frontiers in Education

TYPE Original Research
PUBLISHED 11 March 2026
DOI 10.3389/feduc.2026.1773320

OPEN ACCESS

EDITED BY
Nadia Rehman,
Zhejiang Normal University, China

REVIEWED BY
Nokuthula Tlalajoe-Mokhatla,
University of the Free State, South Africa
Amir Mahmood,
Zhejiang Normal University, China

*CORRESPONDENCE
Feliciano Veiga
fhveiga@ie.ulisboa.pt

RECEIVED 22 December 2025
REVISED 16 February 2026
ACCEPTED 17 February 2026
PUBLISHED 11 March 2026

CITATION
Veiga F, Wong ZY, Veiga FM, Seabra F, Festas I, Faria L, Forno LF and Martínez I (2026) Higher education student engagement in the academic community: clarifying the concept and proposing a short measure. *Front. Educ.* 11:1773320. doi: 10.3389/feduc.2026.1773320

Higher education student engagement in the academic community: clarifying the concept and proposing a short measure

Feliciano Veiga[1]*, Zi Yang Wong[2], Francisco M. Veiga[3], Filipa Seabra[4], Isabel Festas[5], Liliana Faria[6], Letícia F. Forno[7] and Isabel Martínez[8]

[1]Instituto de Educação, UIDEF, Universidade de Lisboa, Lisboa, Portugal, [2]School of Social Sciences, Singapore Management University, Singapore, Singapore, [3]Eidgenössische Technische Hochschule, Universität ETH Zürich, Zürich, Switzerland, [4]LE@D - Laboratory of Distance Education and Learning, Universidade Aberta, Lisboa, Portugal, [5]Faculdade de Psicologia e de Ciências da Educação, Universidade de Coimbra, Coimbra, Portugal, [6]Faculty of Human and Social Sciences, University of Algarve, Faro, Portugal, [7]Curso de Psicologia, Universidade Cesumar, Maringá, Brazil, [8]Departamento de Psicología, Universidad de Castilla-La Mancha, Cuenca, España

Background: Engagement in the academic community is increasingly recognized as a crucial aspect of students' social integration in higher education, with implications for persistence, academic success, and wellbeing. However, its assessment remains problematic, as existing instruments often blur the distinction between community engagement and learning engagement, obscuring their distinct predictive value.
Objectives: The primary objectives of this research were to clarify the construct of student engagement in the academic community and, in doing so, to develop and validate a short measure that encompasses proactive engagement beyond the three traditional dimensions: identity with the academy, relational, and participatory engagement.
Methods: To achieve this second objective, two empirical studies were conducted. Study 1 involved developing the "Higher Education Student Engagement in the Academic Community: A Short Scale" via an exploratory factor analysis. Study 2 examined the scale's reliability and validity through confirmatory factor analysis.
Results: The results supported the four-dimensional structure of the new scale, confirming its robust psychometric properties and practical utility.
Conclusion: These findings hold significant implications for educators and researchers alike. The research also addresses its limitations, highlights the advantages of utilizing this short scale, and suggests future investigation.

KEYWORDS
engagement in the academic community, higher education, proactive engagement, scale validation, student engagement

1 Introduction

Higher education systems worldwide face profound and interrelated challenges, including widening participation, ensuring educational quality, fostering students' wellbeing, and promoting meaningful social integration in increasingly diverse academic contexts (European Higher Education Area, 2024; UNESCO, 2022). Alongside academic performance, universities are now expected to support students' psychological adjustment,

sense of belonging, and active participation in institutional life (Haw and King, 2023; Kahu, 2013; Kahu and Nelson, 2018). In this context, student engagement (SE) has emerged as a central construct for understanding how students connect with, navigate, and thrive within higher education institutions (Martinie and Shankland, 2024; Trowler and Trowler, 2010; Wong and Liem, 2022).

In this sense, a robust body of research has demonstrated that SE is associated with a wide range of desirable outcomes, including academic success, persistence, satisfaction, and wellbeing (Palos et al., 2019; Gopalan and Brady, 2020; Kuh and Hu, 2001; Wong et al., 2024). Nevertheless, despite its prominence, the concept of SE remains theoretically fragmented and methodologically inconsistent (Christenson et al., 2012; Kahu, 2013; Trolian, 2023). One of the main sources of this problem lies in the tendency to treat it as a unitary construct or to conflate qualitatively distinct forms of engagement within single measures (Wong and Liem, 2022; Zhoc et al., 2019). As a result, research about its explanatory and predictive power has often been limited, particularly when attempting to disentangle academic outcomes from psychosocial and wellbeing outcomes (Kahu and Nelson, 2018; Wong et al., 2024).

To address this conceptual ambiguity, recent theoretical developments have proposed a clearer distinction between different components of SE. Among these, the Dual Component Framework of Student Engagement (Wong and Liem, 2022; Figure 1) represents a significant advance by distinguishing between student engagement in learning activities (SELA) and student engagement in the academic community (SEAC). SELA refers to students' cognitive, behavioral, affective, and agentic involvement in learning processes (Reeve and Tseng, 2011; Veiga et al., 2026), whereas SEAC concerns students' connection to the broader academic community, including their sense of belonging, interpersonal relationships, participation in institutional life, and identification with the institution (Kahu, 2013; Slaten et al., 2017).

Although this distinction has received growing empirical support (Wong et al., 2024), the literature reveals an important imbalance. Research and measurement efforts have largely focused on SELA, particularly classroom-based engagement, while SEAC has received comparatively less conceptual refinement and empirical attention (Kahu, 2013; Trolian, 2023). Moreover, many existing SE instruments mix indicators of SELA and SEAC, making it difficult to examine their unique contributions to academic achievement, wellbeing, and psychosocial development (Gunuc and Kuzu, 2015; Zhoc et al., 2019; Lin and Huang, 2018). This lack of conceptual clarity is compounded by the fact that SEAC has been operationalized in diverse and sometimes inconsistent ways, with proposed dimensional structures ranging from three to six dimensions (Gunuc and Kuzu, 2015; Pace, 1984; Wong and Liem, 2022).

Traditionally, SEAC has been conceptualized through three core dimensions: identitary engagement, relational engagement, and participatory engagement (Kahu, 2013; Wong and Liem, 2022). The identitary dimension captures students' sense of belonging and identification with their academic institution (Rehman et al., 2023; Slaten et al., 2017); the relational dimension reflects the quality of students' interpersonal relationships with peers, faculty, and staff (Kahu, 2013; Raposa et al., 2021); and the participatory dimension refers to involvement in formal and informal academic and extracurricular activities (Krause and Coates, 2008; Kuh, 2001; Kuh and Hu, 2001). While these dimensions are well established and theoretically grounded, they primarily reflect reactive or adaptive forms of engagement, emphasizing students' responses to existing institutional structures and opportunities (Kahu and Nelson, 2018).

However, contemporary higher education increasingly emphasizes students' active agency and co-responsibility in shaping academic life (European Higher Education Area, 2024; UNESCO, 2022). Educational policies and institutional discourses now encourage students not only to participate but also to contribute ideas, voice concerns, and initiate change within their institutions (Raposa et al., 2021; Rehman et al., 2024; Zepke and Leach, 2010). This expectation aligns with broader theoretical work on proactive motivation and agency (Parker et al., 2010), yet such proactive forms of SE remain largely absent from existing SEAC measures (Wong and Liem, 2022; Zhoc et al., 2019). In this sense, we propose the inclusion of a dimension of proactive engagement in the academic community, conceptualized as distinct from the agentic engagement described in the domain of learning activities (Reeve and Tseng, 2011). Whereas agentic engagement primarily manifests in students' efforts to influence teaching and instructional practices, proactive engagement in the academic community refers to students' initiatives at institutional and community levels, including the formulation of suggestions, proposals, and contributions directed toward organizational structures, services, and the collective dynamics of the institution (Raposa et al., 2021).

A critical review of existing instruments reveals three persistent gaps in the literature. First, no available scale exclusively measures SEAC in accordance with the Dual Component Framework of Student Engagement, without conflating it with SELA (Wong and Liem, 2022). Second, existing measures do not explicitly incorporate proactive engagement as a distinct dimension of SEAC (Zhoc et al., 2019). Third, most available instruments are relatively long, limiting their practical utility in large-scale research, institutional monitoring, and multi-construct studies where respondent burden is a concern (Credé and Harms, 2015; Rammstedt and John, 2007). Short, theoretically grounded measures are increasingly recognized as essential for advancing both research quality and practical application in higher education contexts (Marsh et al., 2013).

Against this backdrop, the present research seeks to address these conceptual and methodological limitations. The overarching aim of this study is twofold: (a) to clarify the construct of SEAC by proposing a theoretically coherent, four-dimensional model that includes identitary, relational, participatory, and proactive engagement; and (b) to develop and validate a short, psychometrically robust instrument, the Higher Education Student Engagement in the Academic Community–Short Scale (HESEAC-SS), aligned with this model. More specifically, this study addresses the following research questions:

1. Can SEAC be empirically represented as a four-dimensional construct encompassing identitary, relational, participatory, and proactive engagement?

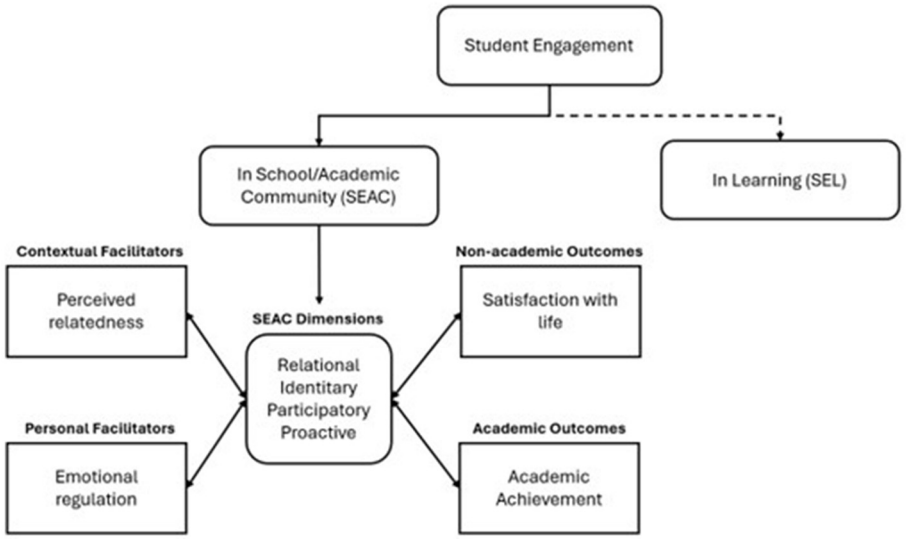

FIGURE 1
Dual component framework of student engagement and four-dimensionality of SEACS: conceptual framework. Dual component framework of student engagement.

2. Does the proposed short scale demonstrate satisfactory reliability and construct validity, including convergent, discriminant, and concurrent validity?
3. To what extent do the dimensions of SEAC uniquely predict indicators of wellbeing and psychosocial functioning, beyond SELA?
4. Is the measurement structure of the proposed scale invariant across gender and academic year?

By addressing these questions, this study aims to contribute to a more precise conceptualization of SE, advance the empirical study of SEAC, and provide researchers and practitioners with a concise, theoretically grounded tool to capture contemporary forms of SE in higher education.

2 Materials and methods

To attain the second objective of this research, we conducted two studies to develop and validate a scale that would overcome the aforementioned theoretical and empirical concerns. In Study 1, we developed the scale, while in Study 2, we assessed its reliability and validity through confirmatory factor analysis.

2.1 Participants

A total of 743 higher education students participated in this research, which involved two empirical studies using distinct samples (Table 1). Participants were selected through non-probabilistic convenience sampling. A random selection process was carried out within each sample to enhance the sample's representativeness, ensuring that every student had an equal opportunity to be selected (Taherdoost, 2016). Participants attended seven universities and four polytechnic institutes in Portugal. The universities focused on theory and research, while the polytechnic institutes adopted a vocational approach. Participants originated from various geographic regions (north, central, and south) and represented a range of socio-economic backgrounds, primarily from middle- to high-class families.

TABLE 1 Samples for study 1 and study 2.

Studies	Study 1		Study 2	
Variable	*n*	%	*n*	%
Gender				
Female	282	81.7	331	83.5
Male	61	17.7	62	15.7
Non-binary	2	0.6	3	0.8
Course				
Psychology	141	40.6	139	35.1
Education	109	31.4	181	45.7
Architecture	97	28.0	76	19.2
Academic year				
1st	180	51.9	168	42.4
3rd	167	48.1	228	57.6

The research focuses exclusively on participants from the first and third academic years, as these years represent significant transitions in a student's educational journey. The first year marks the transition to higher education, a critical period for academic adjustment, engagement formation, and identity development within the university context (Chemers et al., 2001; Van Rooij et al., 2018). The third year reflects a more consolidated phase

of academic experience, in which students have accumulated sustained exposure to institutional practices and are approaching degree completion, allowing for more stable perceptions of engagement and academic functioning (Bowden et al., 2021). Limiting the participants to these 2 years also facilitates easier access and simplifies data analysis, avoiding complications that might arise from including all academic years. Moreover, by contrasting these two non-adjacent stages, the study captures variability across early and advanced phases of higher education without conflating transitional and intermediate experiences.

The research included participants from Psychology, Education, and Architecture because these courses facilitated data collection and provided sufficient participants. The focus on various areas, including the social sciences, education, and the arts, was justified because it offers a more diverse and comprehensive perspective, enabling comparisons across disciplines.

In Study 1, after excluding eight outliers, the sample consisted of 347 participants (Table 1). Most identified as female (81.3%), 40.6% were studying Psychology, and the majority were first-year students (51.9%). In Study 2, five outliers were excluded, and the final sample included 396 participants, mostly female (83.6%), attending the Education course (45.7%), and mainly in the third year (57.6%).

2.2 Measures

2.2.1 HESEAC-SS: items development

The development of HESEAC-SS items involved several steps. First, we conducted a comprehensive literature review to identify existing SE scales and items relevant to the academic community. Next, we conducted semi-structured interviews with higher education students to assess the need for new items. After that, field experts reviewed the selection of items, and we conducted a pilot administration.

In the initial phase, we developed 33 HESEAC-SS items based on existing engagement questionnaires. These items evaluate four types of engagement: identitary, participatory, relational, and proactive engagement. While previous studies have explored agentic engagement in learning activities, this research focuses specifically on proactive engagement within the academic community.

We conducted semi-structured interviews with a heterogeneous group of nine higher education students to explore their experiences in the academic community. To ensure the group's diversity, students were chosen based on a balanced distribution across regions (north, center, and south of the country), academic years (first and third), age, gender, and courses (education, psychology, architecture). We informed this student group about the meaning of SEAC in its four dimensions and invited them to respond to an open-ended question regarding each dimension. In the identitary dimension, we asked, "How would you describe your sense of belonging to your university/institute?" For proactive engagement, we asked, "Do you often take the initiative and express your opinions within the academic community? Can you give an example of a situation where you did this?" These interviews also allowed us to expand the item pool for each SEAC dimension by introducing 6 new items to the original set.

The thirty-nine items were later assessed by nine experts, all higher education faculty members with experience in teaching and research in education, psychology, and architecture, and with familiarity with SE research and instrument development. The expert panel was intentionally multidisciplinary, reflecting the academic fields represented in the student samples. We aimed to ensure a diverse expert panel that reflected the methodology applied to the student group. The consensus process was conducted through an iterative expert review procedure. First, experts independently reviewed and categorized each item according to the proposed SEAC dimensions. Inter-rater agreement was then calculated using the Kappa index (Landis and Koch, 1977). In cases of disagreement, items were re-examined and discussed among the research team, considering both statistical agreement indices and conceptual alignment with the theoretical framework. This process was repeated until a satisfactory level of consensus was achieved for each item. This procedure follows recommended best practices for scale development, including iterative expert review, assessment of agreement, and theory-driven item refinement (Boateng et al., 2018).

After considering the experts' feedback, 12 items were eliminated. The remaining 27 items exhibited a strong consensus, with agreement levels of 0.72 for the identitary dimension,0.81 for the participatory dimension,0.87 for the relational dimension, and 0.076 for the proactive dimension.

In a pilot study involving 67 higher education students, selected through convenience sampling within participating institutions, participants were asked to respond to 27 items to evaluate their comprehension and the time required to complete the survey. Students, enrolled in undergraduate programs in education, psychology, and architecture, were contacted through their course instructors, who informed them about the pilot study during class and invited them to participate voluntarily. Inclusion criteria for the pilot study were enrollment in higher education and sufficient proficiency in the questionnaire language to provide meaningful feedback. Three items were unclear to all students, resulting in their removal. After this modification, 24 items remained, with six dedicated to each dimension. Respondents answered using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), a commonly used scale in social science research (Tanujaya et al., 2022). Each dimension consisted of the corresponding items, with no reverse-scored items included (see Appendix 2 for further details).

The initial set of 24 HESEAC-SS items was designed to be condensed into a short scale to address the increasing demand for these measures in research (Zepke and Leach, 2010). Short scales provide numerous advantages. Hence, we decided to retain only a few items, focusing on the distinctiveness of each SEAC dimension, adopting a classical factor-analytic strategy combining exploratory and confirmatory factor analyses, as suggested by Worthington and Whittaker (2006). Specifically, this decision was informed by the results of the exploratory factor analysis (EFA), considering the factor loadings, communality values, cross-loadings and relevant theoretical criteria (e.g., Hayduk and Littvay, 2012; Pett et al., 2003).

2.2.2 Perceived relatedness

Perceived relatedness refers to an individual's sense of belonging and the social support they experience within a given social context. This aspect is essential for developing interpersonal skills in SEAC (Capon-Sieber et al., 2022; Gopalan and Brady, 2020). It encompasses three items (e.g., "I find it easy to relate to people") that pertain to relationships within the academic community and were initially derived from the Activity-Feelings States (Reeve and Sickenius, 1994; $\alpha = 0.83$ in the current research). This measure was used to assess concurrent validity. Similar to the HESEAC-SS, responses to this measure and the following ones were given using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

2.2.3 Student engagement in learning activities

To evaluate the concurrent validity of the HESEAC-SS, we also selected the Higher Education Student Engagement in Learning Activities—A Short Scale (HESELA-SS; Veiga et al., 2026; the scale has been published as a preprint and is currently under review for publication in PLOS ONE). These two measures assess distinct but related sub-concepts within the Dual Component Framework of Student Engagement (Wong and Liem, 2022). HESELA-SS consists of 12 items organized into four dimensions. The cognitive dimension refers to the mental processes involved in learning (e.g., "I try to integrate my previously learned knowledge to solve new problems"; $\alpha = 0.80$ in the current research). The affective dimension concerns emotional responses experienced during learning (e.g., "I feel enthusiasm for what I am going to learn this academic year"; $\alpha = 0.88$ in the current research). The behavioral dimension relates to observable behaviors during the learning process (e.g., "I pay attention in classes"; $\alpha = 0.82$ in the current research). Moreover, the agentic dimension concerns students' proactive involvement in learning (e.g., "I communicate with the professor about my thoughts on the topics we are studying"; $\alpha = 0.81$ in the current research).

2.2.4 Life satisfaction

The Satisfaction with Life Scale (Kjell and Diener, 2021) measures individuals' perceptions of a fulfilling and satisfying life. It consists of three items (e.g., "In most ways, my life is close to my ideal"; $\alpha = 0.83$ in the current research). Research indicates that SEAC positively influences students' wellbeing and life satisfaction (Kahu and Nelson, 2018). Therefore, using this scale enabled us to investigate the predictive validity of the HESEAC-SS.

2.2.5 Emotional intelligence

Six items were used to evaluate emotional intelligence, drawn from the Brief Emotional Intelligence Scale (Davies et al., 2010; $\alpha = 0.83$ in the current research). These items assess three areas: understanding one's own emotions (two items, e.g., "I know why my emotions vary"), appraising others' emotions (two items, e.g., "I can tell how people are feeling by listening to the tone of their voice"), and regulating others' emotions (two items, e.g., "I help other people feel better when they are down"). Students' emotional experiences are interconnected with their engagement, and recognizing this correlation can support the implementation of effective educational strategies, as discussed by Pekrun and Linnenbrink-Garcia (2022), whose framework of academic emotions extends to university settings. Therefore, the analysis of HESEAC-SS predictive validity was facilitated by emotional intelligence.

2.2.6 Sociodemographic variables

A sociodemographic questionnaire included inquiries about gender, age, course, academic year, and academic performance. To assess students' academic performance, we asked them, "How do you rate your academic performance?" Responses were measured on a 5-point Likert scale, ranging from 1 (very low) to 5 (very high). Although research indicates a moderately strong and positive correlation between overall SELA and academic achievement (Trowler and Trowler, 2010), there is a dearth of studies examining the relationship between SEAC and academic achievement. Hence, we also used academic achievement to assess SEAC's predictive validity.

2.3 Procedures

The research received approval from the Ethics Committee at the Institute of Education of the University of Lisbon (N.° 1525 Proc. IDOK de 27/11/2023). Interested participants were directed to a website detailing the study's procedures and questionnaires. After explaining the study's objectives and importance, students were informed that their participation would be entirely voluntary. All collected information remained confidential, ensuring participants' anonymity. Students were able to contact the researchers if they had any questions. Participants confirmed they had not participated in any other related studies and provided written informed consent.

Data collection began on March 10, 2024, and concluded on June 6, 2024. Participants completed online questionnaires via Google Forms and, to maintain consistency, filled them out in the classroom under the supervision of a professor or psychologist. There was no missing data, as the online platform required respondents to answer all questions. A comprehensive record of faculties/institutes, courses, academic year, and classes was meticulously maintained to ensure that participants in one study did not participate in the other.

2.4 Data analyses

We conducted data analyses using IBM SPSS and AMOS, version 29. To assess the normality of the item distribution, we examined skewness and kurtosis, which were within acceptable ranges: skewness $< |3.0|$ and kurtosis $< |8.0|$ (Kline, 2011). To

ensure the absence of multicollinearity, all tolerance values were greater than 0.10 and variance inflation factor (VIF) values were less than 10 (Kline, 2011).

In Study 1, a principal components EFA was conducted to establish construct validity. Although principal components analysis is frequently used in early stages of scale development as a data-reduction and exploratory tool (Jolliffe, 2002), it is important to note that it is not equivalent to common factor analysis and should not be interpreted as providing definitive evidence of latent structure. A varimax rotation was chosen to facilitate interpretation (Field, 2017), which aligns with the methodology employed by other researchers who developed SE scales (Gunuc and Kuzu, 2015). The determination of the number of factors and retained items was guided by various criteria, including communality values close to or exceeding 0.50, eigenvalues greater than 1, contribution to variance, scree plot, parallel analysis, and theoretical considerations such as conceptual clarity and interpretability (Field, 2017; Pallant, 2020). Factor loadings were classified as excellent if exceeding 0.71, very good if exceeding 0.61, and good if exceeding 0.55 (Comrey and Lee, 1992). In terms of explained variance, we aimed for a satisfactory level of at least 60% of the total variance (Hair et al., 2014). Cronbach's alpha (α) was computed to assess reliability, with values above 0.70 considered satisfactory (Hair et al., 2014; Kline, 2011).

In Study 2, a confirmatory factor analysis was performed using maximum likelihood estimation to assess the fit of the resulting model. A well-fitting model was indicated by a χ^2/df ratio between 1 and 3 (Bollen, 1989), CFI and GFI values exceeding 0.90 (Kline, 2011), and RMSEA values below 0.08 (Hair et al., 2014). Before carrying out the confirmatory factor analysis, the existence of common method bias was examined using Harman's single factor test. The total variance of a single factor was 23.50%, under the cut-off value of 50% (Podsakoff et al., 2003), indicating the absence of common method bias. Standardized residuals were also examined, and values below |2.5| did not suggest issues with the model (Hair et al., 2014). Additionally, convergent validity was evaluated by calculating the average variance extracted (AVE), with AVE values ≥ 0.50 considered acceptable (Fornell and Larcker, 1981).

In our analysis, we ensured discriminant validity by confirming that the square root of the AVE exceeded the correlations among the four-dimensional scale scores and that the AVE values were greater than the maximum shared variance (MSV), as recommended by Fornell and Larcker (1981) and Hair et al. (2014). To assess reliability, we calculated composite reliability (CR), with values over 0.70 considered satisfactory according to Hair et al. (2014) and Kline (2011).

We computed Pearson correlation coefficients to examine concurrent validity between the HESEAC-SS and relatedness and HESELA-SS dimensions. We evaluated the magnitude of correlations using Cohen's (1988) criteria ($r = 0.10$ small, $r = 0.30$ moderate, $r = 0.50$ large).

Additionally, we examined predictive validity using multiple linear regressions to determine whether the dimensions of HESEAC-SS predicted independent variance in life satisfaction, emotional intelligence, and academic achievement.

We conducted multigroup confirmatory factor analyses to evaluate measurement invariance based on gender (male vs. female) and academic year (first vs. third year). Our assessment encompassed configural, metric (weak), scalar (strong), covariance (structural), and residual (strict) invariance of the four-factor model of SE. Initially, we established an unconstrained baseline model as a reference. We then constrained factor loadings, intercepts, covariances, and residual variances to be equal between groups to analyze metric, scalar, covariance, and residual invariance, respectively. We evaluated invariance using two criteria: the $\Delta\chi^2$ test comparing the fit of constrained and free models (Satorra and Bentler, 2001) and a maximum change in CFI of less than 0.01 between models (Cheung and Rensvold, 2002). When full invariance was not achieved, we examined partial invariance, as recommended (Byrne et al., 1989; Schmitt and Kuljanin, 2008), accepting it when at least some parameters showed equivalence between groups (Hair et al., 2014). In this case, we identified problematic constraints by examining the critical ratios for parameter differences and adjusting accordingly (Byrne et al., 1989).

3 Results

3.1 Construct validity

An initial construct validity analysis with EFA was performed to choose the final 12 items (Table 2) out of the 24 candidate items in Appendix 2. The first EFA revealed six factors, explaining 66% of the variance. One of the factors consisted of only two items, making it a weaker and less stable factor (Osborne and Costello, 2009). As a result, these items were excluded, and a new EFA was conducted.

The subsequent analysis yielded five factors, explaining 64.33% of the variance. One item exhibited a cross-loading and was thus removed. A parallel analysis was then conducted, supporting the retention of four factors. A new EFA was performed using this approach, and the four factors captured 59.13% of the total variance. Four items were removed from the analysis: one due to cross-loading and the others due to lower communality values. The updated EFA accounted for 68.77% of the variance.

Among the 15 final items, the top three in each dimension were selected, resulting in a 12-item scale across four factors, as illustrated in Table 2, which explained 72.96% of the total variance. Most factor loadings were excellent, with values above.75. One-factor loading was very good at 0.69. Cronbach's Alpha reliability coefficients for the four dimensions and total of the SEAC were satisfactory: 0.81 (identitary), 0.81 (relational), 0.78 (participatory), 0.79 (proactive), and 0.82 (total scale).

Construct validity was further examined in Study 2 by performing a confirmatory factor analysis with this 12-item four-dimensional structure (Figure 2). A good model fit was found, χ^2 (48) = 136.25, χ^{2}/df = 2.84, GFI = 0.948; CFI = 0.954; RMSEA = 0.068. All factor loadings were higher than 0.61, very good or excellent, except for one, which was 0.54 (all $p < 0.001$). When analyzing the correlations among the four dimensions, all were statistically significant ($p < 0.05$), the strongest being the one between the proactive and participatory dimensions ($r = 0.71$), followed by the one between the relational and identitary

10.3389/feduc.2026.1773320

TABLE 2 Items of the HESEAC-SS identified in the EFA (study 1).

HESEAC-SS	Participatory	Identitary	Relational	Proactive
	19.02%	18.67%	18.22%	17.05%
17 (09). I regularly go to the socio-cultural activities planned by the faculty/institute (e.g., films, theater, volunteering).	0.84			
15 (07). I am usually present at the entertaining events organized by the faculty/institute (e.g., games, parties, outings).	0.78			
16 (08). I attend the meetings called by the faculty/institute on matters related to its functioning.	0.77			
01 (01). I feel happy to be a part of this faculty/institute.		0.83		
06 (03). I identify with this faculty/institute.		0.82		
03 (02). I feel strongly connected to my faculty/institute.		0.81		
07 (04). Students at this faculty/institute are friendly with me.			0.86	
08 (05). I like the students at my faculty/institute.			0.85	
12 (06). I have good relations with the people of this faculty/institute.			0.74	
22 (10). I let those in charge know what I think about the faculty/institute services.				0.86
24 (12). I openly express my opinion about what happens in the academic community.				0.81
23 (11). I give suggestions to those responsible for creating innovative activities in the academic community.				0.69

Only the three items with the highest loading by dimension are presented (Study 1). The number in parentheses refers to the item number in study 2.

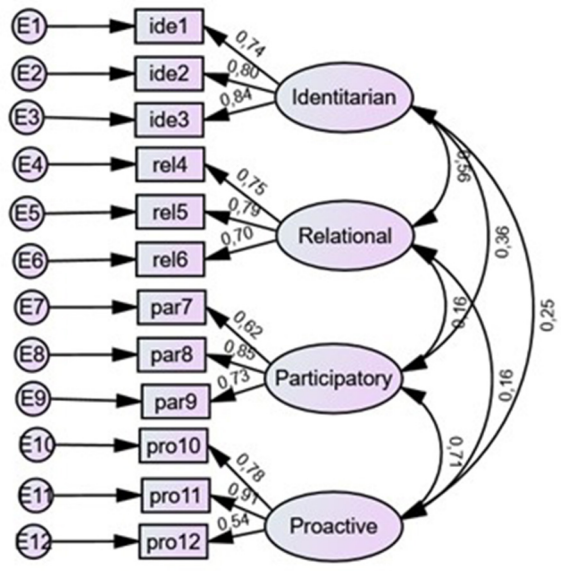

FIGURE 2
Items of the HESEAC-SS validated in the confirmatory factor analysis: four-factor model (study 2).

dimensions ($r = 0.56$). On the other hand, the correlations between relational engagement and participatory and proactive engagement were weak (both with $r = 0.16$).

When the standardized residuals for each model were analyzed, only two were between |2.5| and |4.0|. Considering that the respective items did not show any other problems, no changes were made to the models, as Hair et al. (2014) recommended.

In addition to the four-factor structure, a unidimensional alternative model was tested through confirmatory factor analysis, in which all items loaded on a single latent factor. This unidimensional solution presented poor model fit, $\chi^2_{(54)} = 1{,}061.61$, $\chi^{2}/df = 19.66$, GFI = 0.619, CFI = 0.473, RMSEA = 0.217, indicating that a single general factor could not adequately account for the variance among items. Thus, the four-factor solution was evidenced to be the most parsimonious and empirically supported representation of the HESEAC-SS structure.

3.2 Reliability

Table 3 presents the descriptive statistics and reliability concerning the four HESEAC-SS dimensions. CR ranged between 0.78 and 0.84, suggesting that the three items of each dimension consistently represented the same underlying latent construct (Kline, 2011).

3.3 Convergent and discriminant validity

Table 4 displays the findings on convergent and discriminant validity. All four dimensions exhibited AVE values above 0.50, indicating strong support for convergent validity. Additionally, the square root of the AVE values surpassed the observed correlations between the dimensions, and the AVE values exceeded the MSV values, thereby confirming discriminant validity (Hair et al., 2014).

TABLE 3 Reliability and descriptive statistics for the HESEAC-SS dimensions (study 2).

Dimensions	Mean	SD	Skewness	Kurtosis	CR
Identitary	3.55	0.80	−0.38	−0.04	0.84
Relational	3.82	0.62	−0.19	0.37	0.79
Participatory	2.80	0.96	0.13	−0.47	0.78
Proactive	3.18	0.92	−0.23	−0.16	0.80

TABLE 4 Convergent and discriminant validity for the HESEAC-SS (study 2).

Dimensions	AVE	MSV	Proactive	Identitary	Relational	Participatory
Proactive	0.57	0.50	**0.76**			
Identitary	0.63	0.32	0.25	**0.80**		
Relational	0.56	0.32	0.16	0.56	**0.75**	
Participatory	0.55	0.50	0.71	0.36	0.16	**0.74**

All correlations are statistically significant at $p < 0.001$. AVE, average variance extracted (convergent validity); MSV, maximum shared squared variance (discriminant validity). Bold values on the diagonal represent the square root of the AVE for each construct.

TABLE 5 Correlations between the HESEAC-SS, relatedness, and the HESELA-SS (study 2).

Variables	Relatedness	HESELA-SS			
		Cognitive	Affective	Behavioral	Agentic
HESEAC-SS					
Identitary	0.45***	0.22***	0.47***	0.31***	0.28***
Relational	0.55***	0.26***	0.32***	0.25***	0.14**
Participatory	0.33***	0.09	0.21***	0.17***	0.42***
Proactive	0.30***	0.24***	0.22***	0.26***	0.51***

**p < 0.01.
***p < 0.001.

3.4 Concurrent validity

In Table 5, we can find the results on concurrent validity. It is worth noting that all HESEAC-SS dimensions showed positive, moderate to strong, and statistically significant correlations with relatedness (all $p < 0.001$). Furthermore, each HESEAC-SS dimension exhibited a positive and significant correlation with the HESELA-SS dimensions (all $p < 0.01$), except for the correlation between the HESEAC-SS participatory dimension and the HESELA-SS cognitive dimension, which was found not to be significant ($r = 0.09$, $p = 0.068$).

3.5 Predictive validity

The analysis found that all four HESEAC-SS dimensions showed positive and significant correlations with the three outcome criterion variables, except for the participatory dimension, which did not correlate significantly with academic achievement ($r = 0.10$, $p = 0.056$). As a result, we employed multiple linear regression to investigate whether each dimension could predict unique variance in each criterion while accounting for the variance explained by the other three dimensions (see Table 6).

The regression models for life satisfaction and emotional intelligence showed statistical significance ($p < 0.001$). However, the regression model for academic achievement was not statistically significant ($p = 0.050$). In terms of life satisfaction, the individually significant dimensions included identitary ($p = 0.007$), relational ($p < 0.001$), and proactive ($p = 0.029$). As for emotional intelligence, the individually significant dimensions were identitary ($p = 0.001$), relational, and proactive (both with $p < 0.001$).

Moreover, hierarchical linear regressions showed that the proactive dimension added in step 2 significantly contributed to the model for both life satisfaction ($p = 0.029$) and emotional intelligence ($p < 0.001$). Additionally, hierarchical linear regressions were conducted for life satisfaction and emotional intelligence, including the four SELA dimensions in step 1 and the four SEAC dimensions in step 2. Results showed that the addition of SEAC was statistically significant after SELA was accounted for, both for life satisfaction (R^2 increase $= 0.04$, $p = 0.002$) and emotional intelligence (R^2 increase $=0.08$, $p < 0.001$).

3.6 Measurement invariance

We examined measurement invariance according to gender (male vs. female) and academic year (1st vs. 3rd) using a series

TABLE 6 HESEAC-SS as predictor of life satisfaction, emotional intelligence, and academic achievement (study 2).

Variables	Bivariate correlation	Multiple regression	
	r	*B* (*SE*)	β
Life satisfaction			
Identitary	0.28***	0.16 (0.06)	0.15**
Relational	0.30***	0.29 (0.08)	0.20***
Participatory	0.18***	0.03 (0.05)	0.04
Proactive	0.20***	0.12 (0.05)	0.12*
Emotional intelligence			
Identitary	0.33***	0.12 (0.04)	0.17**
Relational	0.30***	0.16 (0.05)	0.17***
Participatory	0.30***	0.06 (0.03)	0.10
Proactive	0.34***	0.14 (0.03)	0.23***
Achievement			
Identitary	0.11*	0.05 (0.05)	0.06
Relational	0.11*	0.07 (0.06)	0.06
Participatory	0.10	0.02 (0.04)	0.03
Proactive	0.11*	0.06 (0.04)	0.08

$N = 396$; For Life Satisfaction, Adjusted $R^2 = 0.12$, $F = 14.94$, $p < 0.001$; for Emotional Intelligence, Adjusted $R^2 = 0.21$, $F = 26.95$, $p < 0.001$; for Achievement, Adjusted $R^2 = 0.01$, $F = 2.40$, $p = 0.050$.
*p < 0.05.
** p < 0.01.
*** p < 0.001.

of nested models. Findings, summarized in Table 7, showed that HESEAC-SS presented full configural, metric, scalar, and residual invariance across different genders, scalar invariance only with Cheung and Rensvold's (2002) ΔCFI criterion. However, the covariance invariance was not achieved.

Regarding the academic year, full configural, metric, covariance, and residual invariance were verified; additionally, partial scalar invariance was obtained after freeing one constraint, and only with Cheung and Rensvold's (2002) ΔCFI criterion ($\Delta \chi^2 = 25.39$, $p = 0.008$, Δ CFI $= 0.008$).

4 Discussion

4.1 A psychometrically strong scale

HESEAC-SS presented good psychometric properties, providing support for construct validity within the present samples. It showed good indicators of internal consistency for each of the three-item HESEAC-SS dimensions and excellent indicators of convergent and discriminant, concurrent, and predictive validity. Additionally, it exhibited partial measurement invariance based on gender and academic year.

4.1.1 Construct validity

Both EFA and confirmatory factor analysis supported the four-dimensional model, including the proactive dimension. Most factor loadings were rated good or excellent (Comrey and Lee, 1992). The analysis of the correlations among the four dimensions revealed a moderate correlation between the relational and identitary dimensions. This finding suggests that students' interactions with others may be related to their academic identity. It implies that the relational and identity dimensions are primarily connected to social interactions, including social relationships and identity formation. Developing meaningful relationships with others contributes to forming identities and vice versa (Raposa et al., 2021).

As reported in the Results section, a strong correlation was observed between the participatory and proactive dimensions. This robust association suggests a strong empirical and conceptual proximity between participatory and proactive engagement. Students who are likely engaged in community events will exhibit self-motivation and proactivity, consistent with previous studies (Parker et al., 2010; Zhoc et al., 2019). From a conceptual perspective, this result might indicate functional proximity, as more participatory students are also more likely to exhibit proactive behaviors. However, participation primarily refers to adherence to existing activities, whereas proactivity entails transformative initiatives and active influence on the academic community.

On the other hand, the correlation between relational engagement and participatory and proactive engagement was weak. This may seem unexpected, as participation in academic and extracurricular activities is generally thought to strengthen students' interpersonal connections and sense of belonging within the university community (Krause and Coates, 2008). On the other hand, the psychological dynamics of relational, participatory, and proactive engagement may become more differentiated in young adulthood (Kahu and Nelson, 2018; Salanova et al., 2010). This developmental distinction, together with variations in the type of activities or institutional contexts, could help explain the weak correlations observed among these dimensions (Raposa et al., 2021; Wirt and Jaeger, 2014).

Understanding the SEAC dimensions aligns with existing literature (Slaten et al., 2017; Wong and Liem, 2022; Zhoc et al., 2019), and the content of the items allows for a refinement of each dimension's definition. The identitary dimension pertains to students' sense of connection with the academic community, encompassing their perception of belonging as members. The relational dimension involves students' interactions with colleagues and other academic community members. The participatory dimension indicates how students take part in socio-cultural activities, events, and meetings about the academy's functioning. The proactive dimension refers to how students propose initiatives and express their opinions and suggestions about the academic community, contributing to their innovation.

4.1.2 Concurrent validity

As far as concurrent validity is concerned, all HESEAC-SS dimensions showed moderate to strong correlations with relatedness, as expected (Capon-Sieber et al., 2022; European

TABLE 7 Invariance: Model Comparisons for Gender and Academic Year (Study 2).

Model	χ^2	*df*	χ^2/df	CFI	$\Delta\chi^2$	ΔCFI
Gender						
Configural (factor structure)	201.94	96	2.10	0.946		
Metric	217.11	104	2.09	0.943	15.17	0.003
Scalar	239.08	116	2.06	0.938	21.97*	0.005
Covariances	275.61	126	2.19	0.924	36.53***	0.014
Residuals	294.64	138	2.14	0.921	19.03	0.003
Academic year						
Configural (factor structure)	186.36	96	1.94	0.952		
Metric	195.02	104	1.88	0.952	8.66	0.000
Scalar	220.41	115	1.92	0.944	25.39**	0.008
Covariances	238.08	125	1.91	0.940	17.67	0.004
Residuals	253.79	137	1.85	0.938	15.71	0.002

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

Higher Education Area, 2024). In addition, the correlations between HESEAC-SS and HESELA-SS dimensions ranged from low to moderate. This indicates that while SEAC and SELA are interrelated, they are also distinct constructs that should be evaluated separately following the Dual Component Framework of Student Engagement (Wong and Liem, 2022). Furthermore, the correlation between the participatory dimension of HESEAC-SS and the cognitive dimension of HESELA-SS was found to be non-significant. The relationship between these two variables can be complex (Trowler and Trowler, 2010; Wong et al., 2024). While cognitive engagement is significantly related to academic achievement, participatory engagement influences social connectedness and wellbeing (Knifsend, 2020). It is possible that participatory engagement is not directly associated with students' cognitive engagement but with other soft skills or social and emotional competencies (e.g., collaboration skills) that could facilitate students' learning (Ulupinar et al., 2019; Yang and Chau, 2011).

4.1.3 Predictive validity

The identitary, relational, and proactive dimensions displayed significant predictive validity as independent factors for two criterion variables: life satisfaction and emotional intelligence. These results are consistent with previous findings (Kahu and Nelson, 2018; Pekrun and Linnenbrink-Garcia, 2022). However, despite correlating with life satisfaction and emotional intelligence, the participatory dimension did not independently explain variances when the other HESEAC-SS dimensions were considered. This suggests that the participatory dimension may be more strongly dependent on other dimensions in predicting life satisfaction and emotional intelligence, such as the proactive dimension, since a proactive student is also participative (Pekrun and Linnenbrink-Garcia, 2022). As anticipated, the SEAC dimensions strongly predicted wellbeing indicators, such as life satisfaction and emotional intelligence, but they did not predict academic achievement. These findings align with those synthesized in Wong et al.'s (2024) meta-analysis.

The findings from the hierarchical linear regressions revealed that incorporating SEAC had a statistically significant influence on predicting both life satisfaction and emotional intelligence, even when controlling for SELA. This implies that HESEAC-SS contributes additional predictive capability for these outcomes, surpassing the explanatory power of SELA alone. This provides further support to the idea that SEAC and SELA are two distinct constructs (Wong and Liem, 2022).

Moreover, in the hierarchical analysis of the regression models, proactive engagement was found to significantly enhance the model after accounting for the other three dimensions. It was observed that proactive engagement predicted life satisfaction and emotional intelligence independently from the identitary, relational, and participatory aspects, particularly concerning the latter. This indicates that proactive engagement uniquely predicts these outcomes, consistent with prior research findings (Parker et al., 2010; Wong et al., 2024). These results provide initial empirical support for the inclusion of proactive engagement as a distinct dimension of engagement in the academic community, although further research using longitudinal and experimental designs is needed to consolidate this four-dimensional framework.

4.1.4 Measurement invariance

In the measurement invariance analysis, gender and academic year were considered. As reported in the Results section, HESEAC-SS achieved full configural, metric, scalar, and residual invariance across genders. A similar pattern was observed for the academic year, although scalar invariance was only partial. Consequently, these findings support the comparison of HESEAC-SS scores between female and male students and between first-year and

third-year students. However, as full invariance was not achieved across all tested parameters, these comparisons across groups should be interpreted with caution, particularly regarding mean-level differences. The observed partial invariance related to the academic year may be attributed to the malleability characteristic of the SE, which can fluctuate with contextual and personal student variables (Reeve et al., 2020; Reschly and Christenson, 2022).

In summary, the elements considered in Section 3, from method to discussion, achieved our second research objective—to create and validate a short scale that incorporates proactive engagement. Several implications can be drawn from this.

4.2 Theoretical and practical implications

This research clarifies the concept of SEAC and distinguishes it from SELA. Our findings highlight that fostering engagement in the academic community involves enhancing individual motivation and nurturing the social dynamics and psychosocial processes underpinning students' sense of belonging, proactivity, and collaborative participation. The development and validation of the HESEAC-SS provide a theoretically grounded, psychometrically sound tool. This scale enables researchers and educators to measure SEAC, facilitating comparative and longitudinal studies accurately. By incorporating proactive engagement, this research enhances our theoretical understanding of how students actively participate in the academic community, extending beyond mere belonging and participation. This aligns with the goals the European Higher Education Area (2024) set out, emphasizing the importance of active SEAC. It is important to note, however, that the operationalization of proactive engagement in this study focused primarily on students' initiatives expressed through communication with institutional actors (e.g., feedback or suggestions to authorities). Other forms of proactive engagement, such as organizing or leading community activities, were not explicitly captured by the items used and would be interesting to explore in future studies.

Considering the practical implications, the reduced number of items makes the HESEAC-SS an easy-to-use scale, in line with the advantages of short scales (Kjell and Diener, 2021; Zepke and Leach, 2010). Higher education institutions, educational policymakers, and researchers may utilize this scale as a potentially useful monitoring tool, particularly in contexts similar to those examined in this study. It can help develop and implement favorable education policies for a more inclusive and quality learning environment. The results obtained can also inform training and professional development programs for teachers. The HESEAC-SS may help identify patterns of engagement that warrant further attention in specific student groups. It can assist higher education institutions in addressing some of their most pressing challenges, such as accessibility issues, education quality, students' mental health, and the transition from university to the labor market (Covas, 2020; Dallago, 2021; UNESCO, 2022). These implications underscore the significant impact of HESEAC-SS, both theoretically and practically, on higher education.

4.3 Limitations and future research

Despite the good psychometric properties of HESEAC-SS, this study has several limitations. The sample was obtained by convenience, has a gender imbalance, is limited to three subject areas (Psychology, Education, and Architecture), two academic years (first and third) and a single national context, which restricts the generalization of the results. In the future, research should strive to include more diverse samples from various countries, higher education institutions, scientific areas and courses, and demographic variables, as these factors influence the generalizability of the results. The number of non-binary participants in the present research was insufficient for meaningful statistical analyses. However, we recognize the importance of analyzing data from non-binary participants in future research to ensure the inclusion of all gender identities.

Similar to existing SE scales, the HESEAC-SS also has its limitations. We noted that many current measures could benefit from incorporating the Dual Component Framework of Student Engagement, as they primarily assess the academic community or learning activities. We acknowledge that the concept of SEAC may also vary significantly, particularly in its manifestations in extracurricular activities and interpersonal relationships, as well as in engagement within formal and informal community contexts.

Additionally, it is essential to note that correlational and cross-sectional research designs do not allow for causal inference. Future longitudinal research could further explore the interrelationships between the dimensions of SEAC, such as the relationship between participatory and proactive dimensions and the correlation between the identitary and relational dimensions.

It is also important to note that although the use of principal components analysis for construct development may be considered a limitation, as it does not explicitly model latent constructs or measurement error, it was used as a preliminary step for item refinement. The factorial structure was subsequently validated through confirmatory factor analysis in an independent sample, thereby mitigating this limitation.

An additional limitation concerns the exclusive reliance on self-report measures; while self-report instruments are widely used and considered appropriate for capturing subjective constructs such as students' engagement and perceptions of academic experiences, future research would benefit from incorporating complementary data sources (e.g., behavioral indicators, peer or teacher reports, or institutional records).

Furthermore, it is worth noting that academic achievement was assessed solely through students' self-reports, thus weakening the conclusions regarding predictive validity. Future studies should incorporate official ratings for a more comprehensive evaluation. Additional research could explore the relationships among participatory SEAC, cognitive SELA, and participation, emotional intelligence, and life satisfaction.

The simultaneous use of HESEAC-SS and HESELA-SS as short, distinct scales can offer additional benefits. This approach could facilitate a more thorough and nuanced evaluation of SE in higher education, enabling more precise and effective interventions to enhance both SEAC and SELA, academic performance, and student wellbeing.

5 Conclusions

This research offers a theoretically grounded framework that contributes to the understanding and evaluation of SE in higher education. We clarify the conceptualization of SE into two distinct components, SEAC and SELA. The research included developing and validating a short, psychometrically sound instrument to measure SEAC. Additionally, we present an expanded, multidimensional approach to SEAC that includes proactive engagement alongside identitary, relational, and participatory engagement. We also showed the predictive value of HESEAC-SS concerning emotional intelligence and life satisfaction. The 12-item HESEAC-SS is particularly useful in large-scale studies. It can greatly deepen our understanding of SEAC, which is crucial for reducing failure rates and enhancing the success of both students and higher education institutions. The validation of HESEAC-SS not only addresses a psychometric gap but also reinforces the importance of considering student engagement as a fundamentally psychosocial construct deeply rooted in social identity, relationships, and proactive participation within the academic environment.

Data availability statement

The datasets presented in this article are not readily available because to protect participant privacy and adhere to ethical standards, the data can only be shared upon legitimate request and subject to approval. Requests to access the datasets should be directed to Feliciano Veiga, fhveiga@ie.ulisboa.pt.

Ethics statement

The studies involving humans were approved by Comissão de Ética do Instituto de Educação da Universidade de Lisboa. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

FV: Writing – original draft, Writing – review & editing. ZW: Writing – original draft, Writing – review & editing. FMV: Writing – review & editing. FS: Writing – review & editing. IF: Writing – review & editing. LiF: Writing – review & editing. LeF: Writing – review & editing. IM: Writing – review & editing.

Funding

The author(s) declared that financial support was received for this work and/or its publication. This research was realized in the framework of the project 2025-GRIN-38473, 85% co-financed by the European Regional Development Fund, within the framework of the FEDER Program of Castilla-La Mancha for the period 2021-2027, action 01A/008; and was funded by FCT-Portuguese Foundation for Science and Technology, I.P., under the scope of UIDEF -Unidade de Investi-gação e Desenvolvimento em Educação e Formação, UIDB/04107/2020, https://doi.org/10.54499/UIDB/04107/2020, within the scope of the LC4Inclusion project -PTDC/CED-EDG/4650/2021.

Acknowledgments

Special thanks to the professors and psychologists who contributed to data collection: Conceição Martins, Instituto Politécnico (IP) Bragança, ESEB; Cidália Silva, Universidade (U) do Minho, EAAD; Íris Oliveira, U Católica Portuguesa, CEFH; Isabel Festas, U Coimbra, FPCEUC; Marta Tagarro (IP Santarém, ESES); Filomena Covas (IP Lisboa, ESEL); Liliana Faria (U Algarve, CUIP); Magdalena Melo (U Évora, CIDHUS); Rui Fonseca (ISEC, EEDH); Pedro Rodrigues and Jorge Spencer (U Lisboa, FA); Maria J. Mogarro and Ana Paz (U IEUL).

Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that generative AI was not used in the creation of this manuscript.

Any alternative text (alt text) provided alongside figures in this article has been generated by Frontiers with the support of artificial intelligence and reasonable efforts have been made to ensure accuracy, including review by the authors wherever possible. If you identify any issues, please contact us.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2026.1773320/full#supplementary-material

References

Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quiñonez, H. R., and Young, S. L. (2018). Best practices for developing and validating scales for health, social, and behavioral research: a primer. *Front. Public Health* 6:149. doi: 10.3389/fpubh.2018.00149

Bollen, K. A. (1989). *Structural Equations with Latent Variables*. New York, NY: John Wiley & Sons.

Bowden, J. L.-H., Leonie, T., and Kay, N. (2021). The four pillars of tertiary student engagement: a holistic measurement approach. *Stud. Higher Educ.* 46, 1207–1224. doi: 10.1080/03075079.2019.1672647

Byrne, B. M., Richard, J. S., and Bengt, M. (1989). Testing for the equivalence of factor covariance and mean structures: the issue of partial measurement invariance. *Psychol. Bull.* 105, 456–66. doi: 10.1037/0033-2909.105.3.456

Capon-Sieber, V., Carmen, K., Andrea, C., Joël, H., and Anne-Kathrin, P. (2022). The role of relatedness in the motivation and vitality of university students in online classes during social distancing. *Front. Psychol.* 12, 1–16. doi: 10.3389/fpsyg.2021.702323

Chemers, M. M., Li-Tze, H., and Brian, F. G. (2001). Academic self-efficacy and first-year college student performance and adjustment. *J. Educ. Psychol.* 93, 55–64. doi: 10.1037/0022-0663.93.1.55

Cheung, G. W., and Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Struct. Equation Model.* 9, 233–255. doi: 10.1207/S15328007SEM0902_5

Christenson, S. L., Amy, L. R., and Cathy, W. (2012). *Handbook of Research on Student Engagement*. New York: Springer. doi: 10.1007/978-1-4614-2018-7

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences, 2nd edn*. New York: Routledge.

Comrey, A. L., and Lee, H. B. (1992). *A First Course in Factor Analysis, 2nd edn*. Hillsdale, NJ: Erlbaum.

Covas, F. (2020). *Envolvimento na Escola e Saúde Mental dos Estudantes de Ensino Superior* (PhD dissertation). Instituto de Educação da Universidade de Lisboa, Lisbon, Portugal.

Credé, M., and Harms, P. D. (2015). 25 years of higher-order confirmatory factor analysis: a meta-analytic review. *J. Res. Personality* 54, 25–31. doi: 10.1002/job.2008

Dallago, B. (2021). "European higher education: challenges and achievement," in *Comparative Economic Studies in Europe*, ed. W. Andreff (Cham: Palgrave Macmillan), 11–147. doi: 10.1007/978-3-030-48295-4_7

Davies, K. A., Andrew, M. L., Thomas, J. D., and James, A. S. (2010). Validity and reliability of a brief emotional intelligence scale (BEIS-10). *J. Individual Differ.* 31, 198–208. doi: 10.1027/1614-0001/a000028

European Higher Education Area (2024). *Ministerial Conference Bologna 1999*. Brussels: EHEA Secretariat.

Field, A. P. (2017). *Discovering Statistics Using IBM SPSS Statistics, 5th edn*. London: Sage.

Fornell, C., and Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* 18, 39–50. doi: 10.1177/002224378101800104

Gopalan, M., and Brady, S. T. (2020). College students' sense of belonging: a national perspective. *Educ. Res.* 49, 134–137. doi: 10.3102/0013189X19897622

Gunuc, S., and Kuzu, A. (2015). Student engagement scale: development, reliability and validity. *Assess. Eval. High. Educ.* 40, 587–610. doi: 10.1080/02602938.2014.938019

Hair, J. F., William, C. B., Barry, J. B., and Rolph, E. A. (2014). *Multivariate Data Analysis, 8th edn*. Harlow: Pearson Education.

Haw, J. Y., and King, R. B. (2023). Perceived need-supportive leadership, perceived need-supportive teaching, and student engagement: a self-determination perspective. *Soc. Psychol. Educ.* 26, 1289–1319. doi: 10.1007/s11218-023-09790-2

Hayduk, L. A., and Littvay, L. (2012). Should researchers use single indicators, best indicators or multiple indicators in structural equation models? *BMC Med. Res. Methodol.* 12, 1–17. doi: 10.1186/1471-2288-12-159

Jolliffe, I. T. (2002). *Principal Component Analysis, 2nd edn*. New York: Springer.

Kahu, E. R. (2013). Framing student engagement in higher education. *Stud. High. Educ.* 38, 758–73. doi: 10.1080/03075079.2011.598505

Kahu, E. R., and Nelson, K. (2018). Student engagement in the educational interface: understanding the mechanisms of student success. *Higher Educ. Res.* 37, 58–71. doi: 10.1080/07294360.2017.1344197

Kjell, O. N. E., and Diener, E. (2021). Abbreviated three-item versions of the satisfaction with life scale and the harmony in life scale yield as strong psychometric properties as the original scales. *J. Personality Assess.* 103, 183–194. doi: 10.1080/00223891.2020.1737093

Kline, R. B. (2011). *Principles and Practice of Structural Equation Modeling, 3rd edn*. New York: Guilford Press.

Knifsend, C. A. (2020). Intensity of activity involvement and psychosocial well-being among students. *Active Learn. Higher Educ.* 21, 116–127. doi: 10.1177/1469787418760324

Krause, K.-L., and Coates, H. (2008). Students' engagement in first-year university. *Assess. Eval. Higher Educ.* 33, 493–505. doi: 10.1080/02602930701698892

Kuh, G. D. (2001). *The National Survey of Student Engagement: Conceptual Framework and Overview of Psychometric Properties*. Bloomington, IN: Indiana University Center for Postsecondary Research.

Kuh, G. D., and Hu, S. (2001). The effects of student-faculty interaction in the 1990s. *Rev. Higher Educ.* 24, 309–332. doi: 10.1353/rhe.2001.0005

Landis, J. R., and Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics* 33, 159–174. doi: 10.2307/2529310

Lin, S.-H., and Huang, Y.-C. (2018). Assessing college student engagement: development and validation of the student course engagement scale. *J. Psychoeduc. Assess.* 36, 694–708. doi: 10.1177/0734282917697618

Marsh, H. W., Oliver, L., Benjamin, N., Alexandre, J. S. M., and von Davier, M. (2013). Why item parcels are (almost) never appropriate: two wrongs do not make a right. *Psychol. Methods* 18, 257–284. doi: 10.1037/a0032773

Martinie, M. A., and Shankland, R. (2024). Achievement goals, self-efficacy, and psychological flexibility as antecedents of study engagement. *Soc. Psychol. Educ.* 27, 2395–2416. doi: 10.1007/s11218-024-09921-3

Osborne, J. W., and Costello, A. B. (2009). Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. *Pract. Assess. Res. Eval.* 10, 1–9. doi: 10.7275/jyj1-4868

Pace, C. R. (1984). *The College Student Experiences Questionnaire*. Los Angeles: Higher Education Research Institute, University of California.

Pallant, J. (2020). *SPSS Survival Manual: A Step-by-Step Guide to Data Analysis Using IBM SPSS, 7th edn*. London: Routledge. doi: 10.4324/9781003117445

Palos, R., Liviu, P. M., and Ionut, C. (2019). Relations between academic performance, student engagement, and student burnout: a cross-lagged analysis of a two-wave study. *Stud. Educ. Eval.* 60, 199–204. doi: 10.1016/j.stueduc.2019.01.005

Parker, S. K., Uta, K. B., and Karoline, S. (2010). Making things happen: a model of proactive motivation. *J. Manag.* 36, 827–856. doi: 10.1177/0149206310363732

Pekrun, R., and Linnenbrink-Garcia, L. (2022). "Academic emotions and student engagement," in *Handbook of Research on Student Engagement, 2nd edn*, eds. Amy L. Reschly, and Sandra L. Christenson (Cham: Springer), 107–138. doi: 10.1007/978-3-031-07853-8_6

Pett, M. A., Nancy, R. L., and John, J. S. (2003). *Making Sense of Factor Analysis: The Use of Factor Analysis for Instrument Development in Health Care Research*. Thousand Oaks, CA: Sage Publications. doi: 10.4135/9781412984898

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., and Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J. Appl. Psychol.* 88, 879–903. doi: 10.1037/0021-9010.88.5.879

Rammstedt, B., and John, O. P. (2007). Measuring personality in one minute or less: a 10-item short version of the big five inventory in english and German. *J. Res. Personality* 41, 203–212. doi: 10.1016/j.jrp.2006.02.001

Raposa, E. B., Molly, H., Dan, L., and Jean, E. R. (2021). Predictors of close faculty-student relationships and mentorship in higher education: findings from the gallup-purdue index. *Ann. N. Y. Acad. Sci.* 1483, 36–49. doi: 10.1111/nyas.14342

Reeve, J., and Sickenius, B. (1994). Development and validation of a brief measure of the three psychological needs underlying intrinsic motivation: the AFS scales. *Educ. Psychol. Meas.* 54, 506–515. doi: 10.1177/0013164494054002025

Reeve, J., Sung, H. C., and Hyungshim, J. (2020). How and why students make academic progress: reconceptualizing the student engagement construct to increase its explanatory power. *Contemp. Educ. Psychol.* 62:101899. doi: 10.1016/j.cedpsych.2020.101899

Reeve, J., and Tseng, C.-M. (2011). Agency as a fourth aspect of student engagement during learning activities. *Contemp. Educ. Psychol.* 36, 257–267. doi: 10.1016/j.cedpsych.2011.05.002

Rehman, N., Irum, A., Xiao, H., Muhammad, I., and Amir, M. (2023). Sense of belonging and retention in higher education: an empirical study across chinese universities. *Braz. J. Educ. Technol. Soc.* 16, 1067–1082. doi: 10.14571/brajets.v16.n4.1067-1082

Rehman, N., Xiao, H., Saima, J., and Amir, M. (2024). Project-based learning as a catalyst for 21st-century skills and student engagement in the math classroom. *Heliyon* 10:e39988. doi: 10.1016/j.heliyon.2024.e39988

Reschly, A. L., and Christenson, S. L. (2022). *Handbook of Research on Student Engagement, 2nd edn*. Cham: Springer. doi: 10.1007/978-3-031-07853-8

Salanova, M., Wilmar, B. S., Isabel, M. M., and Esteve, B. (2010). How obstacles and facilitators predict academic performance: the mediating role of study burnout and engagement. *Anxiety Stress Coping* 23, 53–70. doi: 10.1080/10615800802609965

Satorra, A., and Bentler, P. M. (2001). A scaled difference chi-square test statistic for moment structure analysis. *Psychometrika* 66, 507–514. doi: 10.1007/BF02296192

Schmitt, N., and Kuljanin, G. (2008). Measurement invariance: review of practice and implications. *Hum. Resour. Manag. Rev.* 18, 210–222. doi: 10.1016/j.hrmr.2008.03.003

Slaten, C. D., Zachary, M. E., Eric, D. D., Heather, A. H., and Dallas, A. S. (2017). The development and validation of the university belonging questionnaire. *J. Exp. Educ.* 86, 633–651. doi: 10.1080/00220973.2017.1339009

Taherdoost, H. (2016). Sampling methods in research methodology: how to choose a sampling technique for research. *Int. J. Acad. Res. Manag.* 5, 18–27. doi: 10.2139/ssrn.3205035

Tanujaya, B., Rully, C. I. P., and Juliana, M. (2022). Likert scale in social sciences research: problems and difficulties. *FWU J. Soc. Sci.* 16, 89–101. doi: 10.51709/19951272/Winter2022/7

Trolian, T. L. (2023). "Student engagement in higher education: conceptualizations, measurement, and research," in *Higher Education: Handbook of Theory and Research*, ed. Laura W. Perna (Cham: Springer), 1–60. doi: 10.1007/978-3-031-32186-3_6-1

Trowler, V., and Trowler, P. (2010). *Student Engagement Evidence Summary*. New York: Higher Education Academy.

Ulupinar, S., Emine, S., and Nazan, K. Y. (2019). Does the participation of nursing students in social activities affect their social-emotional learning skills? *Nurse Educ. Today* 79, 15–20.

UNESCO (2022). *The Right to Education in the 21st Century: Findings from the International Seminar on the Evolving Right to Education*. Paris: UNESCO Education Sector.

Van Rooij, E. C. M., Ellen, P. W. A. J., and van de Grift, Wim, J. C. M. (2018). First-year university students' academic success: the importance of academic adjustment. *Higher Educ.* 76, 755–776. doi: 10.1007/s10212-017-0347-8

Veiga, F., Reeve, J., Veiga, C. M., Wong, Z. Y., Martínez, I., de Carvalho, N. A., et al. (2026). Higher education student engagement in learning activities: Clarifying concepts and introducing a short-scale. *PLoS One* 21:e0340391. doi: 10.1371/journal.pone.0340391

Wirt, L. G., and Jaeger, A. J. (2014). Seeking to Understand Faculty-Student Interaction at Community Colleges. *Community College J. Res. Pract.* 38, 980–994. doi: 10.1080/10668926.2012.725388

Wong, Z. Y., Gregory, A. D. L., Melody, C., and Juan, A. D. D. (2024). Student engagement and its association with academic achievement and subjective well-being: a systematic review and meta-analysis. *J. Educ. Psychol.* 116, 48–75. doi: 10.1037/edu0000833

Wong, Z. Y., and Liem, G. A. D. (2022). Student engagement: current state of the construct, conceptual refinement, and future research directions. *Educ. Psychol. Rev.* 34, 107–138. doi: 10.1007/s10648-021-09628-3

Worthington, R. L., and Whittaker, T. A. (2006). Scale development research: a content analysis and recommendations for best practices. *Couns. Psychol.* 34, 806–838. doi: 10.1177/0011000006288127

Yang, M., and Chau, A. W. L. (2011). Social involvement and development as a response to the campus student culture. *Asia Pac. Educ. Rev.* 12, 393–402. doi: 10.1007/s12564-011-9149-x

Zepke, N., and Leach, L. (2010). Improving student engagement: ten proposals for action. *Active Learn. Higher Educ.* 11, 167–177. doi: 10.1177/1469787410379680

Zhoc, K. K. H., Ben, J. W., Raymond, B. K., Jacqueline, C. L., and Tanya, S. C. (2019). Higher education student engagement scale (HESES): development and psychometric evidence. *Res. Higher Educ.* 60, 219–244. doi: 10.1007/s11162-018-9510-6