness is increasingly recognised alongside academic performance, existing measurement approaches predominantly focus on satisfaction, often neglecting psychological, emotional, and social dimensions. [Elwick and Cannizzaro \(2017\)](#) emphasise the importance of moving beyond satisfaction metrics, whereas [Figueira et al. \(2017\)](#) note that well-being fluctuates across the academic year, highlighting the necessity of a multidimensional framework. Institutional initiatives constitute a critical but insufficiently studied factor. Evidence indicates that integrating SF into curriculum design can enhance well-being ([Iordache-Platis, 2020](#)); however, the systematic implementation and evaluation of such strategies remain limited.

Moreover, the relationship between education and happiness is complex and context-dependent, as previous research demonstrates. Empirical studies in China indicate that the impact of education on happiness is contingent on income and employment status ([Yang et al., 2022](#)), suggesting that a uniform index may overlook local variations. This underscores the importance of contextual relevance in developing countries, exemplified by Vietnam and specifically Saigon University ([Orsini, 2023](#)). A further methodological gap concerns the insufficiency of current measures, which are often based on broad constructs that fail to fully capture the distinctive experiences of students. [Bore et al. \(2016\)](#) emphasise the need to develop reliable and validated instruments through participatory engagement with students and educators. To address these limitations, the HIHE was developed using a four-phase approach comprising Delphi research, pilot testing, PLS-SEM analysis, and ANN modelling, thereby ensuring conceptual rigour, contextual relevance, and methodological reliability.

From a managerial and policy perspective, higher education institutions should extend beyond conventional satisfaction surveys by implementing continuous feedback mechanisms, expanding support services, and tailoring well-being initiatives to socio-economic diversity. Advanced analytics can be employed to predict trends in student happiness and evaluate institutional policies, while policymakers should integrate happiness indicators into performance frameworks and allocate resources for

comprehensive student services. Collectively, these measures are expected to enhance student engagement, academic success, and institutional sustainability. The research is structured to achieve these objectives, with the introduction identifying research gaps, the literature review synthesising previous findings, the methodology detailing the four-phase design, the results and discussion validating the HIHE, and the conclusion highlighting contributions, practical implications, and directions for future research.

THEORETICAL BACKGROUND

The conceptualisation of happiness indices is grounded in multiple theoretical frameworks. To ensure conceptual precision and avoid redundancy, this study focuses on three principal perspectives that directly inform scale development. Subjective Well-Being (SWB) Theory (Deci & Ryan, 2000) provides the foundational framework, defining happiness as the combination of LIS, positive affect, and low negative affect. This perspective emphasises students' cognitive and affective evaluations of overall life quality. In this study, SWB underpins constructs such as LIS and EWB, capturing both cognitive appraisals and emotional resilience. Psychological Well-Being (PWB) theory (Ryff, 1989) complements SWB by emphasising eudaimonic aspects, including self-acceptance, autonomy, positive relations, environmental mastery, personal growth, and purpose in life. These dimensions extend beyond hedonic measures to reflect fulfilment and meaningful engagement. Within this study, PWB informs constructs such as PEL and PWB, representing students' sense of purpose, vitality, and capacity to manage academic demands.

Self-Determination Theory (SDT) (Deci & Ryan, 2000) posits that autonomy, competence, and social relatedness are essential psychological needs for well-being. This framework is particularly relevant in higher education, where engagement and self-directed learning are critical for overall health. Accordingly, SDT informs constructs such as AIL and SF, reflecting students' need for independence, recognition, and active participation in shaping the learning environment. The integration of SWB, PWB, and SDT provides a robust theoretical foundation for the HIHE. SWB underlies subjective evaluations of LIS and EWB; PWB incorporates eudaimonic dimensions such as PEL and PWB; and SDT highlights the psychological needs that promote intrinsic motivation and engagement. This combined framework enables a multidimensional assessment of student well-being that captures cognitive, emotional, motivational, and developmental facets, thereby enhancing the validity and precision of the HIHE.

STUDY 1: A DELPHI STUDY

Identifying Key Factors for the Happiness Index

Following a systematic literature review, a comprehensive set of potential determinants for assessing student happiness in higher education was identified. These determinants,

summarised in [Table 1](#), were subsequently evaluated by twelve experts in higher education and psychology using a seven-point Likert scale.

Table 1: Selected Key Variables in Happiness Index in Higher Education

Construct	Definition	Theory	Reference(s)
Life Satisfaction (LIS)	Overall cognitive evaluation of one's life quality and fulfilment.	Subjective Well-Being (SWB) Theory	(Patino et al., 2023)
Optimism About the Future (OAF)	Positive expectations about academic and career outcomes.	Positive Psychology Theory	(Seligman, 2011)
Physical Well-Being (PWB)	Perceived health, vitality, and energy levels affecting daily activities.	Psychological Well-Being (PWB) Theory	(Deci & Ryan, 2016)
Purpose and Engagement in Life (PEL)	Sense of meaning, motivation, and fulfilment in academic and personal life.	Self-Determination Theory (SDT)	(Deci et al., 1999; Deci & Ryan, 2016)
Time Balance (TB)	Perceived control over time for academics, personal life, and leisure.	Work-Life Balance Theory	(Greenhaus & Allen, 2011)
Academic Stress (AS)	Level of pressure and anxiety related to coursework and academic performance.	Stress and Coping Theory	(Lazarus & Folkman, 1984)
Learning, Arts, and Culture (LAC)	Engagement in academic, artistic, and cultural activities contributes to personal growth.	Cultural Capital Theory	(Bourdieu, 2018)
My University's Community (MUC)	Sense of belonging, inclusion, and emotional connection within the university.	Sense of Community Theory	(McMillan & Chavis, 1986)
Work-Study Balance (WSB)	The ability to manage both academic responsibilities and part-time work without excessive stress.	Role Strain Theory	(Butler & Kern, 2016)
Social Support (SS)	Availability of emotional, academic, and peer support.	Social Support Theory	(Liu et al., 2023)
Respect (RES)	Feeling valued and respected by peers, faculty, and university leadership.	Social Identity Theory	(Abecia et al., 2014)
Perceived Institutional Support (PIS)	The degree to which students feel supported by faculty, administration, and university services.	Organizational Support Theory	(Abecia et al., 2014; Kumari et al., 2022)
Financial Stability (FS)	Perceived economic security and its impact on academic success.	Economic Well-Being Theory	(Diener, 1984)
Peer Relationships (PR)	The quality of friendships and peer interactions at university.	Social Network Theory	(Flodén, 2017)
Student Feedback & Suggestions (SF)	The extent to which student voices are heard and influence university decisions.	Participatory Decision-Making Theory	(Flodén, 2017)

Table 1: Selected Key Variables in Happiness Index in Higher Education (cont...)

Construct	Definition	Theory	Reference(s)
Emotional Well-being (EWB)	Frequency of positive emotions and resilience to stress.	Broaden-and-Build Theory	(Abecia et al., 2014)
Cognitive Engagement (CE)	The extent to which students invest effort in understanding and mastering academic content.	Student Engagement Theory	(Cohen & Wills, 1985; McMillan & Chavis, 1986)
Campus Environment (CEV)	The perceived safety, inclusivity, and physical infrastructure of the university.	Environmental Psychology Theory	(Iordache-Platis, 2020)
Institutional Trust (IT)	Confidence in the fairness, transparency, and effectiveness of university policies.	Trust Theory	(Figueira et al., 2017)
Autonomy in Learning (AIL)	The ability to make independent academic decisions.	Self-Determination Theory (SDT)	(Deci et al., 1999; Deci & Ryan, 2016)
Growth Mindset (GM)	The belief that intelligence and abilities can be developed through effort and learning.	Mindset Theory	(Hosoda & Estrada, 2024; Iordache-Platis, 2020)

Source(s): Created by Authors.

Data Collection and Expert Consensus

A questionnaire encompassing all constructs and their definitions (Table 1) was circulated to twelve experts in higher education, psychology, and student affairs from internationally recognised universities. Each expert assessed the significance of the constructs using a seven-point Likert scale (1 = Not important, 7 = Very important). Consensus was established when: (i) the mean rating exceeded 5; (ii) at least 75% of experts assigned a rating of 5 or higher; and (iii) the standard deviation was below 1.5 (Okoli & Pawlowski, 2004). The outcomes from Round 1 (Table 2) indicated that seven constructs satisfied all criteria, representing the principal dimensions of student happiness in higher education.

Table 2: Results of Round 1 of the Delphi Study

Variables	Mean	Standard Deviation	% of Experts Rating (>5)	Selected
Life Satisfaction (LIS)	6.42	0.89	91.7%	Yes
Optimism About the Future (OAF)	5.75	1.12	83.3%	Yes
Time Balance (TB)	4.75	1.52	58.3%	No
Academic Stress (AS)	4.92	1.48	66.7%	No
Learning, Arts, and Culture (LAC)	5.17	1.30	75.0%	Yes
My University's Community (MUC)	6.08	1.02	83.3%	Yes
Work-Study Balance (WSB)	4.75	1.52	58.3%	No
Social Support (SS)	6.33	0.95	91.7%	Yes
Respect (RES)	5.50	1.25	75.0%	Yes

Table 2: Results of Round 1 of the Delphi Study (cont...)

Variables	Mean	Standard Deviation	% of Experts Rating (>5)	Selected
Perceived Institutional Support (PIS)	5.08	1.38	66.7%	No
Financial Stability (FS)	4.83	1.42	66.7%	No
Student Feedback & Suggestions (SF)	5.42	1.10	75.0%	Yes
Peer Relationships (PR)	4.92	1.46	66.7%	No
Emotional Well-being (EWB)	4.83	1.42	66.7%	No
Cognitive Engagement (CE)	5.00	1.37	66.7%	No
Campus Environment (CEV)	4.67	1.50	58.3%	No
Institutional Trust (IT)	4.92	1.48	66.7%	No
Physical Well-being (PWB)	4.75	1.52	58.3%	No
Purpose and Engagement in Life (PEL)	6.25	0.96	91.7%	Yes
Autonomy in Learning (AIL)	4.83	1.42	66.7%	No
Growth Mindset (GM)	4.83	1.42	66.7%	No

Source(s): Created by Authors.

Iterative Refinement through Delphi Rounds

In the second round of the Delphi study, the expert panel was provided with a summary of mean scores, medians, and standard deviations for the variables ranked in the first round. Experts were requested to either confirm the existing rankings or reassess the significance of specific variables and offer additional feedback. The Delphi process was finalised by establishing a consensus threshold of at least 80% agreement among experts (Taghipoorreynh, 2022). This second round achieved a 91.7% consensus rate, with most experts endorsing the rankings identified in Round 1. Minor adjustments were made, but the overall prioritisation of the variables remained largely unchanged.

Final Constructs and Conceptualization for the Happiness Index

The HIHE was constructed through a rigorous Delphi process, retaining only constructs that satisfied all three selection criteria ($M > 5$, $SD < 1.5$, $\geq 75\%$ expert agreement). The final dimensions included LIS, PEL, LAC, MUC, SS, RES, and SF. Collectively, these factors encompass the psychological, social, and institutional facets of student happiness. They were incorporated into the research model for further testing in Study 2 to evaluate their influence on overall student happiness.

HYPOTHESES DEVELOPMENT AND CONCEPTUAL FRAMEWORK

Drawing on the Delphi study and prior research, this study conceptualises student happiness as a multidimensional construct influenced by academic, social, and personal well-being. Figure 1 depicts the research model, in which seven constructs—LIS, PEL, LAC, MUC, SS, RES, and SF—are identified as key determinants of student happiness.

Life Satisfaction (LIS): LIS constitutes a core dimension of student happiness. Students exhibiting higher LIS report greater fulfilment and contentment, which function as pivotal contributors to overall happiness. Empirical evidence further demonstrates a robust association between LIS and student happiness (Putra & Ardi, 2024; Yeşiltepe et al., 2022).

H1: *Life Satisfaction is positively correlated with student happiness.*

Purpose and Engagement in Life (PEL): PEL reflects a robust sense of purpose and active involvement in meaningful pursuits, which promote intrinsic motivation and emotional well-being. Students whose behaviours are aligned with their personal values tend to experience higher levels of happiness and overall satisfaction (Choi, 2016; Vorkapić & Pelozza, 2017).

H2: *Purpose and Engagement in Life is positively correlated with student happiness.*

Learning, Arts, and Culture (LAC): Engagement in creative and cultural activities supports personal development, emotional enrichment, and overall fulfilment. Participation in such activities has been demonstrated to enhance mental well-being and contribute to elevated levels of happiness (Laosum, 2023; Zhu, 2024).

H3: *Learning, Arts, and Culture is positively correlated with student happiness.*

My University's Community (MUC): A strong sense of belonging within the university community fosters academic engagement, resilience, and overall well-being. Robust community connections offer emotional support, thereby contributing to higher levels of student happiness (Putra & Ardi, 2024).

H4: *My University's Community is positively correlated with student happiness.*

Social Support (SS): SS from peers, faculty, and institutional services constitutes a crucial factor in promoting emotional well-being and overall life satisfaction. Comprehensive support systems enhance both physical and mental health, thereby contributing to increased levels of student happiness (Ghafari et al., 2021).

H5: *Social Support is positively correlated with student happiness.*

Respect (RES): RES within the educational setting fosters a supportive environment that strengthens students' psychological well-being and overall satisfaction with university life. Students who perceive themselves as valued are more likely to experience elevated levels of happiness (Piqueras et al., 2011).

H6: *Respect is positively correlated with student happiness.*

Student Feedback (SF): SF mechanisms that acknowledge and act upon student input empower learners and foster greater engagement. Students who perceive that their

contributions are valued report higher levels of happiness and a stronger sense of connection to their academic environment (Barker et al., 2016).

H7: *Student Feedback is positively correlated with student happiness.*

STUDY 2: PILOT STUDY-CONTEXTUALIZATION OF SCALE

Following the Delphi study, a pilot test was undertaken to verify the clarity, reliability, and contextual applicability of the scale. Content validity was established using both the Content Validity Index (CVI) and the Scale-Level Content Validity Index (S-CVI) (Hew & Kadir, 2016). The relevance of each item to its corresponding construct was systematically evaluated, ensuring that the resulting measurement instrument was reliable, culturally appropriate, and capable of accurately capturing student well-being in higher education (Rousseau & Fried, 2001).

Instrument Development and Validation

The development of the measurement instrument was conducted in two phases. In Phase One, constructs were identified, items were selected, and preliminary testing, translation, and pilot surveys were undertaken to refine the scale. Phase Two involved the validation of the scale through a large-scale field survey. Concurrently, a back-translation procedure was employed to ensure both linguistic and conceptual accuracy.

Measurement Scales

In this study, a seven-point Likert scale was employed to assess participants' level of agreement with the statements, allowing for greater response variability and minimising neutral selections. The scale ranged from (1) Strongly Disagree to (7) Strongly Agree, thereby facilitating a more nuanced and precise evaluation of participants' perceptions.

Target Population and Sample

The study sample comprised undergraduate students from diverse disciplines and academic levels at Saigon University (Vietnam). Purposive sampling was employed to ensure a representative and suitable cohort for the development of the HIHE (Nguyen et al., 2024).

Data Collection Procedures

Data collection was conducted in two stages. During Phase 1 (pre-test survey), a small cohort of SGU students assessed the clarity and appropriateness of the questionnaire, with their recommendations subsequently incorporated into the instrument. In Phase 2 (formal survey), the online questionnaire was administered via Google Forms and disseminated through the university's email system and social media channels. Reliability testing and factor analysis were performed on the collected data.

Pre-Test

During the pilot phase, the scales were evaluated for both face and content validity. A panel of experts and practitioners reviewed the CVI assessments to ensure that the items accurately captured the intended constructs.

Scale Development and Expert Panel

The scales were adapted from previous research following a comprehensive review of the literature. To ensure face and content validity, the instrument was evaluated by a panel of experts, including three Vietnamese professors with extensive publications in ISI and Scopus journals, who had also contributed to the Delphi study. Cultural relevance was carefully considered to ensure appropriateness in the local context, and practical applicability was assessed by three experienced lecturers and master professors. The final assessment confirmed that the instrument was theoretically sound, culturally appropriate, and educationally relevant.

Face Validity

Face validity differs from content validity in that it assesses whether items appear to measure the intended construct, whereas content validity evaluates whether the items comprehensively represent the entire domain of the construct (Hardesty & Bearden, 2004). To establish face validity, a panel of experts reviewed each item for content relevance and consensus and evaluated the extent to which each item accurately reflected its intended measurement. Feedback from the expert panel confirmed that the instrument demonstrated a high degree of face validity. Minor revisions to content and formatting were suggested to enhance conceptual clarity and readability.

Content Validity Index (CVI)

The CVI was rigorously assessed at both the item and scale levels, in accordance with Lynn (1986). At the item level (I-CVI), each item attained a value of 0.83 or higher, surpassing the recommended threshold for a six-expert panel. At the scale level, the mean-based S-CVI/AVE exceeded 0.90, indicating a strong consensus among the expert reviewers. These results substantiate the instrument's content validity, confirming that all items are appropriately aligned with and capable of accurately measuring the intended research constructs.

Item-Level CVI

The item-level Content Validity Index (I-CVI) was determined by calculating the proportion of expert panel members who rated each item as either 3 or 4. Following Lynn (1986), a minimum I-CVI of 0.83 is recommended for a six-member expert panel. The evaluation of all items by the expert panel revealed that each I-CVI met or exceeded this threshold, thereby justifying the retention of all items within the measurement instrument.

Scale-Level CVI

The S-CVI reflects the proportion of items rated as 3 or 4 by the expert panel. Two approaches are commonly used: the universal agreement method (S-CVI/UA) and the average method (S-CVI/AVE). While S-CVI/UA requires unanimous agreement among all experts, it can be excessively stringent for larger panels, making S-CVI/AVE the preferred approach (Polit & Beck, 2006). According to Lynn (1986), a minimum S-CVI/AVE of 0.90 is recommended. As reported in Appendix B, all S-CVI/AVE values exceeded this threshold, confirming that the scale demonstrated adequate content validity and that no items needed to be removed.

Instrument Translation

As the instrument was administered in Vietnamese to ensure contextual appropriateness for SGU students, a rigorous translation protocol was implemented. The original English version was first translated into Vietnamese and subsequently back-translated independently into English to verify linguistic accuracy (Venkatesh et al., 2012). A panel of language and subject-matter experts reviewed both versions to resolve inconsistencies and ensure semantic and conceptual equivalence. This process confirmed that the final Vietnamese version aligned closely with the original (Al-Gahtani et al., 2007), thereby safeguarding the instrument's reliability and validity across linguistic and cultural contexts.

Pilot Test

The measurement instrument was pilot tested with a cohort of 100 SGU students who were excluded from the main survey. This sample size fell within the recommended range of 25–100 participants for pilot studies, which do not necessitate formal statistical sampling (Cooper et al., 2003). The pilot aimed to evaluate the reliability, clarity, and comprehensibility of the instrument. Feedback from participants prompted minor revisions to wording and formatting, ensuring that the questionnaire was optimally designed and contextually appropriate for the subsequent large-scale field survey.

Construct Reliability

Construct reliability evaluates the extent to which a scale consistently measures the intended construct (Phan et al., 2025). In the present study, reliability testing was performed using SPSS version 23, with Cronbach's alpha computed for each construct (Duc et al., 2024). An iterative refinement process was applied, removing items that did not enhance overall reliability. The initial Cronbach's alpha values obtained during the pilot test, presented in Table 6, ranged from 0.742 to 0.897. As all values exceeded the recommended threshold of 0.70 (Hair, 2010), the instrument was confirmed to possess a high level of construct reliability.

Field Work

To further substantiate the Vietnamese version of the instrument, a comprehensive field study was undertaken involving 800 SGU students, selected through purposive sampling to ensure relevance and diversity. From this effort, 575 and 398 questionnaires were initially returned. After systematically removing incomplete and duplicate entries, the dataset was refined to 327 valid responses, forming the basis for subsequent statistical analyses.

STUDY 3-EMPIRICAL STUDY PLS-SEM

Methodology

Sample Collection

A non-probability judgmental sampling approach was employed to capture insights regarding the HIHE and learner preferences in Vietnam, in alignment with previous studies (Duc et al., 2024; Phan et al., 2025). The required sample size was determined using the “50-times rule” for PLS-SEM and ANN, which stipulates a minimum of 50 cases per maximum number of arrows directed at an endogenous construct. In this study, the HAP construct had eight incoming paths, necessitating at least 400 cases. The final dataset comprised 1,339 respondents, substantially exceeding this requirement. It should be noted that data were purposively collected from a single Vietnamese institution (SGU). While this approach ensured contextual relevance and provided rich insights from a culturally coherent sample, it may limit the generalisability of the findings to other universities or cross-cultural settings.

Table 3: Respondents Profile (N=1339)

	Constructs	Frequency	%
Gender	Male	413	30.84%
	Female	926	69.16%
Academic Year	First Year	211	6.21%
	Second Year	418	24.60%
	Third Year	489	43.17%
	Fourth Year	221	26.02%
Faculty	Faculty of Information Technology	127	9.48%
	Faculty of Cultural Tourism	101	7.54%
	Faculty of Law	109	8.14%
	Faculty of Foreign Languages	296	22.11%
	Faculty of Early Childhood Education	120	8.96%
	Faculty of Finance and Accounting	140	10.46%
	Faculty of Applied Mathematics	98	7.32%
	Faculty of Business Administration	348	25.99%

Source(s): Created by Authors.

The sample included 69.16% female and 30.84% male students (Table 3). All academic levels were represented, with 6.21% freshmen, 24.60% sophomores, 43.17% juniors, and 26.02% seniors. Participants also reflected a diverse range of faculties, with the highest proportions from Business Administration (25.99%) and Foreign Languages (22.11%). The remainder were distributed across Finance and Accounting (10.46%), Information Technology (9.48%), Early Childhood Education (8.96%), Law (8.14%), Cultural Tourism (7.54%), and Applied Mathematics (7.32%).

Common Method Variance

The collection of data for both exogenous and endogenous variables from a single source may increase the likelihood of common method bias (CMB). To evaluate and mitigate this potential threat, both statistical and procedural measures were applied, and a cross-sectional research design was employed (Foo et al., 2018). Statistically, Harman's single-factor test indicated that the first factor accounted for 27.79% of the total variance, well below the 50% threshold (Teo, 2015). Consequently, common method variance did not materially compromise the study's results.

Measurement Model Assessment

Prior to testing the hypotheses within the structural model, validation of the outer (measurement) model was undertaken to ensure the reliability and validity of the constructs, encompassing both convergent and discriminant validity (Hair, 2010). As presented in Table 4, all factor loadings exceeded 0.7, composite reliability (CR) values were above 0.7, and average variance extracted (AVE) values surpassed 0.5, thereby confirming both reliability and convergent validity.

Table 4: Reliability and Convergent Validity

Construct	Item	FL	Cronbach's Alpha	(rho a)	(rho c)	AVE
HAP	HAP1	0.874	0.833	0.839	0.890	0.670
	HAP2	0.876				
	HAP3	0.711				
	HAP4	0.802				
LAC	LAC1	0.919	0.916	0.916	0.947	0.856
	LAC2	0.935				
	LAC3	0.921				
LIS	LIS1	0.856	0.825	0.834	0.895	0.740
	LIS2	0.883				
	LIS3	0.841				
MUC	MUC1	0.871	0.856	0.895	0.900	0.693
	MUC2	0.871				
	MUC3	0.845				
	MUC4	0.734				
PEL	PEL1	0.805	0.840	0.847	0.885	0.608
	PEL2	0.810				

Table 4: Reliability and Convergent Validity (cont...)

Construct	Item	FL	Cronbach's Alpha	(rho a)	(rho c)	AVE
	PEL3	0.745				
	PEL4	0.714				
	PEL5	0.819				
RES	RES1	0.869	0.836	0.843	0.891	0.673
	RES2	0.871				
	RES3	0.720				
	RES4	0.814				
SF	SF1	0.855	0.907	0.908	0.931	0.730
	SF2	0.869				
	SF3	0.873				
	SF4	0.874				
	SF5	0.797				
SS	SS1	0.911	0.753	0.911	0.861	0.683
	SS2	0.668				
	SS3	0.946				

Note(s): HAP = Happiness; LAC = Learning, Arts, and Culture at University; LIS = Life Satisfaction; MUC = My University's Community; PEL = Purpose and Engagement in Life; RES = Respect; SF = Student Feedback & Suggestions; SS = Social Support

Source(s): Created by Authors.

Discriminant validity was evaluated using the Fornell-Larcker criterion, which demonstrated that the square roots of AVE for each construct exceeded their respective inter-construct correlations (Table 5).

Table 5: Fornell-Lacker's Criterion

	HAP	LAC	LIS	MUC	PEL	RES	SF	SS
HAP	0.819							
LAC	0.207	0.925						
LIS	0.436	0.332	0.860					
MUC	0.389	0.577	0.473	0.832				
PEL	0.357	0.346	0.570	0.534	0.780			
RES	0.713	0.165	0.286	0.304	0.241	0.821		
SF	0.530	0.175	0.430	0.304	0.379	0.389	0.854	
SS	-0.205	-0.424	-0.455	-0.531	-0.654	-0.157	-0.270	0.826

Source(s): Created by Authors.

Cross-loadings further corroborated the distinctiveness of the constructs. Moreover, all HTMT ratios were below the recommended threshold of 0.90 (Table 6), providing additional confirmation of discriminant validity (Fornell & Larcker, 1981; Hair Jr et al., 2017; Henseler et al., 2015).

Table 6: Hetero-Trait- Mono-Trait (HTMT) (0.90)

	HAP	LAC	LIS	MUC	PEL	RES	SF	SS
HAP								
LAC	0.238							
LIS	0.522	0.385						
MUC	0.439	0.661	0.559					
PEL	0.413	0.399	0.682	0.633				
RES	0.853	0.191	0.340	0.350	0.279			
SF	0.610	0.192	0.490	0.327	0.425	0.447		
SS	0.248	0.511	0.556	0.652	0.769	0.186	0.312	

Source(s): Created by Authors.

Structural Model Assessment

All variance inflation factor (VIF) values were below 3.3, indicating the absence of serious multicollinearity within the structural model. Path coefficients were examined using a bootstrapping procedure with 5,000 subsamples, applying bias-corrected 95% confidence intervals to enhance robustness. The findings (Table 7) indicated that LAC did not exert a significant effect on HAP (H1), and perceived homophily was also non-significant. Except for H1, all other hypothesised relationships were supported, thereby confirming the overall validity of the structural model.

Table 7: Hypothesis Testing

Hypothesis	Pathway	Original Sample (O)	T Statistics	P Values	2.50%	97.50%	Remark
H1	LAC -> HAP	-0.016	0.584	0.559	-0.069	0.036	Unsupported
H2	LIS -> HAP	0.139	5.256	0.000	0.088	0.193	Supported
H3	MUC -> HAP	0.113	3.311	0.001	0.043	0.178	Supported
H4	PEL -> HAP	0.076	2.246	0.025	0.009	0.140	Supported
H5	RES -> HAP	0.553	15.496	0.000	0.484	0.624	Supported
H6	SF -> HAP	0.223	7.144	0.000	0.164	0.285	Supported
H7	SS -> HAP	0.108	3.469	0.001	0.046	0.167	Supported

Source(s): Created by Authors.

STUDY 4-ARTIFICIAL NEURAL NETWORKS ANALYSIS

Conventional linear models, such as multiple regression analysis (MRA) and structural equation modelling (SEM), are limited in capturing the intricacies of human decision-making because they primarily identify linear correlations and employ compensatory mechanisms, whereby reductions in one variable can be offset by increases in another. Such approaches are insufficient for representing non-compensatory behavioural dynamics. In contrast, ANN can model both linear and nonlinear relationships, rendering them particularly suitable for non-compensatory contexts. Consistent with Lim et al. (2021), the ANN employed in this study demonstrated superior predictive accuracy and robustness against noise, non-normality, and multicollinearity relative to

MRA and SEM.

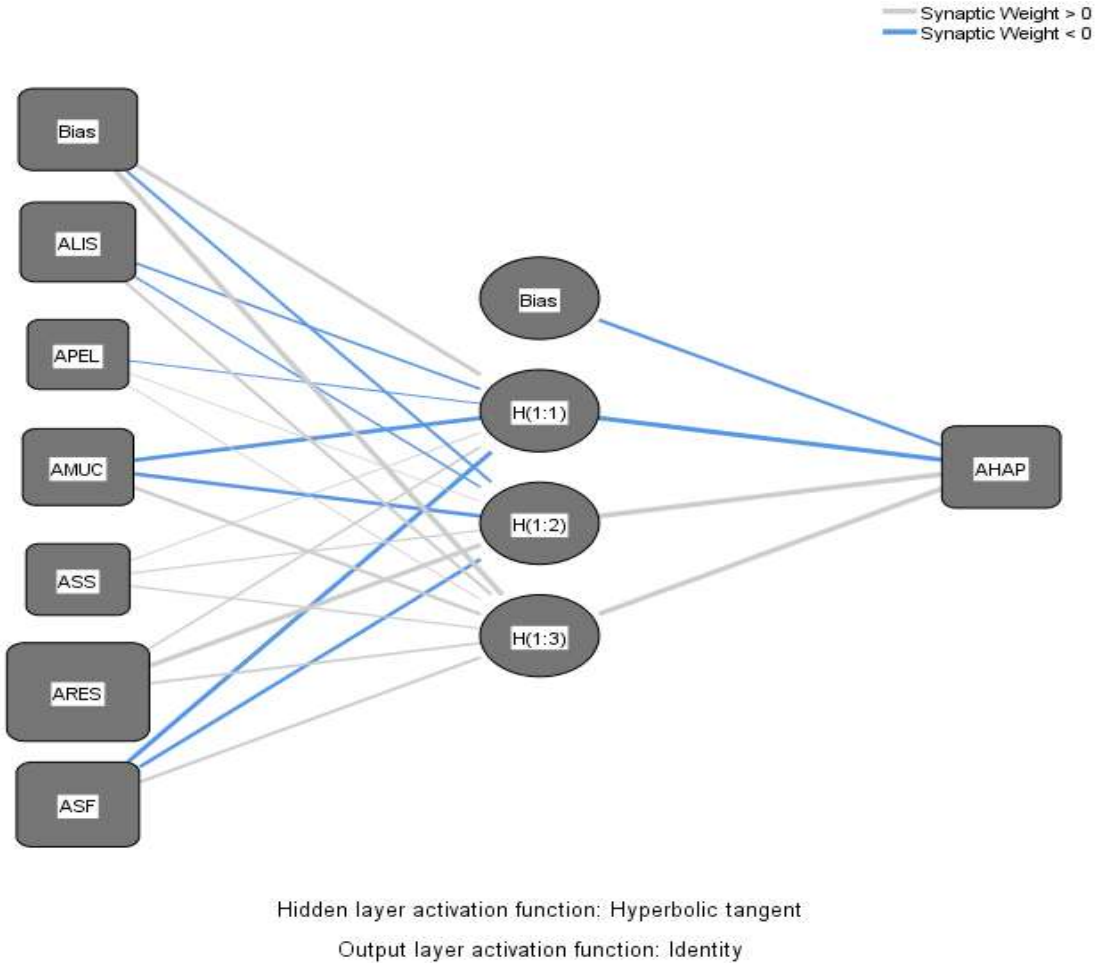


Figure 1: Neural Network Model

Source(s): Created by SPSS Software.

Tables 8 and 9 further corroborate the predictive strength of the model, showing low mean RMSE values for training (0.381) and testing (0.398). Sensitivity analysis indicated varying levels of predictor importance, with RES emerging as the most influential factor (100%), followed by SF (58.3%) and LIS (42.5%).

Table 8: RMSE Values of ANN

Neural Network	TRAINING			TESTING			TOTAL
	N	SSE	RMSE	N	SSE	RMSE	
1	1194	1510.587	0.358	145	187.916	0.345	1339
2	1208	1657.347	0.404	131	179.848	0.412	1339

	TRAINING			TESTING			
3	1197	1568.809	0.346	142	186.042	0.303	1339
4	1213	1508.368	0.349	125	157.769	0.328	1338
5	1208	1578.738	0.329	131	185.012	0.389	1339
6	1200	1474.902	0.343	138	183.713	0.391	1338
7	1212	1684.171	0.375	127	194.199	0.425	1339
8	1198	1486.896	0.340	140	183.425	0.336	1338
9	1214	1919.484	0.540	124	211.556	0.516	1338
10	1202	1738.610	0.424	137	246.101	0.533	1339
Means		1612.791 2	0.381		191.5581	0.398	
SD		139.9516 3	0.064		23.273458	0.077	

These findings highlight the advantages of ANN over traditional models in capturing non-compensatory behaviour while offering valuable insights for both research and practical applications.

Table 9: Sensitivity Analyses: Normalized Importance of Constructs for ANN Model

Neural Network	LIS	PEL	MUC	SS	RES	SF	Total
1	0.188	0.124	0.110	0.106	0.262	0.209	0.999
2	0.205	0.086	0.134	0.116	0.262	0.197	1
3	0.170	0.122	0.148	0.078	0.300	0.182	1
4	0.188	0.106	0.159	0.104	0.273	0.170	1
5	0.165	0.102	0.132	0.102	0.319	0.180	1
6	0.173	0.106	0.139	0.139	0.284	0.160	1.001
7	0.208	0.065	0.074	0.050	0.400	0.201	0.998
8	0.198	0.067	0.170	0.092	0.280	0.192	0.999
9	0.162	0.062	0.138	0.083	0.321	0.234	1
10	0.228	0.095	0.105	0.075	0.304	0.193	1
Means	0.160	0.049	0.126	0.067	0.378	0.220	
Normalized Importance	42.50%	12.90%	33.50%	17.80%	100.00%	58.30%	

Beyond its predictive capabilities, ANN was employed in this study due to its methodological strengths in capturing the complexity of student experiences. Unlike traditional linear models, which assume additive and compensatory relationships, ANN can identify non-linear interactions that more accurately reflect the dynamics within higher education contexts. For example, constructs such as RES, SS, and LIS may not contribute to HAP in a purely additive manner but can interact in ways that amplify or mitigate each other's effects. By revealing these nuanced interdependencies, ANN complements PLS-SEM and provides a more comprehensive understanding of how multiple factors collectively shape student well-being.

Table 10: Comparison Between SEM Results and Neural Network Results

	PLS-SEM	Ranking	ANN	Ranking	Remark
LIS	0.139	3	0.160	3	Match
PEL	0.076	6	0.049	6	Match
MUC	0.113	4	0.126	4	Match
SS	0.108	5	0.067	5	Match
RES	0.553	1	0.378	1	Match
SF	0.223	2	0.220	2	Match

Source(s): Created by Authors.

To evaluate the comparative efficacy of ANN and PLS-SEM, the study examined the relative significance of the constructs LIS, PEL, MUC, SS, RES, and SF. The PLS-SEM analysis (Table 10) revealed that both techniques consistently highlighted RES and SF as the dominant determinants of HAP, followed by LIS, MUC, SS, and PEL, indicating substantial concordance between the methods. Whereas PLS-SEM elucidates linear associations, ANN additionally captures complex nonlinear interactions, thereby augmenting the model's predictive precision. These findings offer profound theoretical and practical implications, illustrating the differential influence of each predictor and demonstrating that advanced machine learning approaches, such as ANN, can substantially enhance the understanding of the intricate, multidimensional relationships that underpin student happiness and broader well-being outcomes.

DISCUSSION

This study introduces a multidimensional framework for assessing well-being in higher education, extending beyond conventional satisfaction metrics (Elwick & Cannizzaro, 2017). The PLS-SEM results further revealed that RES, SF, and LIS were the most salient predictors, emphasising the integrated influence of individual-psychological and institutional factors, consistent with prior research (Bore et al., 2016). Notably, RES demonstrated the highest impact ($\beta = 0.553$, $p < 0.001$), underscoring its critical role in fostering emotional stability and well-being (Piqueras et al., 2011), while SF ($\beta = 0.223$, $p < 0.001$) highlighted the importance of institutional responsiveness to student autonomy and engagement (Barker et al., 2016). Additional constructs, including LIS, PEL, MUC, and SS, exerted positive effects, indicating that student happiness arises from a confluence of academic, social, and personal experiences.

These outcomes corroborate previous evidence regarding the significance of social support (Ghafari et al., 2021) and purpose-driven engagement (Vorkapić & Peloza, 2017). Despite its grounding in creativity and emotional enrichment, LAC did not exert a significant influence on HAP ($\beta = -0.016$, $p = 0.559$) (Laosum, 2023; Zhu, 2024), suggesting that the impact of cultural and extracurricular involvement is highly context-dependent. Within the Vietnamese higher education setting, such activities are frequently perceived as secondary to academic achievement and career preparation.

Socioeconomic factors may further constrain participation, as students from lower-income backgrounds often prioritise part-time work or financial obligations over arts and cultural pursuits, thereby diminishing engagement and its perceived contribution to HAP. Variability in institutional resources, campus culture, and support for extracurricular programmes may also account for the weaker association observed.

Beyond PLS-SEM, the incorporation of ANN enhanced predictive precision and enabled a more nuanced interpretation of complex, non-linear interrelationships among constructs. Student happiness rarely emerges from isolated factors; rather, it is shaped by the interplay of social, psychological, and institutional influences. For instance, RES and SS may mutually reinforce one another in promoting HAP, providing actionable insights for educational practitioners and policymakers. Collectively, these findings underscore that fostering mutual respect, implementing effective feedback mechanisms, and cultivating a supportive academic community are pivotal strategies for enhancing student satisfaction within university environments.

THEORETICAL CONTRIBUTIONS, MANAGERIAL IMPLICATIONS, AND LIMITATION & FUTURE RESEARCH DIRECTIONS

Theoretical Contributions

This study offers several significant theoretical contributions to the literature on student well-being and scale development in higher education. Firstly, it presents a comprehensive and multidimensional HIHE, addressing a notable gap in prior research where student happiness has frequently been measured using fragmented or general well-being indicators. By integrating insights from social psychology, positive psychology, and higher education scholarship, the study conceptualises happiness as a holistic construct encompassing LIS, PWB, PEL, SS, RES, time balance, LAC, MUC, and SF. Secondly, the research advances scale development methodology through a rigorous four-phase validation process, incorporating the Delphi method (conceptualisation), pilot testing (contextualisation), PLS-SEM (linear analysis), and ANN (non-linear relationships). This hybridised approach enhances the robustness of psychometric assessment and provides a methodological template for future studies in scale construction.

Thirdly, by combining linear (PLS-SEM) and non-linear (ANN) modelling, the study deepens theoretical understanding of student happiness as a dynamic and complex construct. It underscores the potential for non-linear interactions among determinants of HAP, which conventional linear models may fail to capture, thereby offering a more refined interpretation of how multiple factors collectively influence student well-being. Finally, the research contributes to the evolving discourse on happiness in higher education by situating the construct within the context of SGU. While prior happiness indices have predominantly emerged from Western settings, this study establishes a

culturally attuned framework that reflects the distinctive experiences of SGU students, providing a basis for future cross-cultural comparison and adaptation.

Managerial Implications

The findings of this study yield several practical implications for administrators, educators, and policymakers in cultivating a supportive and engaging learning environment at SGU. From a managerial standpoint, universities should implement policies that balance academic, social, and personal dimensions of student well-being, thereby adopting a holistic approach to student development. Strengthening initiatives such as career counselling, mentorship programmes, and extracurricular activities can significantly enhance overall HAP. The HIHE provides a robust and reliable instrument for assessing student well-being, facilitating evidence-based enhancements in academic policies, student services, and campus engagement. Emphasis should be placed on SS and RES, which emerged as principal drivers of HAP. Training faculty and staff to foster inclusivity and respect, alongside instituting regular feedback mechanisms, can empower students and strengthen engagement. The integration of technological solutions, such as AI-enabled learning platforms and digital communities, further supports real-time monitoring of well-being and enables timely interventions for at-risk students.

From a policy perspective, incorporating student happiness as a core performance metric in university evaluations would incentivise institutions to prioritise well-being. Establishing a national framework for well-being assessment and investing in mental health services, counselling, and financial assistance are critical, particularly for vulnerable student populations. Additionally, public–private partnerships can enrich the student experience through internships, career development opportunities, and networking platforms that cultivate purpose and personal growth. Policymakers should also promote research and allocate funding to initiatives focused on student well-being, thereby driving continuous innovation. By adopting these strategies, SGU and higher education authorities can enhance academic outcomes, reduce attrition, and foster a more satisfied and engaged student body. The HIHE serves as an essential tool for ongoing evaluation and policy refinement, supporting sustainable improvements in student well-being.

Limitation & Future Research Directions

While this research makes substantial contributions to the measurement of student happiness in higher education, several limitations warrant acknowledgement. Firstly, the study was conducted exclusively at SGU, a public university in Ho Chi Minh City, where many students balance academic responsibilities with part-time employment and navigate distinct urban socio-economic pressures. Such cultural and institutional characteristics may influence HAP differently than in rural universities or institutions

in other countries. Although the sizeable sample ($N = 1,339$) enhances statistical robustness, the use of purposive sampling within a single institution constrains external validity. Future studies should aim to validate the HIHE across multiple universities, regions, and countries using probability-based sampling to ensure cross-cultural generalisability. Longitudinal designs, such as panel surveys or cohort tracking, are recommended to examine temporal changes in HAP under evolving economic conditions, curriculum reforms, or technological innovations. Cross-national investigations could further employ measurement invariance testing or multi-group analysis to confirm that the HIHE functions equivalently across diverse cultural contexts.

Secondly, despite the utilisation of both PLS-SEM and ANN, this study did not explore potential moderating effects of demographic variables, including gender, socio-economic status, or academic discipline. Subsequent research should investigate these factors to elucidate differential impacts on HAP. Additionally, the reliance on self-reported survey data introduces the possibility of response bias; triangulating multiple data sources, such as focus groups, interviews, or institutional records, would enhance the validity of findings. Thirdly, the non-significant influence of LAC highlights the necessity of examining socio-economic and institutional determinants, including income disparities, accessibility to extracurricular activities, and institutional support, in shaping engagement with cultural and creative pursuits. Finally, future research should consider the integration of technological approaches, such as AI-driven sentiment analysis and machine learning models, to monitor and predict HAP in real time, utilising data derived from learning management systems, engagement platforms, and mental health applications. Addressing these limitations will enable future studies to refine and extend the HIHE, bolstering its applicability across varied academic contexts and contributing to a more comprehensive understanding of student well-being.

DECLARATIONS

The authors declare no conflict of interest.

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This study did not involve any experimental procedures with human subjects. Nevertheless, as it engaged human participants through a structured questionnaire survey, informed consent was obtained from all respondents. Participants were fully briefed on the purpose of the research, and their involvement was entirely voluntary.

All responses were collected anonymously and were used exclusively for academic purposes.

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