Assessing Entrepreneurship Education Among UiTM Undergraduates: Preliminary Reliability and Dimensionality Evidence

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ABSTRACT

Entrepreneurship education has become a visible part of university graduate development, yet researchers do not always measure the educational experience in the same way. Before such measures are used in structural models or programme evaluation, their item behaviour and internal consistency should be examined. This study evaluates the preliminary reliability and dimensionality of a five-item Entrepreneurship Education (EE) measure administered to 100 Universiti Teknologi MARA (UiTM) undergraduates who had completed in ENT530 Principles of Entrepreneurship. The analysis used descriptive statistics, corrected item-total correlations, Cronbach's alpha, inter-item correlations, a sensitivity check for cases flagged for uniform response patterns, and principal component analysis as an exploratory dimensionality check. Item means ranged from 4.42 to 4.49 on a five-point scale. Corrected item-total correlations ranged from 0.863 to 0.928 and Cronbach's alpha was 0.963; deleting individual items produced alpha values between 0.949 and 0.960. Reliability remained high when the analysis was repeated using only the 77 non-flagged responses (alpha = 0.958). The Kaiser-Meyer-Olkin value was 0.894 and Bartlett's test of sphericity was significant, chi-square(10) = 598.58, $p < 0.001$. A single dominant component had an eigenvalue of 4.364, explained 87.3% of total variance, and yielded component loadings from 0.912 to 0.955. Compared with recent entrepreneurship-education studies, the measure shows unusually strong internal coherence for a short five-item scale. This is encouraging, but the very high alpha and inter-item correlations also raise the possibility of content overlap and a ceiling effect. The measure is therefore suitable for continued confirmatory testing, but it should not yet be described as fully validated.

Keywords: entrepreneurship education, higher education, reliability, scale assessment, university students

INTRODUCTION

Entrepreneurship education now sits more visibly within Malaysia's higher-education agenda. The Malaysia Higher Education Blueprint 2026-2035 identifies the entrepreneurial ecosystem and innovation as an area that requires stronger skills development, university-industry links and better impact tracking. In May 2026, the Ministry of Higher Education also launched the Higher Education Institution Entrepreneurship Action Plan (PTK-IPT) 2026-2030 to strengthen the university entrepreneurship ecosystem (Ministry of Higher Education Malaysia, 2026a, 2026b). These developments make measurement especially important: institutions need

evidence not only that entrepreneurship courses and programmes exist, but also that students experience them as useful, relevant and preparatory.

Recent empirical work continues to support the importance of entrepreneurship education, but it also shows that the effect depends on what is taught, how students engage with it and how education is measured. Among Malaysian business undergraduates, Teoh et al. (2024) found entrepreneurship education to be a significant predictor of entrepreneurial intention. Malathi and Venugopal (2025), using 385 final-year management students in India, reported that entrepreneurial education and student engagement were positively linked with entrepreneurial intention. Other recent studies have moved beyond a simple exposure model: Aka and Enagogo (2025) distinguished dedicated entrepreneurship-course support from broader university support, while Ayad et al. (2026) and Maradiaga-López et al. (2026) examined the mechanisms and dimensions through which entrepreneurship education shapes entrepreneurial outcomes. The common message is that entrepreneurship education should not be treated as a single, uniform experience.

The variation in recent studies is also a measurement problem. Entrepreneurship education may be represented as course participation, perceived educational quality, skills development, institutional support or a broader developmental experience. Those choices are not interchangeable. In a sample where students have already been exposed to the same entrepreneurship course, a yes-or-no indicator tells us very little about how they actually experienced the education. A short perceptual measure can be more informative if it captures skill development, relevance and preparedness, but it still needs evidence that its items work together without simply repeating the same idea.

Reliability therefore needs to be read alongside item-level behaviour and dimensionality rather than reduced to one coefficient (Boateng et al., 2018; Hair et al., 2022). Cronbach's alpha above 0.70 is commonly accepted, but a coefficient close to or above 0.95 deserves a second look because very similar items can inflate internal consistency (Tavakol & Dennick, 2011). Corrected item-total correlations, inter-item relationships and exploratory dimensionality evidence help show whether a short scale is coherent while still covering distinct aspects of the construct.

This paper therefore takes one small but important part of a broader doctoral study and examines it on its own: the five-item Entrepreneurship Education (EE) measure. The items ask whether entrepreneurship education develops skills, belongs in university education, stimulates business interest, helps students prepare to start a business and prepares the student personally for entrepreneurship. The broader doctoral model is not tested here. The purpose is narrower - to determine whether these five items show enough coherence to justify carrying them forward to confirmatory measurement modelling.

The study has one objective: to assess the preliminary reliability, item performance and dimensionality of the five-item EE measure among UiTM undergraduates exposed to ENT530 Principles of Entrepreneurship. It asks a straightforward question: do the five items provide adequate early evidence of internal consistency and a dominant common dimension for measuring students' perceived entrepreneurship education experience?

LITERATURE REVIEW

Entrepreneurship education in higher education

Entrepreneurship education covers more than attendance in a business course. It can involve theoretical knowledge, skills practice, opportunity recognition, experiential activities, mentoring and institutional support. Recent studies reflect this broader view. Maradiaga-López et al. (2026), for example, modelled entrepreneurship education as a higher-order construct comprising theoretical knowledge, entrepreneurial skills development, and institutional support and educational environment. Ayad et al. (2026) treated it as students' perceived educational experience and reported satisfactory convergent validity for a six-item measure. These approaches reinforce a basic point: the meaning assigned to an EE score depends heavily on the content of the items used to produce it.

Evidence from different settings also shows why context matters. Teoh et al. (2024) reported a significant role for entrepreneurship education among Malaysian business undergraduates. Jamal and Shahril (2025), working with UiTM hospitality and tourism students, found that entrepreneurial attitudes and the learning environment

were important for entrepreneurial inclination. Malathi and Venugopal (2025) linked entrepreneurial education and student engagement to intention among Indian management students, while Aka and Enagogo (2025) showed that the value of a dedicated entrepreneurship course can operate through students' self-efficacy. These studies examine different outcomes, but together they suggest that educational exposure alone is an incomplete description of the student experience.

Measuring students' perceived entrepreneurship education

For students who share formal exposure to ENT530, the more useful question is not simply whether they took entrepreneurship education, but what they believe it contributed. One student may value the development of entrepreneurial skills; another may respond more strongly to campus programmes or to the sense that university learning has prepared them to start a business. The five items in this study were retained to capture these related but not identical perceptions: skill development, institutional provision, interest stimulation, campus preparation and personal preparedness.

A short scale has to strike a balance. Its items should move together strongly enough to represent the same construct, yet each should still add something. Boateng et al. (2018) recommend reading reliability together with item correlations, item-total relationships and dimensionality. This is especially relevant here because a very high alpha can be reassuring at first sight but can also mean that respondents see several statements as near-duplicates (Tavakol & Dennick, 2011). The analysis therefore looks for both problems: items that are too weak and items that may be too similar.

Preliminary dimensionality assessment

Dimensionality concerns whether a set of items is dominated by one underlying pattern or reflects multiple distinct patterns. Exploratory methods are appropriate at an early stage because they provide information about whether the item set behaves coherently before confirmatory modelling is undertaken. The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity are commonly used to determine whether the correlation matrix is suitable for component or factor analysis, with higher KMO values indicating stronger common variance among items (Kaiser, 1974). In this study, principal component analysis is used only as a preliminary dimensionality check. It is not treated as a substitute for confirmatory factor analysis or PLS-SEM measurement-model assessment in an independent or larger sample.

METHODOLOGY

Research design and participants

This preliminary measurement study used the first 100 complete responses available from the broader doctoral survey on entrepreneurial intention among UiTM undergraduates. Eligible respondents were UiTM undergraduates who had completed or were enrolled in ENT530 Principles of Entrepreneurship. Data were collected through a self-administered Google Forms questionnaire. Participation was voluntary, responses were handled confidentially, and the information sheet explained that the data would be used for academic research. The broader study received formal ethical clearance from the Research Ethics Committee of Universiti Teknologi MARA before data collection.

All substantive questionnaire items were mandatory, so the 100 preliminary cases contained no missing values for EE1-EE5. A data-quality flag identified 23 respondents with uniform response patterns across the broader questionnaire. Uniform responding is not, by itself, proof of careless participation; it may also reflect genuinely consistent views (Meade & Craig, 2012). For that reason, the cases were not automatically discarded. The main analysis used all 100 complete responses, and Cronbach's alpha was then recalculated using the 77 cases without the straight-lining flag as a sensitivity check.

Entrepreneurship Education measure

The EE measure contained five positively worded statements rated from 1 = Strongly Disagree to 5 = Strongly Agree. The items formed part of the broader doctoral questionnaire and were reviewed for content, clarity and

contextual suitability before the current data collection. The measure was intended to capture students' perceived educational value and preparedness rather than course attendance alone.

Table 1. Entrepreneurship Education items and descriptive statistics (n = 100).

Code	Item wording	Mean	SD
EE1	Entrepreneurship courses are important in developing entrepreneurial skills.	4.49	0.59
EE2	Entrepreneurship education should be offered in all universities.	4.45	0.67
EE3	Entrepreneurship subjects increase students' interest in business.	4.49	0.61
EE4	Entrepreneurship programs on campus help students prepare to start a business.	4.46	0.63
EE5	My university course prepares me for entrepreneurship.	4.42	0.67

Data analysis

Analysis focused on the psychometric behaviour of EE1-EE5. First, means and standard deviations were calculated to describe response patterns. Corrected item-total correlations were then calculated by correlating each item with the sum of the remaining four items. Cronbach's alpha was computed for the full five-item measure, together with alpha if each item was deleted. Inter-item Pearson correlations were inspected to assess the degree of overlap among items. Internal consistency values of 0.70 or above were treated as acceptable, while values above approximately 0.95 were interpreted cautiously because of possible item redundancy (Nunnally & Bernstein, 1994; Tavakol & Dennick, 2011).

A sensitivity analysis compared Cronbach's alpha for all 100 responses with alpha for the 77 non-flagged cases. Principal component analysis of the item correlation matrix was then used as an exploratory dimensionality check. KMO and Bartlett's test were used to assess whether the matrix was suitable for this purpose, followed by inspection of eigenvalues, explained variance and first-component loadings. These results describe the preliminary item structure; they do not replace confirmatory measurement assessment using PLS-SEM or CFA.

RESULTS

Descriptive item performance

All five EE items received high average ratings. Means ranged from 4.42 for EE5 to 4.49 for EE1 and EE3, with standard deviations between 0.59 and 0.67. The overall five-item mean was 4.46 (SD = 0.59). More than half of respondents selected the highest response category for each item, with the proportion selecting 5 ranging from 51% to 55%. These results indicate strongly favourable perceptions of entrepreneurship education in the preliminary sample, but they also suggest that future studies should monitor possible ceiling effects and restricted variance.

Internal consistency and item-total evidence

The five-item EE measure demonstrated very high internal consistency, with Cronbach's alpha of 0.963. Corrected item-total correlations ranged from 0.863 to 0.928, indicating that each item was strongly associated with the remaining item set. EE5 recorded the highest corrected item-total correlation (0.928), followed by EE2 (0.906) and EE4 (0.904). Cronbach's alpha if an item was deleted ranged from 0.949 to 0.960. No item deletion produced a meaningful improvement in reliability, and each item contributed a conceptually distinct aspect of the educational experience.

Table 2. Item-total reliability evidence for the five-item EE measure.

Item	Corrected item-total correlation	Cronbach's alpha if item deleted
EE1	0.863	0.960
EE2	0.906	0.953
EE3	0.882	0.957

Item	Corrected item-total correlation	Cronbach's alpha if item deleted
EE4	0.904	0.953
EE5	0.928	0.949

The inter-item correlations were also high, ranging from 0.782 to 0.895, with an average inter-item correlation of 0.841. The strongest relationship occurred between EE2 and EE4 (r = 0.895), while the lowest was between EE1 and EE2 (r = 0.782). The pattern supports coherence among the five indicators but, together with alpha above 0.95, also raises the possibility that some items capture closely overlapping perceptions.

Table 3. Inter-item correlations for EE1-EE5.

Item	EE1	EE2	EE3	EE4	EE5
EE1	1.000	0.782	0.834	0.799	0.848
EE2	0.782	1.000	0.834	0.895	0.878
EE3	0.834	0.834	1.000	0.804	0.850
EE4	0.799	0.895	0.804	1.000	0.884
EE5	0.848	0.878	0.850	0.884	1.000

Sensitivity analysis for flagged response patterns

The data-quality log identified 23 of the 100 cases as exhibiting straight-lining across the broader questionnaire. Cronbach's alpha for the 77 non-flagged cases was 0.958, compared with 0.963 for the complete sample. The difference of approximately 0.005 indicates that the very high reliability coefficient was not created solely by the flagged cases. Alpha among the 23 flagged cases was 0.975, as expected for highly uniform response patterns, but removing these cases did not materially change the conclusion regarding the strong internal consistency of the EE item set.

Table 4. Sensitivity analysis of internal consistency.

Analysis sample	n	Cronbach's alpha
All complete cases	100	0.963
Non-flagged cases only	77	0.958
Flagged straight-lining cases only	23	0.975

Preliminary dimensionality evidence

The correlation matrix was suitable for preliminary component analysis. The KMO measure was 0.894, indicating strong sampling adequacy, and Bartlett's test of sphericity was statistically significant, chi-square(10) = 598.58, $p < 0.001$. The first component had an eigenvalue of 4.364 and explained 87.3% of total variance. All remaining eigenvalues were below one. First-component loadings were high for every item, ranging from 0.912 for EE1 to 0.955 for EE5. This pattern indicates a dominant common dimension in the preliminary data.

Table 5. Preliminary principal component evidence.

Indicator	Result	Interpretation
KMO	0.894	Strong sampling adequacy
Bartlett's test	chi-square(10) = 598.58, $p < 0.001$	Correlation matrix suitable for component analysis
First eigenvalue	4.364	Only component above 1.0
Variance explained	87.3%	Strong dominant component
EE1 loading	0.912	High
EE2 loading	0.940	High
EE3 loading	0.925	High
EE4 loading	0.939	High
EE5 loading	0.955	High

DISCUSSION

Overall measurement performance

The five EE items behaved coherently in this preliminary UiTM sample. Every corrected item-total correlation was strong, and deleting any one item did not improve reliability. The PCA result points in the same direction: the first component was dominant and all five component loadings were high. On this evidence, there is no statistical reason to remove an item at this stage. The more important task is to carry the full set into confirmatory measurement modelling and check whether the same pattern holds when EE is assessed alongside the other constructs in the doctoral model.

The high item means are not surprising given that the respondents were already exposed to ENT530. They generally viewed entrepreneurship education positively across all five statements. That pattern fits recent Malaysian findings in which entrepreneurship education contributed to entrepreneurial intention (Teoh et al., 2024), and it is also consistent with evidence from India and other university settings linking entrepreneurial education with student engagement, self-efficacy and entrepreneurial outcomes (Malathi & Venugopal, 2025; Aka & Enagogo, 2025). At the same time, the concentration of responses near the top of the scale means that the measure may have limited room to distinguish between students who are positive and those who are very positive.

Very high reliability and possible item overlap

The clearest caution is the size of Cronbach's alpha. A value of 0.963 is excellent in the conventional sense, but it is high enough to raise a practical question: are some items doing almost the same job? The inter-item correlations support that concern, particularly for EE2, EE4 and EE5. The statements are conceptually different - one concerns university provision, one campus preparation and one personal preparation - yet respondents may have answered them as closely related expressions of a single positive judgement about university entrepreneurship education. This is why the high alpha is treated as a finding to investigate, not simply as evidence that the scale is 'perfect'.

Immediate item deletion would be premature. Alpha-if-item-deleted did not improve the overall coefficient, and each statement still covers a slightly different aspect of the educational experience. The next step is confirmatory: outer loadings, composite reliability, rho_A, AVE and discriminant validity should be examined in the larger measurement model. If the very high overlap remains, the eventual instrument can then be shortened or reworded without losing the areas of skills, institutional provision, interest and preparedness.

Comparison with recent studies

Table 6 places the current results beside recent entrepreneurship-education studies. The comparison is not intended to rank instruments because the studies use different samples, item sets and analytical models. Instead, it shows where the present five-item measure sits within recent empirical practice: its internal consistency is stronger than most reported comparators, while its brevity and very high inter-item relationships make redundancy and ceiling effects the main issues to test next.

Table 6. Comparison with recent entrepreneurship education studies.

Study / context	Sample	EE approach / selected evidence	Comparison with present study
Gao & Qin (2022), China	n = 351	EE alpha = 0.794; KMO = 0.815; CR = 0.795; AVE = 0.437.	Shows a more moderate reliability profile; the current five-item scale is more internally homogeneous.
Teoh et al. (2024), Malaysia	n = 200	Entrepreneurship education was a significant predictor of entrepreneurial intention among business undergraduates.	Supports the relevance of EE in Malaysia, but the study focused on prediction rather than isolating EE scale performance.

Study / context	Sample	EE approach / selected evidence	Comparison with present study
Malathi & Venugopal (2025), India	n = 385	Entrepreneurial education alpha = 0.887; CR reported above 0.900; education and engagement were positively linked with intention.	The present alpha is higher, suggesting strong coherence but also a greater need to check redundancy.
Aka & Enagogo (2025)	n = 2,259	Distinguished dedicated entrepreneurship-course support from broader university support; self-efficacy was an important mechanism.	Reinforces the value of distinguishing simple exposure from students' perceived educational experience.
Ayad et al. (2026), Saudi Arabia	n = 412	Six-item perceived EE measure: loadings 0.797-0.862, alpha = 0.916, AVE = 0.705.	A useful recent psychometric comparator; the present scale has higher alpha and PCA loadings, but possible overlap must be checked.
Maradiaga-López et al. (2026), Honduras	n = 431	EE modelled as a second-order construct with theoretical knowledge, skills development, and institutional support/educational environment.	Illustrates a broader multidimensional approach compared with the present concise perceived-value measure.
Present study, UiTM Malaysia	n = 100	Five items; alpha = 0.963; KMO = 0.894; first component = 87.3%; PCA loadings = 0.912-0.955.	Strong preliminary coherence; next step is PLS-SEM confirmation and assessment of redundancy/ceiling effects.

Implications for entrepreneurship education research

The comparison with recent studies also shows why measurement deserves its own attention. Gao and Qin (2022) reported more moderate reliability for EE in a Chinese student sample, Malathi and Venugopal (2025) reported alpha of 0.887 for entrepreneurial education, and Ayad et al. (2026) reported alpha of 0.916 with satisfactory AVE for a six-item EE measure. By comparison, the present alpha of 0.963 is unusually high for a five-item measure. That does not automatically make the current measure better; it makes the question of redundancy more important. At the other end of the spectrum, Maradiaga-López et al. (2026) used a much broader multidimensional specification of EE, illustrating how different operational definitions can produce very different measurement structures.

For UiTM and similar institutions, the five items offer a short and practical snapshot of students' perceived educational value. The limitation is that the scale currently appears better at confirming positive perceptions than at separating different levels of positive experience. A future version may benefit from more behaviourally specific statements about applying entrepreneurial skills, experiential learning, opportunity recognition, pitching, financial planning or completing venture-development tasks.

Limitations And Future Research

Four limitations should shape the interpretation of the findings. First, the analysis is based on a preliminary sample of 100 UiTM undergraduates, so it is not a full psychometric validation and it should not be generalised to all Malaysian university students. Second, all five items are positively worded and responses cluster near the upper end of the scale, creating a possible ceiling effect. Third, 23 cases were flagged for straight-lining across the broader questionnaire. Their removal barely changed alpha, but future screening should use several indicators of response quality rather than a single uniform-response rule (Meade & Craig, 2012). Finally, PCA is used here only to check whether one dominant pattern is visible; it does not establish convergent or discriminant validity.

The next stage should therefore test the EE measure in a larger sample using a confirmatory measurement framework. PLS-SEM or confirmatory factor analysis can be used to assess outer or factor loadings, composite reliability, average variance extracted and discriminant validity relative to other constructs. Independent replication across programmes, campuses and institutions would also help determine whether the five-item

structure is stable beyond the current UiTM context. Where possible, future studies should combine perceived educational value with objective indicators of pedagogical exposure and experiential participation.

CONCLUSION

This study examined a five-item Entrepreneurship Education measure using 100 UiTM undergraduate responses. The items showed strong corrected item-total correlations, Cronbach's alpha of 0.963 and a dominant first component explaining 87.3% of total variance. Reliability remained almost unchanged when cases flagged for straight-lining were excluded. The five items can therefore be carried forward to the next stage of the doctoral analysis without deleting an item solely on the basis of the present results.

The evidence is promising rather than final. Very high alpha and inter-item correlations may reflect some content overlap, and the favourable response distribution may make it difficult to discriminate at the top end of the scale. The measure should therefore be taken into PLS-SEM or another confirmatory framework before any claim of full validation is made. Its contribution at this stage is practical: it documents exactly how the five items behave, compares that behaviour with recent EE research, and identifies what needs to be checked before EE is used in the broader structural model of entrepreneurial intention.

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Ethical Approval

The broader doctoral research received formal ethical clearance from the Research Ethics Committee of Universiti Teknologi MARA (UiTM) before data collection. Participation was voluntary, respondents were informed of the study purpose, and responses were collected confidentially for academic research purposes.

Conflict Of Interest

The authors declare no conflict of interest.

Data Availability

The preliminary data are not publicly posted because they form part of an ongoing doctoral research project. De-identified data relevant to the analyses reported in this article may be made available by the corresponding author on reasonable request, subject to applicable ethical and institutional requirements.

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