



Student resources measure: Development and validation in the South African context

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Abstract: This study aimed to develop and evaluate the internal psychometric quality of the Student Resources Measure, which captures study-related and broader student-life resources that support students' academic functioning. A cross-sectional quantitative design was used with 2434 students from one South African university across three campuses. Confirmatory factor analysis supported a six-factor structure comprising support from family, support from friends, support from lecturers, growth and learning opportunities, information and communication, and structural support. Measurement invariance analyses supported configural, metric, and strong invariance across the tested home-language and campus groups. Differential item functioning analyses indicated negligible item bias across these groups (all McFadden pseudo R^2 values were below 0.13), and the measure demonstrated adequate internal consistency. The findings provide preliminary evidence based on internal structure, internal consistency, and comparability across the tested groups. The study contributes to SD-R theory by offering a student-informed, contextually relevant operationalisation of resources for future research on student well-being and success.

Keywords: student resources; factorial validity; measurement invariance; item bias; internal consistency; university students

Introduction

Student well-being has become an increasing concern in higher education research and practice (Cobo-Rendón et al., 2020). For instance, many students report elevated levels of stress and burnout (Olson et al., 2025), placing increasing responsibility on higher education institutions (HEIs) to identify and support at-risk students (Mostert et al., 2024). Although extensive research has focused on the stressors and demands that undermine student well-being, increasing attention has been given to the motivational role of study resources that promote motivation, engagement, and successful academic functioning (Bakker & Mostert, 2024; Klinkenberg et al., 2024; Lesener et al., 2020). This growing emphasis on study resources also highlights the importance of measuring the resources available to students in a conceptually and contextually appropriate manner.

Measures of student resources in higher education

Several measures have been used to assess student resources in higher education, including among South African university students. For example, Cilliers et al. (2018) adapted the Questionnaire on the Experience and Assessment of Work (VBBA; van Veldhoven et al., 1997) for the academic context and assessed support from family, lecturers, and friends, as well as opportunities for growth and development. Similarly, Luruli et al. (2020) used an adapted version of the VBBA to assess study

resources including lecturer support, autonomy, and support from family and friends. Lesener et al. (2020) used a self-developed scale assessing student support, teacher support, and developmental opportunities. Mokgele and Rothmann (2014) also adapted the VBBA for higher education in developing the Study Demands and Resources Scale (SDRS), which operationalised study resources in terms of lecturer support, peer support, and the nature of tasks. More recently, Van Zyl et al. (2024) validated the SDRS in a cross-national student sample, while Scheepers et al. (2024) applied it to assess peer support and growth opportunities among undergraduate medical students in the Netherlands.

Furthermore, the University Demand-Resources Questionnaire (UDRQ) was developed by Jagodics and Szabó (2023) and validated by Sun et al. (2024). The UDRQ includes several resource dimensions, including support from lecturers, opportunities for personal development, information, feedback, and perceived control. This scale represents an important contribution, as it encompasses a broader range of resources relevant to university students and is informed by the JD-R framework. Nevertheless, existing measures have generally focused on a relatively narrow set of academically oriented resources, such as lecturer support, peer support, developmental opportunities, autonomy, information, and feedback. Moreover, relatively few measures have been grounded in qualitative enquiry



into students' lived experiences, while evidence regarding their psychometric equivalence across linguistically diverse and multi-campus student populations remains limited. Consequently, there remains a need for contextually grounded measures that capture a broader range of resources relevant to students' functioning, and that can be evaluated for fair and reliable use across diverse higher education contexts.

Theoretical foundations

The Study Demands–Resources (SD–R) theory provides a useful framework for understanding these processes in higher education (Bakker & Mostert, 2024). Building on the Job Demands–Resources (JD–R) theory (Bakker et al., 2023), SD–R theory classifies student experiences into demands and resources that shape student well-being, engagement, and performance (Bakker & Mostert, 2024). Study demands refer to aspects of studying that require sustained effort and may deplete students' physical, cognitive, and emotional energy, such as academic workload, cognitive demands, and time pressure. Study resources, in contrast, refer to aspects of the study environment that help students achieve academic goals, manage demands, stimulate growth and learning, and enhance engagement (Bakker & Mostert, 2024; Salmela-Aro et al., 2022). Furthermore, study resources are central to the motivational pathway of SD–R theory, supporting students' capacity to remain engaged, motivated, and academically functional (Bakker & Mostert, 2024). Given the significant role that study resources play in students' engagement, motivation, and academic performance (Bakker & Mostert, 2024), their precise measurement is important for both research and evidence-based student support strategies. From an SD–R perspective, such measurement should adequately represent the resources students draw upon to achieve their study goals, manage demands, and sustain engagement.

The South African higher education context

These measurement considerations are particularly important in the South African higher education context, where students' academic experiences are shaped by linguistic diversity, socio-economic inequality, differences across campuses, and varying levels of access to institutional and contextual support (Versfeld et al., 2025). In this context, student resources cannot be understood solely as formal academic supports embedded within teaching and learning. Broader forms of support may also influence whether students can access learning opportunities, cope with demands, and remain engaged in their studies (Bakker & Mostert, 2024; Versfeld et al., 2025). These considerations point to the need for a contextually grounded and psychometrically sound measure capable of capturing the range of resources that students draw upon throughout their academic lives.

A prior qualitative study was conducted to explore the demands and resources experienced by students in a South African higher education context (Mostert et al., 2023). Through thematic analysis, the qualitative study identified key student-resource themes that reflected students' lived experiences and the forms of support they considered important for navigating university life. These themes

informed the development of the Student Resources Measure and provided a conceptual and empirical foundation for the 49-item pool. Importantly, the Student Resources Measure extends beyond solely academic or study-based resources. Although some resources originate directly within the academic environment, such as lecturer support, information availability, feedback, and learning opportunities (Bagdžiūnienė et al., 2025; Lesener et al., 2020; Mokgele & Rothmann, 2014; Van Zyl et al., 2024), students also rely on broader contextual and life resources that enable them to participate in and benefit from higher education (Versfeld et al., 2025). These may include support from family and friends, access to transport, and structural supports that enable students to engage with university life (Cilliers et al., 2018; Luruli et al., 2020). Accordingly, the term student resources is used in this study as an umbrella concept referring to perceived contextual conditions that support students' academic functioning and well-being. It encompasses study-related resources embedded primarily within the academic environment and student-life resources arising from students' broader relational and structural contexts. In this study, student resources are distinguished from personal resources, which refer to psychological characteristics or capacities within the individual that may assist students in managing demands and pursuing their goals. The measure is informed by the functional conceptualisation of resources within SD–R theory while extending the assessment beyond resources embedded directly within the study environment to include broader relational and structural conditions identified as relevant through students' lived experiences.

The present study

The Student Resources Measure was developed to address this gap as part of a broader initiative, StudyWell: Student Well-Being Initiative, which focuses on advancing research and measurement of student well-being as conceptualised in SD–R theory. This initiative addresses the need for contextually relevant, student-centred tools that can accurately evaluate both the student demands and resources in higher education. As part of this initiative, a student demands instrument [anonymised for review] has been validated separately to ensure conceptual and analytical clarity, while the current study focuses exclusively on the student resources component.

Building on this qualitative foundation, the present study aims to validate the newly developed Student Resources Measure among university students. As such, the measure was designed to capture a broader range of study and student-life resources, including support from family, friends, and lecturers; growth and learning opportunities; information and communication; and structural support.

Accordingly, this study evaluates the measure's psychometric properties by examining its factorial validity, measurement invariance across home-language and campus groups, differential item functioning, and internal consistency. Subsequently, the following hypotheses were formulated to evaluate the psychometric properties:

H1: The Student Resources Measure comprises a six-factor structure, including support from family, support from friends, support from lecturers, growth and learning opportunities, information and communication, and structural support.

H2: The Student Resources Measure has configural invariance across different home-language subgroups (Afrikaans, English, Setswana, and Sesotho) and three campuses.

H3: The Student Resources Measure has metric invariance across different home-language subgroups (Afrikaans, English, Setswana, and Sesotho) and three campuses.

H4: The Student Resources Measure has strong invariance across different home-language subgroups (Afrikaans, English, Setswana, and Sesotho) and three campuses.

H5: The Student Resources Measure has negligible item bias across different home-language subgroups (Afrikaans, English, Setswana, and Sesotho) and three campus groups.

H6: The Student Resources Measure has satisfactory internal consistency, as indicated by Cronbach's alpha coefficients of 0.70 or higher and McDonald's omega coefficients of 0.80 or higher.

Method

Participants

Participants were a convenience sample of 2434 undergraduate and postgraduate students registered at one South African university operating across three geographically distinct campuses.

Of the 2434 participants, the largest reported age group comprised students aged 18 to 20 years (887; 36.4%), followed by 558 (22.9%) aged 21 to 22, and 667 (27.4%) aged 25 or older. Among the participants, 685 (28.1%) were Afrikaans-speaking, followed by 472 (19.4%) who spoke Setswana, 255 (10.5%) who spoke Sesotho, and 190 (7.8%) who spoke English. Considering gender, 1779 (73.1%) participants identified as male and 600 (24.7%) as female. Regarding ethnicity, 1571 (64.5%) participants identified as Black, while 691 (28.4%) participants identified as White. By campus, the majority of participants (1641; 67.4%) were enrolled at Campus 2, followed by 470 (19.3%) at Campus 1, and 303 (12.4%) at Campus 3. Percentages may not sum to 100% because only selected categories were reported, and some demographic responses were missing. Furthermore, the three campuses possess distinct and varied cultures. Campus 1 is classified as peri-urban, denoting an urban region contiguous with rural areas, and is well suited to academic programmes centred on rural development and indigenous knowledge. The second campus is the largest and oldest of the three and is located in a suburban community. The third campus is the smallest and is located near the city in an urban area. This campus accommodates students from diverse cultures and linguistic backgrounds.

Measures

Demographic questionnaire: Respondents were asked to complete a demographic questionnaire to ensure accurate

reporting of participant characteristics and adherence to the [American Psychological Association \(2020\)](#) criteria. This study included the following demographic details: age, home language, campus, gender, and ethnicity.

Student resources: The Student Resources Measure comprised a six-factor structure with the subsequent dimensions:

Eleven items measure support from family (e.g., My family supports me).

Eight items measure support from friends (e.g., When things are difficult and confusing, I have friends or fellow students who support me).

Five items measure support from lecturers (e.g., My lecturers are prepared for classes).

Four items measure growth and learning opportunities (e.g., In my studies, I have the opportunity to think for myself).

Ten items measure information and communication (e.g., The communication is excellent at this university).

Eleven items measure structural support (e.g., I have access to transportation to my university).

Responses were scored on a five-point Likert-type scale ranging from 1 (never) to 5 (always). The survey was administered in English to all participants. Home language was therefore used as the grouping variable in the measurement invariance and differential item functioning analyses; these analyses did not compare translated versions of the questionnaire.

Procedure

Ethics approval was obtained from the North-West University ethical committee (Ethics number: NWU-HS-2014-0165). Participants received detailed information about the study; participation was voluntary, and informed consent was obtained. Confidentiality and anonymity were safeguarded at all times.

Data were collected utilising an online survey assessing students' academic experiences, including both student demands and students' study-related resources and student-life resources. Although both measures were administered to the same sample as part of a broader student well-being initiative, the present study focuses exclusively on validating the Student Resources Measure.

The online survey links were distributed via the university's electronic information system, and comprehensive awareness campaigns were implemented across the three campuses. The anticipated completion time for the survey ranged from 15 to 20 min.

Statistical analysis

The questionnaire's psychometric properties were assessed using Mplus 8.9, a specialised software program designed for statistical modelling ([Muthén & Muthén, 2023](#)). Confirmatory factor analysis (CFA) was used to assess the measure's factorial validity and evaluate how well the proposed six-factor Student Resources Measure fitted the observed data. The model's goodness-of-fit was evaluated using Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), the standard chi-square (χ^2) statistic, the Root Mean Square Error of Approximation (RMSEA), and the Standardised Root Mean Square Residual (SRMR).

Given the ordinal nature of the items, they were specified as categorical indicators, and the CFA was estimated using the mean- and variance-adjusted weighted least squares estimator (WLSMV). This estimation approach was considered appropriate because WLSMV does not assume multivariate normality; consequently, tests of normality were not required as a precondition for the analysis. With regard to missing data, Mplus uses pairwise-present information when estimating thresholds and polychoric correlations. Accordingly, each item pair is estimated using the available responses for that specific pair, rather than through listwise deletion. In the present study, item covariance coverage exceeded 0.90 in all instances, indicating excellent coverage. The six-factor structure was specified a priori based on the SD-R theory and the themes identified during the scale development process (Mostert et al., 2023). The model was therefore tested confirmatorily rather than derived through exploratory factor analysis, and no factor-extraction or rotation procedures were applied. The hypothesised model was estimated using the full sample, and item retention was guided by both the theoretical alignment of each item with its intended latent factor and the magnitude of its standardised factor loading.

Measurement invariance was also examined for home-language and campus groups. The present study examined different models, including configural invariance, metric invariance, and strong invariance (Van de Schoot et al., 2012). The suitability of these models was evaluated using TLI, CFI, RMSEA, and SRMR. An acceptable threshold for the TLI value was higher than 0.90, and the CFI value was above 0.90. Values exceeding 0.95 were considered superior (Van de Schoot et al., 2012). Similarly, an RMSEA value below 0.08 was considered acceptable; values below 0.05 were preferred (MacCallum et al., 1996; Van de Schoot et al., 2012). To maintain uniformity in measurement, any alterations in Δ CFI resulting from the configural model should not surpass 0.01 (Chen, 2007; Cheung & Rensvold, 2002). In addition, Δ RMSEA should be less than 0.015, and Δ SRMR should be less than 0.030 (Chen, 2007). To achieve strong invariance, changes of less than 0.010 in CFI, 0.015 in RMSEA, and 0.010 in SRMR were used as decision criteria (Chen, 2007).

Measurement invariance was examined across the four prespecified home-language groups and the three campus groups, as the Student Resources Measure is intended for use within South Africa's multilingual, multi-campus higher education context. Meaningful cross-group comparisons require evidence that the instrument operates equivalently across groups and that observed differences are not attributable to measurement bias. Following established guidelines (Van de Schoot et al., 2012), invariance was tested sequentially by evaluating increasingly restrictive models. Configural invariance was used to establish whether the same factor structure held across groups, metric invariance examined whether factor loadings were equivalent, and strong invariance assessed the equivalence of item intercepts. Establishing these levels of invariance supports increasingly robust inferences, including comparisons of associations between constructs and, where strong invariance is supported, comparisons of latent means across groups.

In addition, an evaluation of item bias, encompassing uniform, total, and non-uniform bias, was performed among different home-language subgroups (Afrikaans, English, Setswana, and Sesotho) and three campuses. The 'lordif' package in RStudio was employed to conduct a comparative analysis of various models using ordinal logistic regression (Choi et al., 2011). Ordinal logistic regression was used to calculate three likelihood-ratio χ^2 statistics. The statistics were calculated using specialised methods to compare several models and evaluate uniform and non-uniform bias (Choi et al., 2011). This constitutes an item-level DIF analysis: each item is tested individually, conditional on the latent trait (the matching total score), for uniform and non-uniform bias, with McFadden's pseudo R^2 as the effect-size index (Zumbo, 1999). Ordinal logistic regression DIF is a well-established item-level alternative to IRT/Rasch-based DIF that yields comparable item-level evidence while accommodating ordinal data without requiring the strict assumptions of a Rasch model.

Model 0: $\text{logitP}(u_i \geq \kappa) = \alpha_k$

Model 1: $\text{logitP}(u_i \geq \kappa) = \alpha_k + \beta_1 * \text{ability}$

Model 2: $\text{logitP}(u_i \geq \kappa) = \alpha_k + \beta_1 * \text{ability} + \beta_2 * \text{group}$

Model 3: $\text{logitP}(u_i \geq \kappa) = \alpha_k + \beta_1 * \text{ability} + \beta_2 * \text{group} + \beta_3 * \text{ability} * \text{group}$

Bias was detected by assessing the statistical significance ($p < 0.01$) of the logistic likelihood values (χ^2) of the model. The McFadden pseudo R^2 statistic was used to assess the magnitude of DIF. The resulting values were categorised as negligible if they were less than 0.13, moderate between 0.13 to 0.26, and large if they exceeded 0.26 (Zumbo, 1999). Furthermore, it was necessary to assess uniform DIF by applying a 10% significance threshold. Internal consistency was assessed using Cronbach's alpha coefficient (α) and McDonald's omega coefficient (ω). Cronbach's alpha coefficients above 0.70 are deemed good (Nunnally & Bernstein, 1994), whereas omega values beyond 0.80 are regarded as satisfactory (Kalkbrenner, 2024).

Results

Factorial validity

Hypothesis 1 proposed a six-factor structure for the Student Resources Measure comprising support from family, support from friends, support from lecturers, growth and learning opportunities, information and communication and structural support. The model's goodness of fit was assessed using confirmatory factor analysis (CFA). The fit statistics for the measure are presented in Table 1.

As presented in Table 1, the six-factor structure of the measure demonstrated a good fit with the data ($\chi^2 = 10,590.86$; $df = 1112$; CFI = 0.96; TLI = 0.96; RMSEA = 0.06 [0.06, 0.06]; SRMR = 0.06), especially when compared to the one-factor model ($\chi^2 = 70,873.57$; $df = 1176$; CFI = 0.71; TLI = 0.69; RMSEA = 0.16 [0.16, 0.16]; SRMR = 0.23). As a result, these findings support Hypothesis 1.

Table 2 presents the standardised factor loadings for the items of the latent variables in the Student Resources Measure.

According to Hair et al. (2015), factor loadings (λ) can be categorised into three levels: high (>0.70), medium (>0.50), or small (>0.30). This study's findings indicate that the factor loadings ranged from small to high.

The estimated correlation matrix for the latent variables is presented in Table 3.

The effect sizes of all the relationships in the study were categorised as small ($r \geq 0.10$), medium ($r \geq 0.30$), or large ($r \geq 0.50$; Cohen, 1992). The correlations between the factors ranged from small to large. Collectively, these findings provide support for both the convergent and discriminant validity of the measure. Convergent validity was evidenced by the statistically significant standardised factor loadings of the items on their hypothesised latent factors (Table 2). Discriminant validity was supported by the substantially better fit of the six-factor model compared with the one-factor model (Table 1), as well as by inter-factor correlations that did not approach unity (Table 3). These results suggest that the student resources factors are theoretically related, yet empirically distinguishable dimensions of the broader study-related resources and student-life resources construct.

Measurement invariance

Hypotheses 2, 3, and 4 proposed that the Student Resources Measure would demonstrate configural, metric and strong invariance across home-language and campus groups. Table 4 shows the measurement invariance across these home-languages and campus groups.

As shown in Table 4, the configural, metric, and strong-invariance models demonstrated acceptable fit across the home-language and campus groups, with CFI and TLI values ranging from 0.96 to 0.97. Changes in CFI and RMSEA remained within the prespecified criteria ($\Delta\text{CFI} < 0.010$; $\Delta\text{RMSEA} < 0.015$; Chen, 2007). These results supported Hypotheses 2, 3, and 4 and provided evidence of strong invariance across the tested groups.

Item bias

Subsequently, Hypothesis 5 proposed that the Student Resources Measure would show negligible item bias across home-language and campus subgroups. DIF analyses were conducted to evaluate the presence of uniform, total, and non-uniform bias. The data presented in Table 5 indicated

that bias was detected across all factors. It specifically delineates the uniform, total, and non-uniform biases, along with their respective effect sizes.

Uniform and total bias were found in four items (items 6, 7, 10, and 11) measuring support from family, one item (item 3) measuring support from friends, two items (items 1 and 10) measuring information and communication, and six items (item 1, 3, 4, 5, 10, and 11) measuring structural support ($p < 0.01$ for χ^2_{12} and χ^2_{13}). In addition, uniform, total, and non-uniform bias was detected in the home-language groups: one item (item 6) measuring support from friends; three items (items 1, 4, and 5) measuring support from lecturers; two items (items 2 and 3) measuring growth and learning opportunities; one item (item 2) measuring information and communication; and one item (item 2) measuring structural support. Total and non-uniform bias were detected for item 9 in the information and communication factor, and for one item (item 1) in the growth and learning opportunities factor, which indicated uniform bias. However, despite the results from Table 5, the practical significance of these findings is considered negligible, as indicated by pseudo-McFadden R^2 values less than 0.13 and $\Delta\beta 1$ coefficients below 0.1 (10%) (Choi et al., 2011; Crane et al., 2007).

The results of the differential item functioning analysis based on the campus group are presented in Table 6.

As indicated in Table 6, bias was detected in four items (items 6, 7, 9, and 10) measuring support from family, one item (item 4) measuring support from lecturers, one item (item 3) measuring growth and learning opportunities, two items (items 1 and 7) measuring information and communication, and six items (items 1, 2, 5, 6, 10, and 11) measuring structural support, indicating uniform and total bias for these items ($p < 0.01$ for χ^2_{12u} and χ^2_{13}). Total and non-uniform bias was also detected in one item (item 7) measuring support from friends. Furthermore, bias was detected within the campus groups: one item (item 5) measuring support from lecturers, one (item 4) measuring information and communication, and two items (items 4 and 7) measuring structural support, showing uniform, total, and non-uniform bias derived from the likelihood ratio χ^2 difference testing among models 1, 2, and 3 ($p < 0.01$). Nevertheless, the results in Table 6 indicate that the impact of these effects was also negligible, as indicated

Table 1. Confirmatory factor analysis

Model	χ^2	df	CFI	TLI	RMSEA [90% CI]	SRMR
Overall						
One-factor CFA	70,873.57	1176	0.71	0.69	0.16 [0.16, 0.16]	0.23
Six-factor CFA	10,590.86	1112	0.96	0.96	0.06 [0.06, 0.06]	0.06
Home language						
One-factor CFA	44,519.92	5286	0.77	0.78	0.14 [0.14, 0.14]	0.22
Six-factor CFA	11,038.44	5196	0.97	0.97	0.05 [0.05, 0.05]	0.07
Campus						
One-factor CFA	68,330.58	3916	0.72	0.74	0.14 [0.14, 0.14]	0.23
Six-factor CFA	7073.38	2471	0.96	0.97	0.05 [0.05, 0.05]	0.06

Note. χ^2 , chi-squared; df , degrees of freedom; CFI, comparative fit index; TLI, tucker-lewis index; RMSEA, root mean square error of approximation; CI, confidence interval; SRMR, standardised root mean squared residual.

Table 2. Standardised factor loadings

Factor	Item	Loading	SE	<i>p</i>
Support from family	1	0.86	0.01	<0.001
	2	0.88	0.01	<0.001
	3	0.82	0.01	<0.001
	4	0.87	0.01	<0.001
	5	0.92	0.01	<0.001
	6	0.87	0.01	<0.001
	7	0.60	0.02	<0.001
	8	0.81	0.01	<0.001
	9	0.91	0.01	<0.001
	10	0.85	0.01	<0.001
	11	0.83	0.01	<0.001
Support from friends	1	0.89	0.01	<0.001
	2	0.94	0.00	<0.001
	3	0.92	0.00	<0.001
	4	0.91	0.00	<0.001
	5	0.95	0.00	<0.001
	6	0.91	0.00	<0.001
	7	0.89	0.01	<0.001
	8	0.94	0.00	<0.001
Support from lecturers	1	0.77	0.01	<0.001
	2	0.89	0.01	<0.001
	3	0.90	0.01	<0.001
	4	0.76	0.01	<0.001
	5	0.76	0.02	<0.001
Growth and learning opportunities	1	0.86	0.01	<0.001
	2	0.90	0.01	<0.001
	3	0.88	0.01	<0.001
	4	0.92	0.01	<0.001
Information and communication	1	0.90	0.01	<0.001
	2	0.91	0.01	<0.001
	3	0.83	0.01	<0.001
	4	0.82	0.01	<0.001
	5	0.83	0.01	<0.001
	6	0.75	0.01	<0.001
	7	0.76	0.01	<0.001
	8	0.76	0.01	<0.001
	9	0.68	0.01	<0.001
	10	0.81	0.01	<0.001
Structural support	1	0.60	0.02	<0.001
	2	0.58	0.02	<0.001
	3	0.72	0.01	<0.001
	4	0.87	0.01	<0.001
	5	0.48	0.02	<0.001
	6	0.66	0.02	<0.001
	7	0.75	0.01	<0.001
	8	0.81	0.01	<0.001
	9	0.82	0.01	<0.001
	10	0.89	0.01	<0.001
	11	0.69	0.01	<0.001

Note. All *p*-values < 0.001; SE, standard error.

by the pseudo-McFadden R^2 values below 0.13 and $\Delta\beta 1$ coefficients below 0.1 (10%) (Crane et al., 2007; Zumbo, 1999), supporting Hypothesis 5.

Reliability

As proposed by Hypothesis 6, the Student Resources Measure would demonstrate satisfactory internal consistency

Table 3. Estimated correlation matrix

Factor	1	2	3	4	5	6
1. Support from family	1.00					
2. Support from friends	0.33	1.00				
3. Support from lecturers	0.25	0.26	1.00			
4. Growth and learning opportunities	0.25	0.28	0.56	1.00		
5. Information and communication	0.20	0.23	0.66	0.65	1.00	
6. Structural support	0.22	0.18	0.57	0.54	0.73	1.00

Note. Values ≥ 0.100 = small effect; Values ≥ 0.300 = medium effect; Values ≥ 0.500 = large effect.

Table 4. Measurement invariance across home-language and campus groups

Language	χ^2	<i>df</i>	CFI	TLI	RMSEA	CM	Δ CFI	Δ TLI	Δ RMSEA
M1: Configural	8849.77	4448	0.97	0.97	0.05 [0.05, 0.05]	–			
M2: Metric	8874.45	4577	0.97	0.97	0.05 [0.05, 0.05]	M1	0.00	0.00	0.00
M3: Strong	9591.60	5000	0.97	0.97	0.05 [0.05, 0.05]	M2	0.00	0.000	0.00
Campus	χ^2	<i>df</i>	CFI	TLI	RMSEA	CM	Δ CFI	Δ TLI	Δ RMSEA
N1: Configural	6726.14	2175	0.97	0.96	0.05 [0.05, 0.05]	–			
N2: Metric	6838.51	2243	0.96	0.96	0.05 [0.05, 0.05]	N1	0.00	0.00	0.00
N3: Strong	7073.39	2471	0.96	0.97	0.05 [0.05, 0.05]	N2	0.00	0.00	0.00

Note. χ^2 = chi-squared; *df* = degrees of freedom; CFI = comparative fit index; TLI, tucker-lewis index; RMSEA, root mean square error of approximation; CM = comparison model; Δ CFI = delta (change in) CFI; Δ TLI = delta (change in) TLI; Δ RMSEA = delta (change in) RMSEA.

as indicated by Cronbach's alpha values above 0.70, and McDonald's omega values greater than 0.80. Table 7 presents the internal consistency of the measure.

Across the six subscales, Cronbach's alpha ranged from 0.86 to 0.97 and McDonald's omega ranged from 0.87 to 0.97 (Table 7). The lowest estimates were obtained for support from lecturers ($\alpha = 0.86$; $\omega = 0.87$), while the highest were obtained for support from friends ($\alpha = 0.97$; $\omega = 0.97$). All coefficients exceeded the prespecified thresholds of 0.70 for alpha and 0.80 for omega (Kline, 2016); therefore, Hypothesis 6 was supported.

Discussion

This study evaluated evidence concerning the internal psychometric quality of the Student Resources Measure, which was designed to assess resources available to university students in South Africa. The analyses examined internal structure, measurement invariance across the tested groups, differential item functioning, and internal consistency. Overall, the findings provide preliminary evidence based on the measure's internal structure, reliability, and comparability across the tested home-language and campus groups. Further research is required to establish its criterion-related, predictive, longitudinal, and cross-institutional validity. Confirmatory factor analysis supported the hypothesised six-factor structure of the measure, comprising support from family, support from friends, support from lecturers, growth and learning opportunities, information and communication, and structural support. This finding underscores the complex and multifaceted nature of students' study-related

resources and student-life resources, indicating that students utilise various distinct yet interconnected forms of support as they navigate their university experience. The six-factor structure further enhances the operationalisation of the resources component within the SD-R theory by illustrating that student resources encompass not only study-related resources but also a wider range of student-life resources (Bakker & Mostert, 2024). Lecturer support, information and communication, and growth and learning opportunities are integral components of the academic environment (Cilliers et al., 2018; Mokgele & Rothmann, 2014; Van Zyl et al., 2024). In contrast, family support, friend support, and structural support represent broader contextual factors that facilitate meaningful student engagement in higher education.

These findings are important because prior research has frequently evaluated a more limited spectrum of resources, including lecturer support, peer support, autonomy, information availability, and developmental opportunities, while some studies have also included relational resources such as support from family and friends (Cilliers et al., 2018; Lesener et al., 2020; Mokgele & Rothmann, 2014; Van Zyl et al., 2024). While the resources measured in existing studies hold theoretical and practical value for SD-R research, they may not fully capture the range of support that students require across various higher education settings. The present findings, therefore, extend SD-R scholarship by offering a more comprehensive, student-informed operationalisation of resources. In particular, the inclusion of family support, friend support, and structural support highlights that students' ability to engage in effective study practices is

Table 5. Differential item functioning across home-language groups

Group	Item	$\chi^2_{12}u$	$\chi^2_{13}t$	$\chi^2_{23}n$	$\Delta\beta_1$	R^2_{12}	R^2_{13}	R^2_{23}
Support from family	Item 1	0.2289	0.3089	0.422	0.0019	0.0012	0.0019	0.0008
	Item 2	0.9345	0.9430	0.729	0.0006	0.0001	0.0005	0.0004
	Item 3	0.1658	0.3096	0.564	0.0066	0.0011	0.0015	0.0004
	Item 4	0.1507	0.2329	0.429	0.0064	0.0015	0.0023	0.0008
	Item 5	0.8158	0.8069	0.557	0.0029	0.0002	0.0008	0.0005
	Item 6	0.0001	0.0003	0.393	0.0339	0.0072	0.0082	0.0010
	Item 7	0.0000	0.0000	0.682	0.0073	0.0173	0.0176	0.0003
	Item 8	0.2944	0.4127	0.497	0.0010	0.0007	0.0012	0.0005
	Item 9	0.0413	0.0749	0.358	0.0001	0.0021	0.0030	0.0008
	Item 10	0.0000	0.0000	0.041	0.0538	0.0141	0.0171	0.0029
	Item 11	0.0008	0.0010	0.137	0.0010	0.0035	0.0047	0.0012
Support from friends	Item 1	0.131	0.118	0.2105	0.0117	0.0012	0.0021	0.0009
	Item 2	0.257	0.237	0.2650	0.0077	0.0008	0.0016	0.0008
	Item 3	0.000	0.000	0.1161	0.0347	0.0061	0.0072	0.0012
	Item 4	0.256	0.578	0.8769	0.0023	0.0008	0.0009	0.0001
	Item 5	0.153	0.296	0.5722	0.0025	0.0010	0.0014	0.0004
	Item 6	0.000	0.000	0.0036	0.0029	0.0150	0.0177	0.0027
	Item 7	0.938	0.959	0.7786	0.0015	0.0001	0.0003	0.0002
	Item 8	0.322	0.649	0.8698	0.0019	0.0007	0.0008	0.0001
Support from lecturers	Item 1	0.0000	0.000	0.0002	0.0093	0.0168	0.0227	0.0059
	Item 2	0.3947	0.382	0.3341	0.0019	0.0006	0.0014	0.0007
	Item 3	0.5206	0.726	0.7107	0.0023	0.0005	0.0008	0.0003
	Item 4	0.0002	0.000	0.0036	0.0135	0.0042	0.0070	0.0029
	Item 5	0.0000	0.000	0.0000	0.0037	0.0115	0.0183	0.0067
Growth and learning opportunities	Item 1	0.0062	0.0232	0.5176	0.0218	0.0037	0.0044	0.0007
	Item 2	0.0058	0.0001	0.0018	0.0217	0.0047	0.0104	0.0057
	Item 3	0.0002	0.0000	0.0051	0.0059	0.0068	0.0111	0.0043
	Item 4	0.3157	0.1149	0.0821	0.0021	0.0011	0.0032	0.0021
Information and communication	Item 1	0.0000	0.0000	0.0881	0.0129	0.0160	0.0174	0.0014
	Item 2	0.0000	0.0000	0.0019	0.0135	0.0163	0.0198	0.0035
	Item 3	0.5404	0.4013	0.2571	0.0015	0.0005	0.0015	0.0010
	Item 4	0.0601	0.0597	0.1950	0.0001	0.0019	0.0030	0.0012
	Item 5	0.6520	0.3729	0.1843	0.0044	0.0004	0.0014	0.0011
	Item 6	0.2145	0.1287	0.1429	0.0013	0.0010	0.0023	0.0012
	Item 7	0.1850	0.2992	0.4910	0.0124	0.0015	0.0022	0.0007
	Item 8	0.3022	0.4068	0.4752	0.0006	0.0008	0.0013	0.0005
	Item 9	0.0266	0.0000	0.0001	0.0131	0.0019	0.0060	0.0041
	Item 10	0.0000	0.0000	0.8228	0.0090	0.0082	0.0084	0.0002
Structural support	Item 1	0.0013	0.0013	0.1102	0.0220	0.0037	0.0051	0.0014
	Item 2	0.0035	0.0000	0.0000	0.0011	0.0029	0.0110	0.0081
	Item 3	0.0001	0.0008	0.8998	0.0408	0.0061	0.0063	0.0002
	Item 4	0.0000	0.0000	0.0729	0.0105	0.0339	0.0362	0.0023
	Item 5	0.0000	0.0000	0.4198	0.1630	0.0346	0.0353	0.0007
	Item 6	0.1134	0.0313	0.0484	0.0066	0.0017	0.0040	0.0023
	Item 7	0.3147	0.2888	0.2824	0.0073	0.0011	0.0022	0.0012
	Item 8	0.7194	0.7281	0.5168	0.0016	0.0004	0.0009	0.0006
	Item 9	0.2848	0.6753	0.9747	0.0089	0.0010	0.0010	0.0001
	Item 10	0.0000	0.0000	0.0853	0.0066	0.0247	0.0267	0.0019
	Item 11	0.0000	0.0000	0.2021	0.0128	0.0171	0.0182	0.0011

Note: Bold values indicate statistically significant likelihood-ratio model comparisons ($p < 0.01$). χ^2_{12} , chi-square of model 1 compared to model 2; χ^2_{13} , chi-squared of model 1 compared to model 3; χ^2_{23} , chi-square of model 2 compared to model 3; β_1 , change in beta coefficient; R^2_{12} , pseudo-Mcfadden R^2 of model 1 compared to model 2; R^2_{13} , pseudo-Mcfadden R^2 of model 1 compared to model 3; R^2_{23} , pseudo-Mcfadden R^2 of model 2 compared to model 3. u , uniform bias; t , total bias; n , non-uniform bias.

Table 6. Differential item functioning across campus groups

Group	Item	$\chi^2_{12}u$	$\chi^2_{13}t$	$\chi^2_{23}n$	$\Delta\beta_1$	R^2_{12}	R^2_{13}	R^2_{23}
Support from family	Item 1	0.1066	0.1788	0.4047	0.0002	0.0007	0.0010	0.0003
	Item 2	0.8130	0.3090	0.1119	0.0005	0.0001	0.0008	0.0008
	Item 3	0.9334	0.9206	0.6739	0.0001	0.0000	0.0001	0.0001
	Item 4	0.2601	0.6058	0.9871	0.0032	0.0005	0.0005	<0.0001
	Item 5	0.2198	0.5507	0.9934	0.0026	0.0005	0.0005	<0.0001
	Item 6	0.0000	0.0000	0.0896	0.0134	0.0043	0.0053	0.001
	Item 7	0.0048	0.0042	0.1029	0.0022	0.0015	0.0021	0.0006
	Item 8	0.2670	0.5241	0.7542	0.0005	0.0003	0.0004	0.0001
	Item 9	0.0006	0.0020	0.3461	0.0065	0.0025	0.0028	0.0004
	Item 10	0.0003	0.0004	0.1043	0.0134	0.0033	0.0043	0.0009
	Item 11	0.1006	0.2437	0.6496	0.0000	0.0006	0.0007	0.0001
Support from friends	Item 1	0.1184	0.0641	0.0994	0.0038	0.0006	0.0012	0.0006
	Item 2	0.0975	0.1786	0.4418	0.0035	0.0006	0.0008	0.0002
	Item 3	0.3533	0.7081	0.9659	0.0028	0.0003	0.0003	0.0000
	Item 4	0.3109	0.6026	0.8184	0.0009	0.0003	0.0004	0.0001
	Item 5	0.8892	0.7273	0.4043	0.0005	<0.0001	0.0003	0.0002
	Item 6	0.0233	0.0219	0.1396	0.0020	0.001	0.0015	0.0005
	Item 7	0.4594	0.0028	0.0007	0.0000	0.0002	0.0021	0.0019
	Item 8	0.7145	0.6605	0.4190	0.0003	0.0001	0.0003	0.0002
Support from lecturers	Item 1	0.3310	0.0728	0.0416	0.0001	0.0004	0.0016	0.0012
	Item 2	0.6618	0.2279	0.0902	0.0003	0.0001	0.0008	0.0007
	Item 3	0.6880	0.7790	0.6016	0.0003	0.0001	0.0002	0.0001
	Item 4	0.0003	0.0002	0.0780	0.0072	0.0023	0.0030	0.0007
	Item 5	0.0000	0.0000	0.0000	0.0032	0.0043	0.0107	0.0064
Growth and learning opportunities	Item 1	0.0346	0.0872	0.498	0.0077	0.0014	0.0017	0.0003
	Item 2	0.0933	0.0828	0.173	0.0066	0.0012	0.0021	0.0009
	Item 3	0.0002	0.0010	0.527	0.0078	0.0037	0.0040	0.0003
	Item 4	0.1343	0.1242	0.200	0.0022	0.0009	0.0016	<0.0001
Information and communication	Item 1	0.0000	0.0000	0.9672	0.0084	0.0063	0.0063	0.0000
	Item 2	0.0730	0.0700	0.1800	0.0000	0.0008	0.0013	0.0005
	Item 3	0.6956	0.8687	0.7670	0.0001	0.0001	0.0002	0.0001
	Item 4	0.0000	0.0000	0.0000	0.0068	0.0056	0.0094	0.0038
	Item 5	0.3113	0.4417	0.4940	0.0020	0.0004	0.0006	0.0002
	Item 6	0.3607	0.2242	0.1618	0.0007	0.0003	0.0009	0.0006
	Item 7	0.0015	0.0073	0.6213	0.0064	0.0024	0.0026	0.0002
	Item 8	0.1561	0.0724	0.0877	0.0025	0.0005	0.0012	0.0007
	Item 9	0.2017	0.3615	0.5650	0.0000	0.0004	0.0006	0.0002
	Item 10	0.6434	0.6790	0.4897	0.0010	0.0001	0.0004	0.0002
Structural support	Item 1	0.0000	0.0000	0.2416	0.0138	0.0129	0.0133	0.0004
	Item 2	0.0000	0.0000	0.3985	0.0014	0.0142	0.0145	0.0003
	Item 3	0.1433	0.0655	0.0844	0.0033	0.0007	0.0016	0.0009
	Item 4	0.0000	0.0000	0.0001	0.0016	0.0086	0.0128	0.0042
	Item 5	0.0000	0.0001	0.7517	0.0095	0.0039	0.0040	0.0001
	Item 6	0.0000	0.0000	0.9754	0.0357	0.0342	0.0343	0.0000
	Item 7	0.0092	0.0004	0.0044	0.0022	0.0019	0.0041	0.0022
	Item 8	0.1414	0.0571	0.0723	0.0025	0.0007	0.0017	0.0010
	Item 9	0.1752	0.2714	0.4326	0.0038	0.0006	0.0009	0.0003
	Item 10	0.0000	0.0000	0.0100	0.0030	0.0096	0.0115	0.0019
	Item 11	0.0006	0.0009	0.1423	0.0042	0.0023	0.0029	0.0006

Note. Values are indicated in bold text when the log-likelihood values of models are compared and statistically significant differences are detected ($p < 0.01$). χ^2_{12} , chi-square of model 1 compared to model 2; χ^2_{13} , chi-squared of model 1 compared to model 3; χ^2_{23} , chi-square of model 2 compared to model 3; β_1 , change in beta coefficient; R^2_{12} , pseudo-McFadden R^2 of model 1 compared to model 2; R^2_{13} , pseudo-McFadden R^2 of model 1 compared to model 3; R^2_{23} , pseudo-McFadden R^2 of model 2 compared to model 3. u , uniform bias; t , total bias; n , non-uniform bias.

Table 7. Internal consistency reliability by subscale

Factor	Cronbach's alpha	McDonald's omega
Support from family	0.93	0.94
Support from friends	0.97	0.97
Support from lecturers	0.86	0.87
Growth and learning opportunities	0.88	0.89
Information and communication	0.92	0.92
Structural support	0.87	0.87

influenced not solely by formal academic resources but also by the relational and structural contexts that shape their educational experiences.

The findings further provide initial support for the relevance of the Student Resources Measure in a multilingual, multi-campus South African higher education context. The analysis revealed configural, metric, and strong invariance across home-language and campus groups, suggesting that the factor structure, factor loadings, and item intercepts were adequately equivalent among these groups (Van de Schoot et al., 2012). Demonstrating measurement invariance is essential, as valid group comparisons require that the measure function consistently across groups. In the absence of such evidence, the observed disparities may reflect measurement artifacts rather than significant variations in students' resource experiences. The findings thus offer preliminary evidence for contrasting student resources between the home-language and campus groups analysed in this research.

DIF analyses revealed that certain items exhibited statistically significant item bias when comparing different home-language and campus groups. Nevertheless, the practical implications of these effects were minimal, as evidenced by the pseudo-McFadden R^2 values and beta-change coefficients. These findings should be interpreted as preliminary evidence that the Student Resources Measure can be used fairly across the tested groups, rather than as evidence that all items are completely free from bias. This distinction is particularly relevant in the South African context, characterised by differences in students' home-language backgrounds, socio-economic conditions, campus locations, and levels of access to institutional support (Versfeld et al., 2025).

The internal consistency results supported the reliability of the six Student Resources Measure subscales in this sample. Cronbach's alpha ranged from 0.86 to 0.97, and McDonald's omega ranged from 0.87 to 0.97 across the six subscales (Table 7). These coefficients provide evidence of internal consistency; they do not by themselves establish temporal stability or other forms of reliability.

Theoretical contribution

This study contributes to the resources component of SD-R theory by providing a multidimensional, contextually grounded operationalisation of student resources that includes both study-related and student-life resources. The findings indicate that student resources need not be conceptualised solely as formal academic supports; they may also include relational and structural conditions that enable students to participate in and engage with their

studies (Bakker & Mostert, 2024). Because the present study examined the measure's internal psychometric properties rather than structural relationships with student outcomes, it does not directly test the motivational or health-impairment processes proposed by SD-R theory. Instead, the Student Resources Measure provides a measurement foundation for future research examining how different resource dimensions relate to engagement, well-being, persistence, and academic success across higher education contexts.

Implications for practice

The Student Resources Measure may assist higher education institutions in describing students' perceived access to academic, relational, and structural resources and in identifying areas that may warrant further investigation. In contexts similar to the one examined, aggregated findings could inform student support services, academic development units, faculty leadership, and institutional planning. For instance, the findings could help pinpoint key areas of focus related to lecturer support, communication, opportunities for growth and learning, or structural barriers. Given that the current evidence is derived from a single institution, the measure should not be used for consequential group comparisons or decision-making without local validation, careful examination of item-level DIF, and evaluation of contextual evidence.

Limitations and recommendations

While the research offers significant insights into the Student Resources Measure, it has several limitations. The research was conducted at a single South African higher education institution spanning three campuses. Notwithstanding the substantial sample size and the inclusion of various home-language and campus groups, the results should not be generalised to all South African or global higher education settings without further validation. Subsequent research ought to assess the measure across various institutions, regions, nations, and types of higher education institutions.

Measurement invariance and differential item functioning were analysed solely within specific home-language and campus groups. These groups were relevant to the institutional framework and aims of the research, yet they failed to represent the full diversity of South African higher education. Subsequent investigations ought to assess the measure among additional pertinent demographics, including gender, academic department, year of enrolment, mode of study, and socio-economic status, contingent upon adequate

sample sizes. Furthermore, subsequent studies should aim to investigate whether the same factor structure and item performance are preserved across distance-learning, hybrid-learning, and in-person settings. The significance of specific resources may vary across these situations, and their availability may hinge on the programme's structure and delivery method. Due to the presence of DIF on several items in the current sample, their performance must be assessed in alternative student cohorts before making robust cross-group comparisons (He & van de Vijver, 2012).

The study focused on the internal psychometric properties of the Student Resources Measure. It did not assess criterion-related validity (e.g., predictive validity), test-retest reliability, or longitudinal measurement invariance. Future research should investigate how the six dimensions of student resources influence both the motivational and health-impairment processes of SD-R theory by analysing their correlations with essential student outcomes, including study engagement, burnout, well-being, academic performance, and dropout intentions (Bakker & Mostert, 2024). Furthermore, the study did not estimate a structural path model linking student resources to student outcomes. This aligned with the study's primary aim: to validate the measure. Future research can use the measure in broader SD-R models to test relationships between student resources and student outcomes. Finally, the study ultimately relied on self-reported data obtained via an online questionnaire. Self-report methods are suitable for evaluating students' perceptions of available resources; however, they may be affected by response bias or survey fatigue. Future research may integrate the Student Resources Measure with qualitative methodologies, institutional data, or longitudinal designs to enhance comprehension of students' experiences and utilisation of student resources across time. The present study retained the original student-informed items; future research could also use cognitive interviewing and item-level analyses to examine how students interpret items and whether a common never-to-always response scale functions consistently across all six dimensions.

Conclusion

The study evaluated evidence concerning the internal psychometric quality of the Student Resources Measure among university students at a South African higher education institution. The findings supported the proposed six-factor structure and the internal consistency of the six subscales, as well as measurement comparability across the tested home-language and campus groups. Although statistically significant DIF was detected for some items, the practical effects were negligible. The measure therefore provides a preliminary measurement foundation for assessing student resources in the context examined. Further validation across institutions, populations, home-language contexts, and external outcomes is required before broader claims about validity or fair use can be made.

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Availability of Data and Materials: Data were collected at the North-West University. Derived data supporting the findings of this study are available from the corresponding author, Karina Mostert, on request.

Ethics Approval: Ethical clearance and permission to conduct the research were obtained at the North-West University (Ethics number: NWU-HS-2014-0165). Participants received detailed information about the study; participation was voluntary, and informed consent was obtained. Confidentiality and anonymity were safeguarded at all times.

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

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