

Development and Validation of an Academic Engagement Scale for Undergraduate Students in Distance Learning

Supunsa Langprasert¹ and Pisutthipa Metheekul^{2*}

(Received: March 2, 2026; Revised: April 24, 2026; Accepted: June 11, 2026)

Abstract

Distance education at open universities faces significant challenges, including high attrition rates driven by social isolation and the demands of self-directed learning. A context-specific instrument is essential for understanding the mechanisms that support student persistence. This study aimed to develop and validate an academic engagement scale, with development referring to the refinement of an existing framework. Drawing on constructivist and motivational theories, academic engagement was conceptualized as a second-order construct comprising cognitive, emotional, and behavioral dimensions. Data were collected from 440 students at Sukhothai Thammathirat Open University using cluster sampling based on academic disciplines (Social Sciences, Health Sciences, and Science and Technology). Confirmatory Factor Analysis (CFA) was conducted to examine the hierarchical structure, while Cronbach's alpha, Average Variance Extracted (AVE), and the Heterotrait-Monotrait (HTMT) ratio were used to assess reliability and construct validity.

The model fit indices indicated an acceptable fit to the data ($\chi^2/df = 3.22$, RMSEA = .07, CFI = .92, NFI = .91, and SRMR = .04). All dimensions demonstrated satisfactory reliability and validity, with HTMT values below .85, supporting the distinctiveness of the constructs. Cognitive engagement showed strong associations within the model, highlighting the role of self-regulated learning in distance education. The findings provide empirical support for a multidimensional structure of academic engagement and contribute a context-specific measurement tool that can be applied to support student engagement and retention in an open university distance learning context.

Keywords: academic engagement, open university, distance learning, scale validation

¹ Lecturer, Office of Registration, Records and Evaluation, Sukhothai Thammathirat Open University, Thailand

² Assistant Professor, School of Human Ecology, Sukhothai Thammathirat Open University, Thailand

* Corresponding Author E-mail: Pisutthipa.Met@stou.ac.th

Introduction

Academic engagement is widely recognized as a key predictor of students' academic success, encompassing cognitive, emotional, and behavioral dimensions (Fredricks et al., 2004; Fredricks, 2012). These dimensions reflect students' active involvement in learning processes, including their effort, emotional connection, and use of self-regulated learning strategies. Students who demonstrate high levels of engagement are more likely to persist in their studies, employ adaptive learning strategies, and achieve positive academic outcomes. From a theoretical perspective, academic engagement can be understood through the lens of constructivist theory. Rooted in the work of Vygotsky (1978) and Piaget (1970), constructivism posits that learning is an active process in which individuals construct knowledge through interaction with their environment. In this context, academic engagement represents the driving force that enables learners to actively participate in and make meaning from learning experiences. This perspective is particularly relevant in distance learning environments, where learners must rely on their own initiative and self-regulation to sustain meaningful learning.

Previous studies have consistently demonstrated that academic engagement plays an important role in student achievement and persistence across educational contexts (Fredricks et al., 2004; Fredricks, 2012). In distance learning environments, engagement has been closely associated with self-regulated learning processes, as learners are required to take greater responsibility for managing their own learning (Lerdpornkulrat, 2023). These findings suggest that academic engagement is not only influenced by individual motivation but also by learners' ability to regulate their learning behaviors.

Sukhothai Thammathirat Open University (STOU) represents a key institution in Thailand's open and distance learning system, providing flexible access to higher education for diverse student populations. While distance education offers advantages such as flexibility and accessibility (Al-Fraihat et al., 2020), it also introduces challenges, including social isolation and the need for strong self-directed learning skills. According to Moore's (1993) theory of transactional distance, the separation between learners and institutions may create psychological distance, which can negatively influence engagement and persistence. Empirical studies in the STOU context have shown that student success is influenced by both individual factors, such as motivation and self-regulated learning, and institutional support mechanisms (Sungsri, 2018; Metheekul, 2022). These findings highlight the importance of academic engagement as a key mechanism linking learners to their educational environment.

Another important factor closely associated with academic engagement in distance learning is self-regulated learning. In technology-mediated environments, learners who actively regulate their learning—by setting goals, monitoring progress, and applying appropriate strategies—tend to exhibit higher levels of engagement and academic performance (Zimmerman, 2000; Lerdpornkulrat, 2023). These characteristics align with constructivist principles and underscore the importance of internal learning processes in sustaining engagement. However, despite the recognized importance of academic engagement, the applicability of existing measurement instruments in the Thai higher education context remains limited. Existing research in Thailand has primarily focused on factors influencing learning success rather than the validation of context-specific measurement tools. As a result, there remains a lack of rigorously validated instruments specifically designed to assess academic engagement in open and distance learning environments.

Although academic engagement has been widely studied, several measurement instruments have been developed in different educational contexts, such as the Utrecht Work Engagement Scale for Students (UWES-S; Schaufeli et al., 2002) and the National Survey of Student Engagement (NSSE; Kuh, 2001). However, these instruments were primarily designed for traditional or Western higher education settings and may not fully capture the characteristics of learners in open and distance learning environments. In particular, they often overlook the flexible learning structures, reduced face-to-face interaction, and the central role of self-regulated learning in such contexts. In the Thai higher education context, existing studies have focused more on factors influencing learning success rather than on the validation of context-specific engagement instruments. As a result, there remains a lack of empirically validated tools specifically tailored to measure academic engagement in open university systems. This gap highlights the need to refine and validate an academic engagement scale that is theoretically grounded and contextually appropriate for distance learning environments.

Therefore, there is a need to refine and validate an academic engagement scale that is appropriate for open university settings. In this study, the term “development” refers to the refinement and contextual adaptation of an existing instrument rather than the creation of a completely new scale. Accordingly, the purpose of this study is to refine and validate an Academic Engagement Scale for undergraduate students in a distance learning context at Sukhothai Thammathirat Open University.

Objective

To examine the factorial structure and assess the reliability and construct validity of the academic engagement scale using Confirmatory Factor Analysis (CFA).

Methods

Research Design

This study employed a quantitative research design to examine the factorial structure and validate the psychometric properties of the Academic Engagement Scale for undergraduate students in a distance learning context.

Population

The population comprised undergraduate students at Sukhothai Thammathirat Open University (STOU) who were actively enrolled during the study period. The sample consisted of 440 undergraduate students who voluntarily participated in the online survey. The use of active enrollment status, rather than a fixed cohort year, reflects the flexible enrollment structure of open universities, where students may enroll intermittently over extended periods.

Sampling and Sample Procedures

The sample size was determined based on recommendations for structural equation modeling. According to Tabachnick and Fidell (2013), a sample size greater than 300 is considered adequate for factor analysis. A total of 500 questionnaires were distributed, and 440 valid responses were received, representing a response rate of 88%.

The sample was obtained using a cluster sampling technique based on three academic disciplines: Social Sciences, Health Sciences, and Science and Technology. This approach was adopted to ensure representation across the major academic fields within the university. Due to the flexible enrollment structure of open universities, students at Sukhothai Thammathirat Open University (STOU) do not follow a conventional year-level progression. In addition, students may enroll in courses across different academic levels simultaneously. As a result, year level does not accurately reflect students' academic standing or learning experience and is therefore less appropriate for grouping purposes in this context.

Table 1 Sample size

Academic field group	Target Sample Size (n)	Actual Responses Collected (n)
Social Sciences	250	285
Health Sciences	150	103
Science and Technology	100	52
Total	500	440

Instrument

The Academic Engagement Scale was adapted from the frameworks of Fredricks et al. (2004) and Wangrunakit (2018). The instrument consists of 27 items measured on a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The instrument consists of three dimensions: Cognitive Engagement (12 items), Emotional Engagement (11 items), and Behavioral Engagement (4 items). The instrument was originally developed and validated in a traditional university context (Wangrunakit, 2018). In the present study, the scale was refined to align with the characteristics of students in an open and distance learning environment at STOU. Minor modifications were made to item wording to reflect the learning context while preserving the original conceptual structure. Given that the construct and dimensional structure had been previously established (Fredricks et al., 2004), a theory-driven approach was adopted. Therefore, Confirmatory Factor Analysis (CFA) was employed to validate the hypothesized structure in the new context. Exploratory Factor Analysis (EFA) was not conducted, as the study aimed to confirm an existing theoretical model rather than to explore a new factor structure. Conducting both EFA and CFA on the same dataset may also lead to overfitting and is generally not recommended (Kline, 2016).

Data Collection

Data were collected through an online survey from undergraduate students at Sukhothai Thammathirat Open University (STOU) who were currently enrolled and willing to participate voluntarily. Participants were informed about the purpose of the study and their rights, and informed consent was obtained prior to participation. The questionnaire was administered across the three academic clusters, and responses were screened for completeness and consistency. Cases with missing or invalid data were excluded.

Data Analysis

Confirmatory Factor Analysis (CFA) was conducted using the Maximum Likelihood (ML) estimation method to examine the factorial structure of the Academic Engagement Scale (Kline, 2016). Model fit was evaluated using multiple indices, including chi-square (χ^2), the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR), the Comparative Fit Index (CFI), and the Normed Fit Index (NFI). Acceptable model fit was determined based on the following criteria: RMSEA < .08, SRMR < .08, and CFI and NFI > .90 (Hu & Bentler, 1999). A χ^2/df value less than 5 was considered indicative of acceptable model fit (Kline, 2016). Given the sensitivity of the chi-square statistic to sample size, a significant χ^2 value does not necessarily indicate poor model fit (Kline, 2016). Reliability and construct validity were assessed using Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). An AVE value greater than .50 and a CR value greater than .70 were considered acceptable (Hair et al., 2010).

Ethical Considerations

This study received approval from the Human Research Ethics Committee of Nakhon Ratchasima Rajabhat University (Ethics Number: HE-RDI-NRRU 139/2024). All participants were informed about the study and provided informed consent prior to data collection.

Results

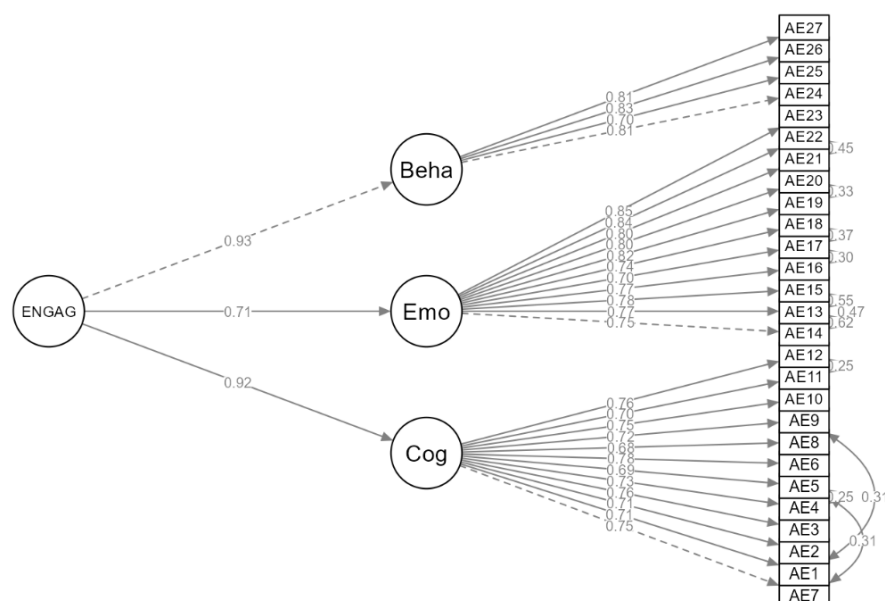
Demographic Characteristics of the Sample

The demographic characteristics of the 440 undergraduate students from STOU are presented in Table 2. The majority of the participants were female ($n = 338$, 76.8%), while male participants accounted for 23.2% ($n = 102$). In terms of age distribution, the largest group consisted of individuals aged 20–25 years ($n = 270$, 61.4%). This was followed by the 36–40 age group ($n = 40$, 9.1%), the 31–35 age group ($n = 39$, 8.9%), and the 26–30 age group ($n = 36$, 8.2%), respectively. Regarding academic clusters, most participants were from Social Sciences ($n = 285$, 64.8%), followed by Health Sciences ($n = 103$, 23.4%) and Science and Technology ($n = 52$, 11.8%).

Table 2 Frequency and Percentage of General Characteristics of the Sample

Demographic Variables	Frequency (n)	Percentage (%)
1. Gender		
Male	102	23.2
Female	338	76.8
2. Age		
20 – 25 years	270	61.4
26 – 30 years	36	8.2
31 – 35 years	39	8.9
36 – 40 years	40	9.1
41 – 45 years	16	3.6
46 – 50 years	16	3.6
51 – 55 years	10	2.3
56 – 60 years	10	2.3
61 years and above	3	0.7
3. Academic Cluster		
Social Sciences	285	64.8
Health Sciences	103	23.4
Science and Technology	52	11.8
Total	440	100

The hypothesized second-order model of academic engagement is presented in Figure 1.

**Figure 1** Second-order CFA model of academic engagement

Confirmatory Factor Analysis

The academic engagement scale items met acceptable thresholds for univariate normality, with skewness and kurtosis within Kline's (2016) recommended range (skewness < 3; kurtosis < 8). The highest skewness was 1.67 (Item 20) and the highest kurtosis was 3.47 (Item 19). The model fit indices indicated an acceptable fit to the data: $\chi^2/df = 3.22$, RMSEA = .07, CFI = .92, NFI = .91, and SRMR = .04. The chi-square statistic was significant ($p < .05$), which is common in large samples. All second-order constructs were significantly associated with their respective first-order subdimensions. Specifically, the behavioral domain, comprising 4 items across three subdimensions, showed standardized factor loadings ranging from .70 to .83 ($p < .001$). The cognitive domain, consisting of 12 items across three subdimensions, yielded loadings between .68 and .78 ($p < .001$). Lastly, the emotional domain, comprising 11 items across three subdimensions, demonstrated loadings ranging from .70 to .85 ($p < .001$). These findings support the proposed second-order structure of academic engagement (Table 3).

Table 3 Validation results of the academic engagement scale

No	Item	Loading	SE	AVE	CR
First-order constructs					
Cognitive Engagement				.53	.93
AE7	I ask myself questions to review my understanding of what I have read.	.75**	-		
AE1	I devote sufficient time to reading the course materials.	.71**	.06		
AE2	Before completing end-of-unit activities, I make sure to understand the questions or issues involved.	.71**	.06		
AE3	I connect what I read in the course materials with my prior knowledge to enhance my understanding.	.76**	.06		
AE4	When reading the course materials, I create examples to help me better understand the content.	.73**	.05		
AE5	I summarize the key points from the course materials I have read.	.69**	.05		
AE6	Whenever I read course materials or view learning media, I try to fully understand the content of the lessons.	.78**	.06		
AE8	I seek additional knowledge from other learning resources beyond the course materials.	.68**	.06		
AE9	I review key points before examinations.	.72**	.05		

Table 3 (Continued)

No	Item	Loading	SE	AVE	CR
AE10	I set goals for reading the course materials and strive to accomplish them every time.	.75**	.06		
AE11	I check the accuracy of my work after completing end-of-unit activities.	.70**	.05		
AE12	I reassess my understanding after completing end-of-unit activities.	.76**	.05		
Emotional Engagement				0.62	0.95
AE14	I feel comfortable and happy when I am at the university.	.75**	-		
AE13	I am happy to be studying at this university.	.77**	.03		
AE15	I feel proud to be a student of this university.	.78**	.04		
AE16	I enjoy learning new things.	.77**	.06		
AE17	I am aware of the importance of my studies.	.70**	.05		
AE18	I am determined to successfully complete my studies so that I can apply the knowledge gained.	.74**	.05		
AE19	I feel that instructors provide academic support.	.82**	.05		
AE20	I feel that instructors care about students.	.80**	.05		
AE21	I feel that university personnel (peers, instructors, and staff) listen to opinions and suggestions.	.80**	.06		
AE22	I feel that university personnel (peers, instructors, and staff) treat students fairly.	.83**	.05		
AE23	I feel that I receive academic support from university personnel.	.85**	.05		
Behavioral Engagement				0.62	0.87
AE24	I allocate my time effectively to complete reading the course materials before examinations.	.81**	-		
AE25	I regularly keep up with university-related information concerning my studies.	.70**	.05		
AE26	I regulate myself to follow the designated study schedule.	.83**	.05		
AE27	I manage distractions in my surroundings that interfere with reading the course materials.	.81**	.05		
Second-order constructs					
Behavioral Engagement		.93	-		
Cognitive Engagement		.92	.07		
Emotional Engagement		.71	.05		

Note: SE = standard error, AVE = average variance extracted, CR = composite reliability.

Convergent Validity

Convergent validity was evaluated using average variance extracted (AVE) and composite reliability (CR). All first-order constructs showed significant standardized loadings (.68–.85, $p < .001$), indicating strong item-construct relationships. AVE values ranged from .53 to .62 and CR from .87 to .95, surpassing recommended thresholds. These results confirm that the constructs captured substantial variance from their indicators.

Discriminant Validity

Discriminant validity was assessed using the Heterotrait–Monotrait ratio (HTMT), which is considered a more rigorous criterion than traditional methods. As shown in Table 4, all HTMT values ranged from .66 to .83. These values remain strictly below the conservative threshold of .85 (Henseler et al., 2015). The results confirm that the cognitive, emotional, and behavioral dimensions are empirically distinct.

Table 4 The heterotrait–monotrait ratio of correlations

	Cognitive	Emotional	Behavioral
Cognitive	1.00		
Emotional	.66	1.00	
Behavioral	.83	.68	1.00

Internal Consistency

The reliability of the scores was assessed in terms of internal consistency. Cronbach's alpha for the 27-item academic engagement scale was .96, indicating excellent internal consistency reliability. When considering each domain, the Cronbach's alpha values for the cognitive, emotional, and behavioral dimensions were .93, .95, and .87, respectively. In addition, the analysis of inter-item and item–total correlations indicated that the items were not redundant. The average inter-item correlation was below .74, well under the .80 threshold typically considered indicative of redundancy (Streiner et al., 2015). Furthermore, all corrected item–total correlations exceeded .30, the generally accepted minimum for item retention and evidence of meaningful contribution to the overall construct (Boateng et al., 2018). These results suggest that the scale was internally consistent while maintaining dimensional distinctiveness across its subdomains.

Discussion

This study provides empirical support for a multidimensional, second-order model of academic engagement in a distance learning context. The findings indicate that academic engagement can be conceptualized as a hierarchical construct comprising cognitive, emotional, and behavioral dimensions. This result is consistent with prior theoretical frameworks (Fredricks et al., 2004), suggesting that engagement is a complex and integrated construct rather than a set of isolated components. In addition, the findings are consistent with empirical evidence reported by Wang and Eccles (2012), which demonstrated that multiple dimensions of engagement interact to influence students' learning processes and academic outcomes. Compared to widely used engagement instruments such as the Utrecht Work Engagement Scale for Students (UWES-S) and the National Survey of Student Engagement (NSSE), the present findings highlight the importance of context-specific measurement in open university settings, where learning structures and student experiences differ substantially from traditional higher education environments.

At the first-order level, cognitive engagement demonstrated relatively strong associations with its indicators, highlighting the importance of self-regulated learning processes in distance education. In line with Zimmerman's (2000) theory of self-regulated learning, students in open university systems are required to actively manage their own learning, including planning, monitoring, and evaluating their academic progress. This finding is consistent with previous empirical studies showing that self-regulated learners tend to exhibit higher levels of engagement and persistence in technology-mediated learning environments (Lerdpornkulrat, 2023). These results suggest that cognitive engagement appears to play an important role in supporting students' adaptation to autonomous learning environments.

Emotional engagement was also found to be an important dimension, particularly in relation to perceived institutional support and sense of belonging. This finding aligns with prior research indicating that emotional connection to the institution contributes to student persistence in distance learning contexts (Wang & Eccles, 2012). While learners in open universities may experience limited face-to-face interaction, their perceived connection to instructors and the institution remains an important aspect of sustained engagement. From the researcher's perspective, this may reflect the role of perceived support as a psychological mechanism that helps reduce feelings of isolation commonly associated with distance learning environments.

Behavioral engagement, reflected through observable study-related actions such as time management and adherence to study schedules, further supports the multidimensional nature of academic engagement. The results indicate that behavioral engagement complements cognitive and emotional dimensions, contributing to a more comprehensive understanding of student participation in distance learning environments. This finding is consistent with previous studies that emphasize the role of active participation and study behaviors in maintaining engagement in online learning contexts (Fredricks et al., 2004).

An additional point worth noting is the relatively lower second-order loading of the emotional engagement dimension (.71) compared to the cognitive and behavioral components. This may reflect contextual characteristics of distance learning environments, where emotional attachment to the institution is less directly reinforced due to limited face-to-face interaction. It is also possible that some items in this dimension capture perceived institutional support rather than emotional engagement itself, which may have influenced the strength of the loading. Furthermore, although the model demonstrated acceptable fit according to established criteria, the fit indices suggest that there is still room for improvement. Therefore, the findings should be interpreted with caution, and future research is encouraged to refine the measurement model and explore alternative model specifications.

From a practical perspective, the findings suggest that the validated scale may serve as a useful tool for assessing student engagement in open university settings. By identifying patterns of engagement across cognitive, emotional, and behavioral dimensions, educators and institutions may better understand areas where students require additional support. However, further research is needed to examine how these engagement profiles relate to academic outcomes and retention across different learner groups. In addition, the study relies on a well-established theoretical framework, which may not fully capture emerging forms of engagement in rapidly evolving digital learning environments.

Limitations and Future Research

Despite the acceptable psychometric properties of the scale, several limitations should be acknowledged to provide a balanced interpretation of the results. First, the data were collected exclusively through self-report measures, which may be subject to social desirability bias—where students might overstate their level of engagement. Future research should triangulate these findings with objective behavioral data from Learning Management Systems (LMS), such as login frequency, time spent on modules, and assignment submission

patterns, to provide a more comprehensive behavioral profile. Second, the disproportionate sample size in the Science and Technology group ($n=52$) suggests that subsequent studies should employ Multi-Group Confirmatory Factor Analysis (MGCFA) to establish measurement invariance across disciplines. Finally, as this cross-sectional study captured engagement at a single point in time, longitudinal designs are recommended to monitor the dynamic fluctuations of engagement and determine its long-term causal impact on academic persistence from enrollment to graduation. Although the instrument was adapted from previously validated sources, content validity was not re-evaluated using the Index of Item-Objective Congruence (IOC) in the current study. Future research should consider conducting expert-based content validation to further strengthen the instrument and ensure its suitability across different educational contexts.

Conclusion

This study provides empirical support for an academic engagement scale conceptualized as a multidimensional, second-order construct comprising cognitive, emotional, and behavioral dimensions. The results of the confirmatory factor analysis indicate that the proposed hierarchical model demonstrates acceptable fit, with all dimensions contributing to the overall construct. Evidence of convergent validity, discriminant validity, and internal consistency suggests that the scale possesses satisfactory psychometric properties.

The findings highlight that academic engagement in distance learning environments is a multidimensional construct involving both behavioral actions and underlying psychological processes. The validated scale may provide a useful foundation for future research and practice in open university contexts.

Declarations

Funding: This research was supported by the Sukhothai Thammathirat Open University (STOU) Academic Research Grant (Innovation Research Category) for the fiscal year 2024.

Conflicts of Interest: The authors declare no conflicts of interest.

Ethical Approval Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board from the Human Research Ethics Committee at the Research and Development Institute Nakhon Ratchasima Rajabhat University (Ethics Number: HE-RDI-NRRU 139/2024). The approval was granted on 27 September 2024 and is valid until 26 September 2025.

References

- Al-Fraihat, D., Joy, M., Masa'deh, R., & Sinclair, J. (2020). Evaluating e-learning systems success: An empirical study. *Computers in Human Behavior, 102*, 67–86.
<https://doi.org/10.1016/j.chb.2019.08.004>
- Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quinonez, H. R., & Young, S. L. (2018). Best practices for developing and validating scales for health, social, and behavioral research: A primer. *Frontiers in Public Health, 6*, 149.
<https://doi.org/10.3389/fpubh.2018.00149>
- Fredricks, J. A. (2012). School engagement. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 1–11). Springer.
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59–109.
<https://doi.org/10.3102/00346543074001059>
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Pearson.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43*(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. <https://doi.org/10.1080/10705519909540118>
- Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). Guilford Publications.
- Kuh, G. D. (2001). Assessing what really matters to student learning: Inside the National Survey of Student Engagement. *Change: The Magazine of Higher Learning, 33*(3), 10–17.
<https://doi.org/10.1080/00091380109601795>
- Lerdpornkulrat, T. (2023). Analyzing student learning behavior in a blended-learning environment in Thai higher education. *Journal of New Horizon in Higher Education, 1*(1), 38–46. <https://so09.tci-thaijo.org/index.php/NHHE/article/view/2147>
- Moore, M. G. (1993). Theory of transactional distance. In D. Keegan (Ed.), *Theoretical principles of distance education* (pp. 22–38). Routledge.
- Piaget, J. (1970). *Science of education and the psychology of the child* (D. Coltman, Trans.). Orion Press.

- Schaufeli, W. B., Martínez, I. M., Pinto, A. M., Salanova, M., & Bakker, A. B. (2002). Burnout and engagement in university students: A cross-national study. *Journal of Cross-Cultural Psychology, 33*(5), 464–481. <https://doi.org/10.1177/0022022102033005003>
- Streiner, D. L., Norman, G. R., & Cairney, J. (2015). *Health measurement scales: A practical guide to their development and use* (5th ed.). Oxford University Press.
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Pearson Education.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Wang, M. T., & Eccles, J. S. (2012). Social support matters: Longitudinal effects of social support on three dimensions of school engagement from middle to high school. *Child Development, 83*(3), 877–895. <https://doi.org/10.1111/j.1467-8624.2012.01745.x>
- Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). Academic Press. <https://doi.org/10.1016/B978-012109890-2/50031-7>

Translate Thai References

- Metheekul, P. (2022). Factors contributing to learning success in distance education: A case study of undergraduate students at Sukhothai Thammathirat Open University. *Silpakorn University Journal of Education, 20*(1), 85–101. (In Thai)
- Sungsri, S. (2018). A model of educational services to enable graduate students of Sukhothai Thammathirat Open University to achieve learning success in the distance education system. *STOU Education Journal, 10*(2), 65–78. (In Thai)
- Wangrunakit, P. (2018). *Development of indicators and program to enhance academic engagement of undergraduate students with personal best goals as a mediator* [Doctoral dissertation]. Srinakharinwirot University. (In Thai)