Assessing student engagement in Higher Education: validation of the university student engagement inventory among Maltese University students

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ABSTRACT

This study examined the psychometric properties of the University Student Engagement Inventory (USEI) among Maltese university students, addressing the lack of validated tools for assessing student engagement (SE) in Malta's higher education (HE) context. The questionnaire was sent to all 12,400 University of Malta students out of which 323 fully completed the USEI, measuring behavioural (BE), emotional (EE), and cognitive engagement (CE). Confirmatory factor analysis supported both the three-factor model (CFI=0.945, TLI=0.933, RMSEA=0.073) and an excellent second-order model fit (CFI=0.981, TLI=0.977, RMSEA=0.057). Reliability was good for EE (α=0.83, ω=0.81) and CE (α=0.79, ω=0.76), and marginal for BE (α=0.68, ω=0.65), consistent with international findings. Measurement invariance was confirmed across STEM and non-STEM groups, indicating model stability across disciplines. Predictive validity showed that higher SE significantly predicted fewer dropout intentions (β=–0.49, p<0.001) and higher self-reported academic performance (β=0.56, p<0.001). Results confirm the USEI as a reliable and valid tool for assessing SE within the Maltese HE context and confirms its use in identifying disengaged students and informing interventions to enhance persistence and academic success.

KEYWORDS

Student engagement, higher education, USEI, Malta, validation, dropout, measurement invariance

RÉSUMÉ

Cette étude évalue les propriétés psychométriques de l'University Student Engagement Inventory (USEI) auprès des étudiants universitaires maltais, répondant à l'absence d'un outil psychométriquement robuste pour mesurer l'engagement étudiant dans le contexte de l'enseignement supérieur à Malte. Un total de 323 sur 12,400 étudiants de l'Université de Malte ont rempli le USEI, qui mesure l'engagement comportemental, émotionnel et cognitif. L'analyse factorielle confirmatoire a soutenu le modèle à trois facteurs (CFI=0.945, TLI=0.933, RMSEA=0.073) ainsi qu'un excellent ajustement du modèle de second ordre (CFI=0.981, TLI=0.977, RMSEA=0.057). La fiabilité s'est révélée bonne pour l'engagement émotionnel (α=0.83, ω=0.81) et cognitif (α=0.79, ω=0.76), et marginale pour l'engagement comportemental (α=0.68, ω=0.65), ce qui est conforme à d'autres résultats internationaux. L'invariance de mesure a été confirmée entre les étudiants STEM et non-STEM, indiquant la stabilité du modèle entre disciplines. La validité prédictive a montré que l'engagement étudiant prédisait significativement une intention moindre d'abandon (β=–0.49, p<0.001) et un rendement académique auto-évalué plus élevé (β=0.56, p<0.001). Ces résultats démontrent que le USEI peut fournir des données fiables, valides et culturellement appropriées pour évaluer l'engagement étudiant à Malte. Les résultats s'alignent sur les preuves mondiales, confirmant l'intégrité structurelle du USEI et sa valeur pour identifier les étudiants désengagés et orienter les interventions visant à améliorer la persistance et la réussite académique dans l'enseignement supérieur.

MOTS-CLÉS

L'engagement d'étudiant, l'enseignement supérieur, USEI, Malte, abandon, l'invariance de mesure

INTRODUCTION

In recent decades, research on student engagement (SE) has grown, reflecting its potential to shed light on key educational issues, such as students' academic pathways, adaptation to schooling, academic performance and achievement, completion and dropout rates (Sáez-Delgado et al., 2023). Studies conducted in university contexts consistently show that SE boosts motivation, involvement, and academic achievement, while reducing disaffection, boredom, and dropout intentions (Esposito et al., 2021; Marôco et al., 2020). Fredricks et al. (2015) describe SE as a protective variable linked to lower crime rates, substance abuse, and depression. Kızıldağ et al. (2017) note that engaged students experience a more positive educational trajectory and have a more successful life. Conversely, low SE can result in poor academic performance, burnout, reduced resilience, dissatisfaction, and higher dropout rates (Christenson et al., 2012; Marôco et al., 2016).

In the context of measuring SE in higher education (HE), a wide range of instruments and approaches are employed (Løken et al., 2026). Fredricks and McColskey (2012) provide a comprehensive overview of commonly used methods, highlighting student self-report tools such as questionnaires, interviews, behavioural observations, and behavioural analyses. Building on this work, Buntins et al. (2021) offer an extensive review of instruments designed to assess the cognitive, affective, and behavioural dimensions of SE. Among the instruments identified in the literature are the Higher Education Student Engagement Scale (HESES) (Zhoc et al., 2019) and the Utrecht Work Engagement Scale–Student Version (UWES-S) (Schaufeli et al., 2003). Other frequently used measures include the Beginning College Survey of Student Engagement (BCSSE) (NSSE, 2013), the Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) (Biggs et al., 2001), the Classroom Community Scale (Rovai, 2002), and the

widely known National Survey of Student Engagement (Kuh, 2003; NSSE, 2013). Together, these instruments illustrate the diverse methodological landscape used to capture the multifaceted nature of SE in HE. However, several measurement instruments have been subject to critique. For example, Marôco et al. (2016) point to persistent issues related to instruments` unclear construct definitions, questionable dimensionality, and limited suitability for university populations. In addition, reviews made by Buntins et al. (2021) and Fredricks and McColskey (2012) highlight that many instruments provide insufficient information about how they operationalize SE and frequently fail to report reliability coefficients, further constraining their usefulness in research and practice.

In the search for a valid and reliable instrument that comprehensively assesses SE in HE, Marôco et al. (2016) developed the University Student Engagement Inventory (USEI) as a measuring instrument for SE in the HE context. Grounded on Fredricks's (2015) three-dimensional model of engagement, the USEI conceptualises SE as a second-order construct comprising behavioural, emotional, and cognitive dimensions. Its psychometric properties have validated across Europe, Africa, North and South America, and Asia, demonstrating its reliability and cross-cultural applicability (for details see Assunção et al., 2020; Esposito et. al., 2021; Løken et. al., 2026; Marôco et al., 2016; Sharif-Nia et al., 2023; Sinval et al., 2019). The USEI exhibits strong item sensitivity, factor validity (for the three-factor model, as well as the second-order model), internal consistency, reliability, and discriminant and convergent validity. Additionally, the USEI shows strong measurement invariance for areas of study and gender, significantly predicting students' dropout intentions, course approval rates, academic achievements, and burnout. These results indicate that the USEI has adequate internal validity and that its items are significantly related to vital features of the university experience (Assunção et al., 2020; Sharif-Nia et al., 2023).

Malta is not exempt from the global challenges of low SE and its academic consequences. In 2023, Malta's early leaving from higher education and training (ELET) rate stood at 10.2%, above the European Union (EU) average of 9.5%, with young males disproportionately affected (Eurostat, 2024b; NSO Malta, 2022-2023). This gender disparity is consistent with broader EU trends, where the ELET rate for males (10.9%) significantly exceeds that of females (7.7%) (Eurostat, 2024a). Structural and socio-cultural factors, such as lower academic attainment, reduced help-seeking, and socio-economic pressures, continue to drive male disengagement. Malta's national strategy, *A Holistic and Inclusive Approach to Tackle Early Leaving from Education and Training (ELET) in Malta: The Way Forward 2023–2030*, identifies boys as a high-risk group and aims to reduce ELET to ≤9% by 2030, through targeted inclusive interventions. Although the ELET rate fell to 9.6% in 2024 (Times of Malta, 2025), males remain disproportionately represented, underscoring the need for gender-sensitive policies that address the interconnections between disengagement, wellbeing and resilience. While national frameworks focus primarily on compulsory and post-secondary education, SE in higher education (HE) remains underexplored. Existing studies primarily focus on post-secondary contexts or specific university subgroups, such as nursing and medical students, often using non-validated, context-specific instruments (Abela, 2023; Camilleri, 2017; Micallef, 2025; Ministry for Education and Employment, 2017; Studenti Demokristjani Maltin, 2025). To date, no nationally representative study has employed psychometrically robust tools such as the USEI (Marôco et al., 2016) to assess measure SE across Malta's HE population. This gap is compounded by the absence of a nationally validated measure of SE at the tertiary level, limiting institutions' capacity to identify at-risk students and implement preventive interventions.

To address existing gap, this article aims to analyse the USEI's psychometric properties within the Maltese context including construct, discriminant and convergent validity, internal consistency, and measurement invariance by gender and area of study. Criterion validity is also

tested through academic coping behaviours such as dropout intentions, and failed courses. Results confirm psychometric sensitivity for the Maltese sample, confirming that SE predicts academic coping aligning with findings from international previous research on the USEI.
The following hypotheses were tested:

H1. The trifactor structure of the USEI displays good evidence of factorial validity in Maltese Students.
H2. A second-order factor - reflected by Cognitive, Emotional and Behavioural engagement holds in the Maltese sample.
H3. The USEI produces data with appropriate reliability in a sample of university students attending the Maltese university.

THEORETICAL FRAMEWORK

In HE research, SE is often defined as students' active involvement and sense of connection within social and institutional contexts, playing a central role in innovation and development processes (Esposito et al., 2021). Engagement as a construct, has been studied across business organisations (Bakker et al., 2008), psychotherapeutic contexts (Holdsworth et al., 2014), primary and secondary education (Fredricks et al., 2004), and HE (Hu & Kuh, 2002). Despite numerous definitions and models have been proposed to capture SE's complexity (Alrashidi et al., 2016; Fredricks et al., 2016; Sharif Nia et al., 2022), no clear consensus has been reached regarding SE's precise definition or dimensionality (Christenson et al., 2012).

Within HE, behavioural engagement (BE) is widely considered the most prevalent dimension of SE (Kuh, 2009), typically characterised by students' participation in academic activities (McCormick et al., 2013). This perspective frames SE as dedication to educational content and activities, emphasising the interaction between student behaviour and institutional conditions (Hu & Kuh, 2002). However, this perspective has been critiqued for its limited attention to the relational aspects of engagement, particularly the connections students form with their educational institution (Esposito et al., 2021; Solomonides & Martin, 2008).

To address these limitations, Fredricks et al. (2004) proposed a more comprehensive model, which integrates emotional and cognitive aspects to the behavioural dimension - elements that interact to support achievement and persistence. SE is thus understood as a dynamic and multifaceted construct that involves students' feelings, thoughts, and behaviours, shaped by personal and contextual factors (Kahu, 2013) and evolving in response to interpersonal and environmental influences (Lawson & Lawson, 2013). This framework has since been expanded to include social engagement, which refers to students' interactions and relationships within the learning environment (Philp & Duchesne, 2016) and agentic engagement, which captures students' proactive contributions to learning, such as expressing preferences and influencing instruction (Reeve & Tseng, 2011).

This study adopts the multidimensional model developed by Fredricks et al. (2004) and Fredricks (2015), conceptualising SE as comprising three interrelated dimensions: behavioural, emotional, and cognitive. BE focuses on students' involvement in academic and extracurricular activities, attentiveness, persistence, and adherence to institutional norms (Marôco et al., 2016; McCormick et al., 2013). Emotional engagement (EE) encompasses affective responses to learning, including relationship with peers, educators and instructors, sense of belonging to the educational institution, and perceptions of the value of HE (Fredricks, 2015; Fredricks et al., 2004; Marôco et al., 2016). Cognitive engagement (CE) involves self-regulated learning, willingness to complete assignments, active engagement in the classroom and overall interactions with lecturers (Appleton et al., 2008; Hu & Li, 2017; Marôco et al., 2016).

In this paper, the approach used to measure SE as a construct, strives to integrate four dominant perspectives on SE: the behavioural, the psychological, the socio-cultural and the holistic perspectives (Kahu, 2013). The three dimensions BE, EE and CE are not hierarchical but relate to each other and coexist on an equal level. They can be viewed along a continuum that includes positive and negative expressions of engagement across behavioral, emotional, and cognitive domains (Esposito et al., 2021). By integrating social and agentic dimensions into this framework, the present study acknowledges the evolving nature of SE and its dependence on both individual agency and the broader socio-cultural context.

MATERIAL AND METHODS

This study adopts a quantitative research design to investigate the relationship between SE and burnout among UM students. The study examines BE, EE and CE of SE, and the indications of student burnout; essentially, emotional exhaustion and a reduced sense of self-efficacy.

Participant sampling and recruitment

The UM is the largest and leading public HE institution in Malta, hosting a diverse student body across various disciplines, academic levels (predominantly Levels 6-8), and modes of study (Eurydice, 2025). In the academic year 2024-2025, UM enrolled 12.400 students, including 1.600 international students from 126 countries (University of Malta, 2023b). The university attracts students from a wide range of socioeconomic backgrounds, cultures and nationalities, reflecting the heterogeneity of Malta's student population. Notably, in 2021-2022, females comprise 61% of the student body (University of Malta, 2023a). UM's extensive enrolment ensures its national relevance, that supports the generalisability of findings to the broader Maltese HE sectors.

The target population of 12,400 included part-time and full-time students, of any gender, aged 18 or older, currently enrolled in any programme offered by the UM. After obtaining ethical clearances from UM's Faculty of Education Research Ethics Committee (FREC) (University of Malta, n.d.), two separate mailshots were distributed to students registered for the 2024-2025 academic year, spaced one month apart. The questionnaire excluded any personal identifiers to ensure full anonymity. Informed consent was obtained and all research data was anonymised.

The measure

The USEI is a multidimensional self-report instrument measuring behavioural, emotional, and cognitive engagement. The 90-item questionnaire include six sections: consent; 26 questions on students' coping strategies; 15 questions on SE; 15 questions on social support; 15 questions on burnout; and 17 socio-demographic and academic-related items (including open-ended items, multiple choice and classification-questions). The USEI is freely accessible in four different languages, including English, through the 'Supplementary material' in this open access publication: https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2019.02796/full.

The researchers were not involved in student recruitment or data collection. A total of 323 out of 12,400 students fully completed questionnaires were submitted. Females comprised 67.8% of the respondents. Age distribution was 55.7 %; aged 18-22 years, 21.7% aged 23-27 years and 22.6% aged 28 or older. 56% of the respondents were enrolled in Bachelor programmes, 30.7% in Master's programmes, 10.5% in Doctoral programmes and 2.8% in other programmes. Of the respondents, 43.3% were enrolled in STEM-subjects, while 56.7% were pursuing non-STEM fields including social sciences and humanities.

Data analysis

Descriptive statistics were computed in R using the skimr package (v. 2.5.1) (Waring et al., 2022). Evidence on the internal structure of the USEI was examined through confirmatory factor analysis (CFA) using the Diagonally Weighted Least Squares (DWLS) estimator applied to the polychoric correlation matrix, as implemented in the lavaan package (Rosseel, 2012). Model fit was assessed using the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Square Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA). Following Hu and Bentler (1999) and Marôco (2021), good fit was indicated by CFI and TLI≥0.90, SRMR≤0.08, and RMSEA≤0.06.

Internal consistency was evaluated using ordinal Cronbach's alpha (Zumbo et al., 2007) and McDonald's omega, computed with the semTools package (Jorgensen et al., 2022) at both first- and second-order levels. Values≥0.7 were considered acceptable (Geldhof et al., 2014; Nunnally & Bernstein, 1994).

Predictive validity based on relations with other variables was tested via structural equation modeling (SEM), specifying USEI as a predictor of intention to drop out and self-reported academic performance, using lavaan (Rosseel, 2012).

Measurement invariance across areas of study (STEM vs. Non-STEM) was assessed through multigroup CFA with robust maximum likelihood estimation in lavaan. Nested models tested configural, metric (equal loadings), scalar (equal loadings and intercepts), and factor mean invariance (constrained latent means). Invariance was supported when ΔCFI<0.01 and ΔRMSE <0.015 (Cheung & Rensvold, 2002; Marôco, 2021).

RESULTS

Item descriptives

TABLE 1

Descriptive statistics for the university student engagement inventory items (n=323)

Item	M	SD	Min	P25	Median	P75	Max	Skewness	Kurtosis	Histogram
eng1	3.75	0.89	1.00	3.00	4.00	4.00	5.00	–0.66	0.25	▁▃▆▇▅
eng2	4.46	0.74	1.00	4.00	5.00	5.00	5.00	–1.52	2.52	▁▁▁▃▇
eng3	4.52	0.77	1.00	4.00	5.00	5.00	5.00	–1.77	3.00	▁▁▁▂▇
eng4	3.07	1.30	1.00	2.00	3.00	4.00	5.00	–0.08	–1.10	▆▇▇▇▆
eng5	4.07	1.05	1.00	4.00	4.00	5.00	5.00	–1.21	0.89	▁▂▃▆▇
eng6r	3.15	1.17	1.00	2.00	3.00	4.00	5.00	–0.07	–0.83	▃▅▇▆▅
eng7	2.38	1.13	1.00	1.00	2.00	3.00	5.00	0.36	–0.82	▇▇▇▅▁
eng8	3.49	1.08	1.00	3.00	4.00	4.00	5.00	–0.49	–0.34	▁▃▅▇▅
eng9	3.38	1.17	1.00	3.00	4.00	4.00	5.00	–0.46	–0.60	▃▃▅▇▅
eng10	2.69	1.10	1.00	2.00	3.00	3.00	5.00	0.15	–0.76	▅▇▇▅▁
eng11	3.22	1.15	1.00	2.00	3.00	4.00	5.00	–0.30	–0.80	▃▅▆▇▅
eng12	3.12	1.11	1.00	2.00	3.00	4.00	5.00	–0.04	–0.70	▃▅▇▅▅
eng13	4.01	0.92	1.00	3.50	4.00	5.00	5.00	–0.69	–0.22	▁▂▃▆▇
eng14	3.61	1.01	1.00	3.00	4.00	4.00	5.00	–0.37	–0.53	▁▃▆▇▇
eng15	3.82	1.03	1.00	3.00	4.00	5.00	5.00	–0.62	–0.28	▁▃▅▇▇

Descriptive statistics for the 15 USEI items revealed generally high average scores, with most means above the scale midpoint of 3.0 (Table 1). Items eng2 and eng3 showed the highest means (M=4.46 and 4.52, respectively), indicating that students consistently follow university rules and complete assignments on time. Conversely, eng7 and eng10 had the lowest means (M=2.38 and 2.69), suggesting lower excitement about assignments and perceived interest in lecture rooms. Most items exhibited mild to moderate negative skewness, with several items also demonstrating positive kurtosis, indicating relatively peaked distributions. However, none of the items had extreme absolute skewness (>3) or absolute kurtosis (>7), that would recommend against their use in SEM modeling (Finney & DiStefano, 2006; Marôco, 2024).

Sources of evidence related to the internal structure of the USEI

TABLE 2

Standardised Factor Loadings from the Confirmatory Factor Analysis of the Three-first-order Factor Model of the USEI (n=323)

Latent Factor	Indicator	β (Loading)	SE	t	p
Behavioral Engagement (BE)	eng1	0.657	0.118	7.39	<0 .001
	eng2	0.526	0.099	6.23	<0 .001
	eng3	0.286	0.081	3.67	<0 .001
	eng4	0.701	0.121	8.15	<0 .001
	eng5	0.556	0.095	7.06	<0 .001
Emotional Engagement (EE)	eng6	0.560	0.083	8.12	<0 .001
	eng7	0.691	0.100	9.53	<0 .001
	eng8	0.770	0.118	10.25	<0 .001
	eng9	0.845	0.166	9.50	<0 .001
	eng10	0.678	0.099	9.30	<0 .001
Cognitive Engagement (CE)	eng11	0.491	0.078	7.26	<0 .001
	eng12	0.551	0.082	8.09	<0 .001
	eng13	0.661	0.086	9.05	<0 .001
	eng14	0.855	0.200	8.22	<0 .001
	eng15	0.804	0.148	9.15	<0 .001

Confirmatory factor analysis of the three-factorial first-order structure of the USEI displayed an acceptable fit to the data [CFI=0.945; TLI=0.933; NFI=0.915; SRMR=0.068; RMSEA=0.073, 90% CI (.062, .084)]. All items demonstrated significant and acceptable standardized factor loadings above 0.50 on their respective latent constructs, apart from item eng3 ('I usually do my assignments on time'), which presented a loading of .286. BE items loaded between 0.286 and 0.701; EE items ranged from 0.560 to 0.845; and CE items ranged from 0.491 to 0.855 (Table 2). These results provide support for the proposed three-dimensional structure of the USEI.

To further confirm the original second order factor structure of the USEI, a second order factor model was fitted to the data. Figure 1 displays the standardised factor loadings for the second order USEI model. The second order model showed an excellent fit to the data [CFI = .981; TLI=0.977; NFI=0.964; SRMR=0.068; RMSEA=0.057, 90% CI (0.045, 0.069)].

Figure 2 presents histograms illustrating the distribution of SE scores across three dimensions—behavioural, emotional, and cognitive (top panels)—as well as the overall engagement score (bottom panel). All distributions show moderate dispersion with some asymmetry. Notably, the behavioural and emotional dimensions exhibit slight bimodality, suggesting potential subgroups within the sample. The CE scores appear more normally distributed, although some clustering around higher values is evident. The overall SE score

(bottom panel) is slightly skewed to the left, with percentiles indicated (e.g., P10=2.3, P50=3.2, P90=4.1), showing that the median engagement score falls around 3.2 on a 5-point scale. These distributions suggest a generally moderate to high level of engagement, with variation across dimensions in the study sample.

FIGURE 1

Second-order engagement model [n=323, CFI=0.985; TLI=0.981; NFI=0.970; SRMR=0.063; RMSEA=0.055, 90% CI (0.042, 0.068)]

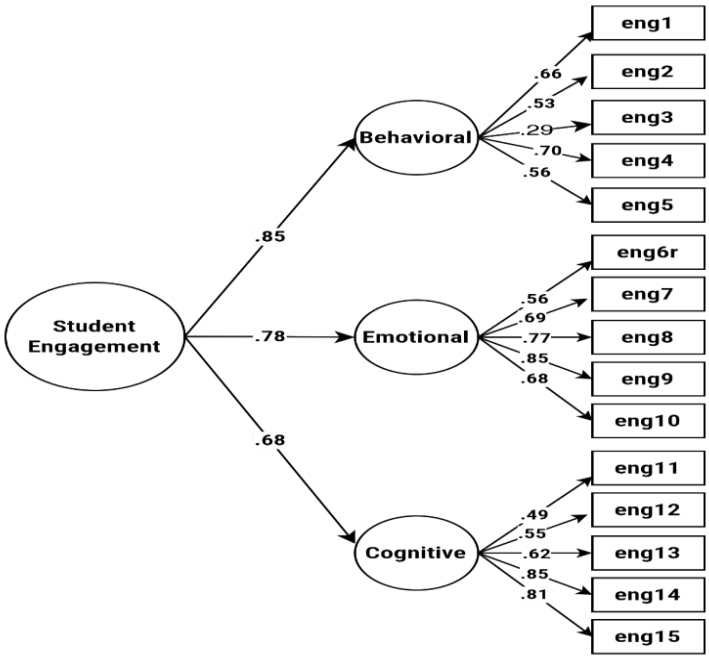
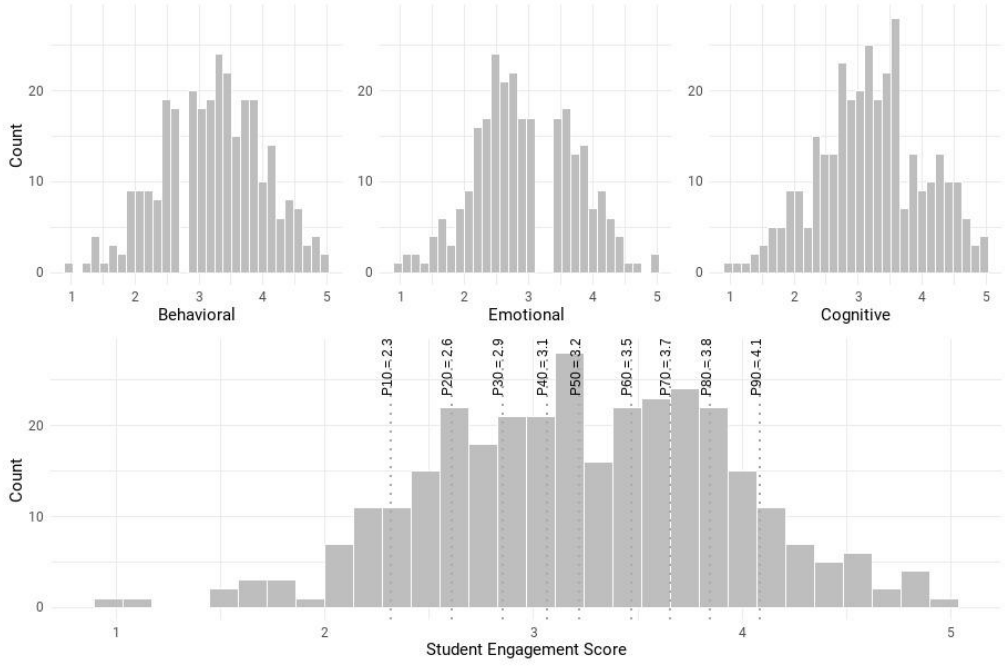


FIGURE 2

Distribution of Behavioural, Emotional, Cognitive, and overall Student Engagement with overlaid percentiles for the study sample (n=323)



Reliability

The internal consistency reliability of the USEI factors was evaluated using ordinal Cronbach's alpha and McDonald's omega. The BE factor presented marginal reliability, with an ordinal alpha of .68 and an ω of .65. The EE factor showed good internal consistency, with an ordinal alpha of .83 and an ω of .81. The CE factor also demonstrated acceptable reliability, with an ordinal alpha of .79 and an ω of .76. These findings suggest that the EE and CE scales possess satisfactory internal consistency, whereas the reliability of the BE scale remains slightly below the conventional threshold of .70, warranting cautious interpretation. The multilevel reliability of the latent variable SE was assessed using the reliabilityL2 function from the semTools package. The results indicated good reliability at both levels of analysis. The within-group (level 1) reliability, ω_{L1}, was .72, and the between-group (level 2) reliability, ω_{L2}, was .83. The partial ω_{L1}, which accounts for the clustering of observations, was .86. These values suggest that the measurement of SE is reliable across individual and group levels.

Invariance of the USEI for area of studies (STEM vs. non-STEM)

TABLE 3

Measurement Invariance Testing Across STEM and Non-STEM Students

Model	df	AIC	BIC	χ^2	$\Delta\chi^2$	Δdf	p	CFI	RMSEA	ΔCFI	ΔRMSEA
Configural	174	12992.37	13355.03	313.86	—	—	—	.892	.071	—	—
Metric	188	12969.27	13279.04	318.76	4.16	14	.994	.899	.066	.007	–.005
Scalar	199	12968.91	13237.12	340.40	17.88	11	.084	.891	.066	–.008	.001
Means	203	12962.44	13215.54	341.93	3.52	4	.475	.891	.066	–.002	.001

Measurement invariance across STEM and non-STEM students was tested using a sequence of increasingly constrained models (Table 3). The configural model, which assumes the same factor structure across groups, demonstrated acceptable fit to the data (CFI=0.892, RMSEA=0.071). Imposing equality constraints on the factor loadings (metric invariance) led to a slight improvement in fit (ΔCFI=0.007, ΔRMSEA= –0.005), supporting metric invariance. Scalar invariance, where item intercepts were also constrained, resulted in a small decrease in fit (ΔCFI= –0.008, ΔRMSEA=0.001), yet the fit remained acceptable. The final model, constraining latent means, showed minimal change in fit indices (ΔCFI= –0.002, ΔRMSEA=0.001), with a non-significant chi-square difference (p=0.475), supporting full invariance. These results suggest that the measurement model of the USEI is invariant across STEM and non-STEM students.

Predictive validity based on relationships with other variables.

Evidence of predictive validity was examined using a structural equation model, where standardized engagement scores predicted students' thoughts of dropping out and self-reported academic performance. The results indicated that higher levels of SE were significantly associated with fewer thoughts of dropping out (β= –0.49, p<0.001) and higher self-reported academic performance (β=0.56, p<0.001). These findings support the predictive validity of the USEI, indicating that SE is a meaningful predictor of key academic outcomes of Maltese university students.

DISCUSSION

This study validates the USEI in a Maltese university student sample, providing evidence of its psychometric soundness, and generating insights into SE as a predictor of academic outcomes.

Internal Structure and Reliability

The results confirm USEI scale's three-dimensional structure (BE, EE, CE), strong model fit, and predictive validity for academic outcomes. A second-order engagement model showed excellent fit mirrored in other international validations (e.g., Alarcón et al, 2022; Assunção et al., 2020; Esposito et al., 2021; Marôco et al., 2016; Sharif-Nia et al., 2023). EE and CE scales showed good reliability, while the behavioral scale presented marginal internal consistency—an issue commonly reported across cultural contexts. Confirmatory factor analysis (CFA) showed an acceptable model fit (CFI=0.945; TLI=0.933; NFI=0.915; SRMR=0.068; RMSEA=0.073), with all items loading significantly on their respective factors. Although most items demonstrated strong loadings, one behavioral item, eng3 ("I usually do my assignments on time"), loaded at .286, well below the conventional .50 threshold for acceptable factor loadings. This weaker loading suggests that punctuality in assignments may not be a strong differentiator of engagement among Maltese students; possibly, the timely completion of assignments is perceived as a baseline requirement rather than an indicator of higher behavioural engagement, thus limiting its discriminative power.

The second-order factor model further confirmed the USEI's robustness locally. Fit indices were excellent (CFI=0.981; TLI=0.977; NFI=0.964; SRMR=0.068; RMSEA=0.057), supporting the conceptualisation of engagement as an overarching construct shaped by behavioural, emotional, and cognitive dimensions. This alignment with international validations (Assunção et al., 2020; Esposito et al., 2021; Marôco et al., 2016;) demonstrates that Maltese data are consistent with broader evidence for the USEI's hierarchical structure. Reliability analyses also provided encouraging results. EE (α=0.83, ω=0.81) and CE (α=0.79, ω=0.76) displayed strong internal consistency, while BE (α=0.68, ω=0.65) fell slightly below conventional thresholds.

Marginal reliability for BE has also been reported in Portugal (Marôco et al., 2016) and Italy (Esposito et al., 2021) and Norway (Løken et al., 2026), suggesting that this may be a recurring issue rather than one specific to Malta. Cross-cultural sensitivity may play a role, with behavioral items perhaps reflecting educational norms that vary between contexts. For Malta, where punctual assignment completion is institutionally enforced, BE items may capture less variability. While the reliability remains marginal, the overall results nonetheless support the use of the USEI to measure SE in the Maltese context.

Invariance and Representativeness

Measurement invariance testing of the Maltese data indicated that the USEI performs consistently across STEM and non-STEM students, with configural, metric, scalar, and mean invariance all supported (ΔCFI$\leq$0.008, ΔRMSEA$\leq$0.005). This supports the tool's generalisability across academic disciplines in Malta, strengthening the evidence for full measurement invariance across academic disciplines (STEM vs. non-STEM), while indicating the scale's consistency across fields within a single national context. This confirms that the underlying constructs of engagement are interpreted similarly across fields of study.

However, the study sample exhibited a gender imbalance, with 67% female respondents. This prevented invariance testing by gender, as the smaller male subgroup lacked sufficient statistical power. Gender imbalance may limit the generalisability of findings to more gender-balanced or male-dominant populations. Nonetheless, this distribution closely reflects the reality of Maltese HE. In the 2021-2022 academic year, the University of Malta reported that 61% of its students were female (University of Malta, 2023a), while national statistics for 2022-2023 showed 58.2% female enrollment at the tertiary level (NSO Malta, 2023). Thus, while the imbalance presents a methodological limitation for cross-gender analyses, it also enhances ecological validity, as the sample mirrors the actual demographics of Maltese university students.

The alignment between sample composition and national enrollment patterns suggests that the validity of the USEI within Malta is not undermined. Instead, it highlights the importance of interpreting results within the local demographic context. However, the inability to confirm gender invariance remains a gap. Future studies should aim to recruit larger male subgroups or employ stratified sampling to allow for gender-based validation. Without this, it remains uncertain whether the USEI functions equally well across genders in Malta, an issue with implications for fairness and comparability.

Predictive Validity and Practical Relevance

Beyond internal structure, the USEI demonstrated strong predictive validity in Malta. Higher engagement scores were significantly associated with fewer thoughts of dropping out ($\beta = -0.49$, $p<0.001$) and with higher self-reported academic performance ($\beta=0.56$, $p<0.001$). These robust effect sizes indicate that SE, as measured by the USEI, is a meaningful predictor of academic success and persistence within the Maltese HE system.

This finding has important practical implications. International research consistently shows that disengagement is linked to dropout, poor wellbeing, and reduced achievement (Araújo et al., 2019; Behr et al., 2021; Wilson et al., 2019). By confirming predictive links between engagement, persistence, and performance, this study demonstrates that the USEI could serve as a valuable monitoring tool for institutions. In particular, it could help identify students at risk of disengagement and dropout, allowing for targeted support and early intervention.

Burnout and Retention

A further contribution of this study is its potential to advance research on the relationship between engagement and burnout in Malta. A validated measure such as the USEI offers the opportunity to systematically investigate these links and inform preventive interventions in Malta. This research provides the first empirically strong evidence on SE and burnout in Malta's largest HE institution. It directly addresses the ELET 2030 (Ministry for Education, Sport, Youth, Research and Innovation, 2022-2023) targets by identifying modifiable factors that contribute to persistence and completion. Without such evidence, institutional and policy interventions risk being reactive rather than preventive, missing opportunities to identify at-risk students before disengagement and burnout lead to withdrawal from studies. It also generates evidence to inform and strengthen the UM's student wellbeing services. The study could bridge the policy–practice gap, ensuring that HE is not overlooked in national efforts to improve student BE, EE and CE.

INTERNATIONAL COMPARISONS

The Maltese findings resonate with cross-national validations that consistently support the USEI's structural integrity and predictive power. For example, Esposito et al. (2021) in Italy and Marôco et al. (2016) in Portugal found strong psychometric properties and predictive relationships with motivation, GPA, and dropout intention. Alarcón et al. (2022) in Latin America confirmed excellent fit and high internal consistency in their Spanish-language adaptation, reinforcing the USEI's applicability in diverse linguistic contexts. Similarly, in a large transcultural study by Assunção et al. (2020) involving students from nine countries across four continents, the USEI showed good internal structure and predictive validity, although only weak measurement invariance across countries.

A notable contribution to the online learning context comes from Sharif-Nia et al. (2023), who validated the USEI among Arab students engaged in remote education, showing

strong fit and reliability, further supporting the tool's adaptability. Their study also supported the three-factor structure, high internal consistency, and good fit indices, showing that the USEI remains valid in virtual learning environments. Their results parallel the present study's psychometric robustness and extend the tool's utility to digital education settings critical in the post-pandemic academic landscape. The Maltese results align with these findings, demonstrating both local validity and international comparability. Importantly, the recurring issue of marginal BE reliability across Portugal, Italy, and Malta suggests cross-cultural sensitivity. Future research should explore item-level revisions or contextual adaptations to strengthen this subscale without compromising comparability.

Overall, the recurring issue of lower reliability in the BE subscale across Malta, Italy, and Portugal suggests a potential cross-cultural sensitivity in how BE is interpreted or reported. Future research could explore contextual influences on these items or examine item-level modifications to enhance clarity and reliability.

LIMITATIONS AND FUTURE RESEARCH

This study has some limitations that should be acknowledged. First, the BE subscale exhibited marginal internal consistency, a pattern observed in multiple cultural contexts (e.g., Malta, Italy, Portugal), suggesting potential issues with how BE is operationalised or interpreted across cultures. This raises questions about the cross-cultural sensitivity of certain items e.g., eng3 – 'I usually do my assignments on time' and highlights the need for item-level refinement or cultural adaptation. Second, the use of convenience non-random sampling limits the generalisability of the findings, as the sample may not accurately represent the broader Maltese university student population. The significant gender imbalance with 67% female participants, which may have influenced the results, limited invariance testing and the applicability of the findings to more gender-balanced populations, leaving open the question of cross-gender robustness. The marginal reliability of the BE subscale also warrants further investigation, as it may reflect cultural or contextual interpretations of engagement behaviours.

Future research should prioritise larger and more gender-balanced samples, longitudinal designs to assess stability over time, and studies linking engagement with burnout and wellbeing. Comparative studies with other small EU states could further illuminate contextual influences on behavioural engagement or examine item-level modifications to enhance clarity and reliability. Additionally, future research should consider exploring whether engagement is driven by intrinsic motivation, fear of failure, family pressures, or competitive dynamics would deepen understanding of the construct in Malta.

The use of convenience non-random sampling limits the generalisability of the findings, as the sample may not accurately represent the broader UM student population. Although a non-random, convenience-based approach was employed, participants were recruited through random convenience sampling from UM. This choice was guided by methodological, representational, and logistical considerations. UM's extensive enrolment base and diversity, ensures substantial national relevance, supporting the generalisability of findings to the wider Maltese HE landscapes. This enhances the sample's representativeness and strengthens the study's external validity. In addition, the UM's scale and breadth render it comparable to institutions featured in similar international validations of the USEI, facilitating meaningful cross-national comparisons. Practical considerations also informed this decision. Two members of the research team were institutionally affiliated with UM, which streamlined the ethical review process, gatekeeper permissions, and access to institutional data. This logistical efficiency enabled timely implementation, reducing the need for parallel negotiations with multiple institutions and minimising delays. Such pragmatic decisions are not uncommon in

educational research, where budgetary constraints, time limitations, and access restrictions often necessitate context-sensitive compromises (Fugard & Potts, 2014; Synowiec et al., 2023). While the current strategy reflects a balance between methodological integrity and operational feasibility, future research in Malta should allocate additional resources to broaden recruitment beyond UM. Carrying out random sampling and including students from other HE institutions would strengthen representativeness, increase the robustness of validity testing, and further enhance the generalisability of findings.

CONCLUSIONS AND RECOMMENDATIONS

This study provides the first evidence of the psychometric adequacy of the USEI in the Maltese higher education (HE) context. The findings confirm its three-dimensional structure - behavioural, emotional, and cognitive engagement; together with strong internal consistency and predictive validity for key academic outcomes, including dropout intention and self-perceived academic performance. The second-order engagement model demonstrated excellent fit, and measurement invariance across STEM and non-STEM fields supports its applicability across disciplines.

By validating the USEI in Malta, this study fills an important gap in local research and offers HE institutions a culturally appropriate and empirically robust instrument to assess student engagement. Given the increasing emphasis on student retention, academic success, and well-being, the availability of a reliable and internationally benchmarked measure is particularly timely.

These findings carry important implications for policy makers, university leaders, and teaching staff. At the policy level, student engagement should be systematically integrated into national higher education quality assurance and monitoring frameworks. Using validated tools such as the USEI can support evidence-informed decision-making, allowing institutions to track engagement trends, identify vulnerable student groups, and design targeted retention strategies. Policymakers may also consider incentivizing institutional initiatives that demonstrably enhance behavioural, emotional, and cognitive engagement, particularly in contexts or disciplines with elevated dropout risk.

For university administrators, the regular assessment of engagement should become part of institutional strategic planning and quality enhancement processes. Engagement data can inform early-warning systems, guide the allocation of student support resources, and shape mentoring, advising, and academic development programs. Embedding engagement indicators within institutional dashboards would enable proactive responses to emerging challenges and promote a culture of continuous improvement.

For teachers and academic staff, the results highlight the central role of pedagogical practices in fostering engagement. Active learning strategies, timely formative feedback, collaborative activities, and inclusive classroom climates can strengthen students' behavioural participation, emotional connection to their studies, and cognitive investment in learning tasks. Monitoring engagement at the course level may also help identify early signs of disengagement, allowing timely pedagogical adjustments and individualized support.

Overall, this study strengthens the international evidence base for the USEI while providing Maltese higher education stakeholders with a practical and validated framework to monitor and enhance student engagement. Systematic assessment and promotion of engagement can contribute to improved academic performance, reduced dropout intentions, and enhanced student well-being, thereby supporting a more resilient and evidence-informed higher education system in Malta.

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