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Scale Development and Investigation of Faculty Self-Efficacy at Isabela State University

Judith E. Daracan

Isabela State University, Angadanan Campus, Angadanan, Isabela, Philippines
E-mail: judithdaracan9@gmail.com

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ABSTRACT Universities expect faculty to perform effectively in teaching, research, leadership, service, and technology integration; however, no comprehensive instrument currently measures faculty self-efficacy across these domains. This study developed and validated a Faculty Self-Efficacy Scale for higher education. An initial 80-item pool was reviewed by six experts and demonstrated excellent content validity. A cross-sectional survey involving 238 faculty members from a Philippine multi-college university was conducted. Exploratory factor analysis supported a 28-item, four-factor structure explaining 78.93 percent of the variance: Professional Competence and Institutional Engagement, Adaptive Leadership and Technology Integration, Instructional Assessment and Alignment, and Stress Management. All subscales and the overall instrument showed excellent reliability (α = .928–.952). Findings indicate that the scale is a concise and reliable multidomain measure that can support faculty evaluation and professional development initiatives. Future studies should confirm the factor structure and examine predictive validity across academic contexts.

INTRODUCTION

Universities now expect faculty to excel across a broad set of roles, including teaching, research, service, leadership, and the meaningful use of digital technologies while maintaining professional growth and well-being. Effective performance in these roles requires not only domain knowledge but also confidence in one's ability to organise and execute complex academic tasks. Self-efficacy reflects these beliefs about capability and serves as a psychological basis for effort, persistence, and resilience in challenging work environments (Bandura 1997). In higher education, emerging research indicates that faculty self-efficacy positively influences instructional innovation, adaptation to digital tools, and professional engagement (Rabbianty et al. 2024; Sahin Kölemen 2023). For example, perceptions of competence in using technology for instructional purposes have been shown to support pedagogical practice and enhance faculty engagement in online and blended learning environments (Rabbianty et al. 2024).

Although studies exist on discrete domains of self-efficacy such as teaching or research, few instruments provide a comprehensive assessment that reflects the full scope of faculty roles in contemporary universities. Investigations have developed brief, valid self-efficacy scales for university professors that show measurement invariance across demographic groups (Lingán Huamán et al. 2023). However, existing tools remain limited in capturing multidomain faculty work encompassing assessment design, leadership roles, and stress management alongside traditional academic functions.

Furthermore, self-efficacy plays a significant role in faculty well-being and professional outcomes. Recent evidence suggests that positive institutional climates and supportive environments enhance faculty self-efficacy, which in turn supports mental health and job satisfaction (Martincová et al. 2025). Faculty with higher self-efficacy are more likely to engage in innovative teaching practices and navigate institutional challenges effectively, contributing to both individual career growth and broader organizational performance.

Guided by social cognitive theory, which emphasises that self-efficacy is specific to tasks and context, the researchers conceptualise faculty self-efficacy as multidimensional rather than unitary. Drawing from literature and academic practice, the researchers identify salient domains including instructional assessment, research performance, service and engagement, professional development, leadership, and student engagement. Because these roles often overlap in practice-particularly around technology use and adaptive leadership-the researchers anticipate that some conceptual domains will cohere into fewer latent factors when examined empirically.

Methodologically, robust scale development requires transparent reporting and rigorous validation. Many existing measures rely on limited retention criteria, leading to unstable factor structures and limited generalizability. Best practice in instrument development calls for theory driven item generation, expert validation, and exploratory factor analysis with clear criteria for factor retention and cross loadings. This study addresses these conceptual and methodological gaps by developing and providing initial evidence for a comprehensive faculty self-efficacy instrument tailored to higher education settings.

METHODOLOGY

The study employed a cross-sectional, instrument-development design using exploratory factor analysis (EFA) to examine the latent structure of a faculty self-efficacy measure and guide item reduction. All analytic decisions followed psychometric best practices emphasising simple structure, interpretability, and parsimony (Fabrigar et al. 1999; Worthington and Whittaker 2006; Hair et al. 2019).

A random sample of 238 faculty members from various colleges of Isabela State University participated, including 100 males and 139 females, representing disciplines such as Education, Criminology, ICT, Agriculture, Hospitality Management, Accountancy, Forestry, Fisheries, Arts and Social Sciences, and others. Participation was voluntary and anonymous, and informed consent was obtained. The sample size met conventional guidelines for EFA (MacCallum et al. 1999; Mundfrom et al. 2005).

An initial pool of 80 items was developed based on self-efficacy theory (Bandura 1997) and six conceptual domains of teaching, research, service/extension, professional development/collegiality, administrative/leadership, and student engagement. Items were first-person capability statements rated on a Likert-type scale. Content validity was confirmed by six experts, and minor refinements were applied to enhance clarity and remove redundancy (Polit et al. 2007).

Data were screened for missing values, outliers, and distributional issues. Factorability was confirmed with KMO and Bartlett's tests, and Principal Axis Factoring with Varimax rotation was conducted to extract factors, guided by parallel analysis, scree plots, and theoretical interpretability. Items were retained based on primary loadings $\geq .50$, cross-loadings $< .40$, content coverage, and factor stability (Stevens 2002; Worthington and Whittaker 2006). Subscale and total-scale reliability were estimated using Cronbach's alpha (Cronbach 1951; Nunnally and Bernstein 1994).

The study adhered to institutional ethical standards, with voluntary and anonymous participation, and approval from the relevant review board.

RESULTS

Preliminary Tests of Factorability

Before conducting factor analysis, the suitability of the 80-item faculty self-efficacy pool was assessed, as presented in Table 1. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .923, which is considered excellent and well above the commonly accepted threshold of .80 for meritorious adequacy (Kaiser 1974). This high KMO value indicates that the correlations among items are strong enough to produce reliable factors.

Bartlett's test of sphericity was also significant at $\chi^2(3160) = 26{,}344.65$, $p < .001$, suggesting that the correlation matrix is not an identity matrix and that sufficient shared variance exists among items to justify factor analysis (Bartlett 1954).

Together, these results confirm that the dataset is appropriate for factor extraction using common-factor methods (Fabrigar et al. 1999; Costello and Osborne 2005). The high KMO value and significant Bartlett's test provide quantitative evidence that the items are interrelated, while qualitative inspection of the correlation matrix also showed multiple moderate-to-strong correlations, further supporting the factorability of the scale.

Table 1 confirms the numerical results described above, that is, the KMO indicates excellent sampling adequacy, and Bartlett's test demonstrates that the correlation structure is suitable for uncovering underlying factors. This preliminary evidence sets a strong foundation for the subsequent exploratory factor analysis.

Factor Extraction and Retention

To identify the underlying dimensions of the 80-item Faculty Self-Efficacy scale, principal axis

Table 1: KMO Bartlett's Tests

Test	*Value*
Kaiser-Meyer-Olkin (KMO)	.923
Bartlett's Test of Sphericity χ^2(df = 3160)	26,344.653***

factoring (PAF) was employed. PAF was selected because it emphasises common variance among items and is less sensitive to non-normality in the data (Fabrigar et al. 1999; Widaman 1993). As shown in Table 2, initial examination of the unrotated eigenvalues suggested up to 10 factors with eigenvalues greater than 1.00 based on the Kaiser criterion, indicating the presence of multiple potential dimensions in the dataset. Recognising that the Kaiser criterion alone can overestimate factor numbers, a parallel analysis (Horn 1965) was conducted, comparing observed eigenvalues with those derived from randomly generated data matrices of equivalent size. This analysis indicated that observed eigenvalues exceeded random counterparts up to the sixth component, suggesting a plausible extraction of six factors.

Factor retention decisions were guided by a combination of criteria, including parallel analysis, percentage of variance explained and interpretability, and attainment of a simple structure after rotation (Zwick and Velicer 1986; Hayton et al. 2004; Tabachnick and Fidell 2019; Worthington and Whittaker 2006). While five- and six-factor solutions were initially considered, they revealed weak or under-identified factors, with fewer than three strong indicators, and conceptually diffuse groupings, reducing theoretical clarity.

In contrast, the four-factor solution provided the clearest and most interpretable structure. It demonstrated theoretically coherent domains, minimal cross-loadings, and strong item-factor associations, achieving both interpretability and parsimony (Fabrigar et al. 1999; Hair et al. 2019). The extracted solution accounted for 64.924 percent of the total variance, with factors beyond the fourth contributing relatively small additional variance, further supporting the four-factor model. Moreover, the consistency between initial and extracted eigenvalues indicates that PAF effectively captured the underlying structure.

Overall, combining quantitative indicators, including eigenvalues, variance explained, and parallel analysis, with qualitative judgments such as interpretability and simple structure, supports a four-factor solution as the most valid and theoretically meaningful representation of faculty self-efficacy domains.

Rotation and Item Retention

To identify the underlying dimensions of the 80-item Faculty Self-Efficacy scale, principal axis factoring (PAF) was employed. PAF was selected because it emphasises common variance among items and is less sensitive to non-normality in the data (Fabrigar et al. 1999; Widaman 1993). As shown in Table 3, initial inspection of the unrotated eigenvalues suggested up to ten factors with eigenvalues greater than 1.00 according to the Kaiser criterion, indicating the presence of multiple potential dimensions. Recognising that the Kaiser criterion alone can overestimate factor numbers, a parallel analysis (Horn 1965) was conducted. This procedure compares observed eigenvalues with those derived from randomly generated data of equivalent size and dimensionality, showing that the observed eigenvalues exceeded random counterparts up to the sixth component. Factor retention decisions were guided by a combination of criteria, including the results of parallel analysis, the percentage of variance explained, interpretability, and attainment of a simple structure after rotation (Zwick and Velicer 1986; Hayton et al. 2004; Tabachnick

Table 2: Initial and extracted eigenvalues and percent variance (unrotated solution)

Factor	*Initial Eigenvalue*	*% Variance*	*Cumulative %*	*Extracted (PAF)*	*% Variance*	*Cumulative %*
1	35.292	44.115	44.115	35.048	43.811	43.811
2	9.077	11.346	55.461	8.882	11.102	54.913
3	5.575	6.969	62.429	5.370	6.712	61.625
4	2.883	3.603	66.033	2.639	3.299	64.924
5	2.555	3.194	69.227	2.336	2.919	67.844
6	1.906	2.383	71.609	1.616	2.020	69.864
7	1.674	2.093	73.702	1.414	1.768	71.631
8	1.439	1.799	75.501	1.225	1.531	73.163
9	1.384	1.730	77.231	1.134	1.418	74.581
10	1.120	1.400	78.631	0.860	1.075	75.655

Table 3: Rotated factor matrix for retained items (Varimax, PAF)

Item	***F1***	*F2*	*F3*	*F4*
56. I feel confident in using software for data analysis in research.	**.869**	.078	.050	.212
78. I am confident in setting and achieving professional development goals.	**.850**	.044	.176	.150
77. I can identify areas where I need to grow professionally.	**.849**	.053	.177	.169
58. I can manage digital resources and research materials effectively.	**.824**	.072	.107	.266
61. I feel confident in managing my work and personal responsibilities.	**.806**	.105	.259	-.029
57. I am capable of utilising digital libraries and databases for research.	**.799**	.121	.189	.190
49. I am confident in managing responsibilities on committees.	**.788**	-.021	.149	.227
75. I feel capable of ensuring my work aligns with institutional expectations.	**.782**	.086	.352	-.063
64. I can organise my time to balance teaching, research, and service.	**.759**	.296	.039	.034
53. I feel comfortable using technology to increase student engagement.	.034	**.840**	.204	.132
55. I can adapt my teaching strategies to include digital technologies.	.131	**.831**	.242	.210
50. I feel capable of representing my department's interests at the university level.	.075	**.816**	.065	.276
62. I can prioritise tasks effectively to meet deadlines.	.167	**.779**	.239	-.212
71. I feel confident in understanding institutional policies related to teaching.	.100	**.764**	.372	.129
72. I can follow institutional procedures for research and administration.	.068	**.756**	.379	.108
80. I am confident in seeking feedback to improve my academic practices.	.064	**.741**	.394	.054
42. I am confident in guiding academic initiatives effectively.	.078	**.725**	.165	.176
27. I am confident in grading student assessments fairly and consistently.	.211	.244	**.850**	.011
22. I can provide timely and constructive feedback to my students.	.321	.100	**.794**	.059
28. I can use summative assessments to make final judgments about student performance.	.071	.376	**.775**	-.095
25. I can design assessments that help students reflect on their learning.	.180	.308	**.767**	-.024
30. I can ensure that assessments align with course objectives.	.067	.457	**.759**	.037
2. I can align course materials with course goals.	.147	.256	**.752**	-.038
26. I am confident in designing exams that evaluate student learning effectively.	.010	.591	**.709**	.108
23. I am confident in using formative assessments to identify learning gaps.	.458	.068	**.679**	.309
68. I am confident in using stress-reduction techniques to maintain my well-being.	.567	.194	.011	**.740**
69. I feel capable of handling work-related stress without affecting performance.	.570	.259	.012	**.682**
66. I feel confident in managing stress related to my academic responsibilities.	.323	.468	.058	**.644**

and Fidell 2019; Worthington and Whittaker 2006). While five- and six-factor solutions were explored, they revealed weak or under-identified factors with fewer than three strong indicators and conceptually diffuse groupings, reducing theoretical clarity. In contrast, the four-factor solution offered the clearest and most interpretable structure, demonstrating theoretically coherent domains, minimal cross-loadings, and strong item-factor associations. These four factors accounted for 64.924 percent of the total variance in the extracted solution, with factors beyond the fourth contributing relatively little additional variance. The consistency between initial and extracted eigenvalues indicates that PAF accurately captured the underlying structure, supporting the four-factor model as the most valid representation of faculty self-efficacy domains.

To enhance interpretability and achieve a clearer factor structure, Varimax rotation (Kaiser 1958) was applied. This orthogonal rotation maximises the differentiation of factor loadings, ensuring that each item loads highly on a single factor while minimally on others. Item retention followed rigorous criteria, including primary factor loadings of $\geq .50$, non-primary factor loadings $< .40$, and at least three items per factor to ensure stability (Stevens 2002; Tabachnick and Fidell 2019). Conceptual coherence checks were also performed to ensure that retained items formed theoretically meaningful constructs. Following these procedures, a 28-item, four-factor solution was finalised. The retained factors include Professional Competence and Institutional Engagement (9 items), reflecting confidence in using research software, setting professional development goals, aligning work with institutional expectations, managing committees, and balancing time, Adaptive Leadership and Technology Integration (8 items), encompassing adapting teaching with digital technology, using technology for engagement, representing the department, understanding policies and procedures, guiding initiatives, and seeking feedback, Instructional Assessment and Alignment (8 items), which includes fair grading, formative and summative assessment, aligning assessments and course materials with objectives, designing effective exams, and providing timely feedback, and Stress Management (3 items), covering the application of stress-reduction techniques, handling work-related stress, and managing stress tied to academic responsibilities. Together, these four factors account for 78.93 percent of the total variance, demonstrating strong explanatory power and suggesting that the scale captures a substantial proportion of faculty self-efficacy across teaching, leadership, assessment, and well-being domains. Each factor exhibits strong primary loadings with minimal cross-loadings, indicating clear separation between constructs. Although Stress Management is the smallest factor, it shows high internal consistency and aligns conceptually with the demands of faculty responsibilities.

Overall, the combination of quantitative criteria, including eigenvalues, variance explained, and parallel analysis, along with qualitative judgments regarding interpretability, simple structure, and conceptual coherence, supports the four-factor, 28-item solution as the most valid and theoretically meaningful representation of faculty self-efficacy.

Reliability

The internal consistency of the Faculty Self-Efficacy Scale and its four subscales was assessed using Cronbach's alpha (Cronbach 1951), a measure of the extent to which items within a factor are correlated, reflecting the reliability and homogeneity of each construct. As presented in Table 4, results indicated excellent reliability across all subscales. The Professional Competence and Institutional Engagement subscale (9 items) demonstrated an alpha of .952, Adaptive Leadership and Technology Integration (8 items) yielded .947, Instructional Assessment and Alignment (8 items) had .944, and Stress Management (3 items) achieved .928. The overall 28-item scale also demonstrated excellent reliability, á = .950, confirming that the instrument consistently measures the broader construct of faculty self-efficacy.

Given the multidimensional nature of the scale, interpretation should prioritise subscale scores, as each reflects a distinct domain of faculty efficacy. The total scale score can serve as a supplemental overall index, providing a general overview of self-efficacy without overshadowing the meaningful distinctions among subscales (McDonald 1999; Raykov 1997). Each subscale's high internal consistency indicates that items within a factor reliably measure the same underlying construct. The slightly lower alpha for the Stress Management subscale likely reflects the smaller number of items rather than a weakness in reliability. Overall, the total scale's high alpha supports the Faculty Self-Efficacy Scale as a reliable instrument for both research and practical applications, capable of capturing multiple domains of faculty competence, leadership, assessment practices, and well-being.

Table 4: Internal consistency (Cronbach's α) for subscales and total scale

	Scale	*N*
Professional Competence and Institutional Engagement	9	.952
Adaptive Leadership and Technology Integration	8	.947
Instructional Assessment and Alignment	8	.944
Stress Management	3	.928
Overall Faculty Self-Efficacy (total)	28	.950

DISCUSSION

This study developed and validated a multidimensional measure of faculty self-efficacy for higher education, providing evidence for a reliable and interpretable four-factor structure. Preliminary diagnostics indicated excellent factorability, with a Kaiser-Meyer-Olkin measure of .923 and a significant Bartlett's test, suggesting sufficient shared variance among items (Kaiser 1974; Bartlett 1954). Principal axis factoring (PAF) was employed to capture common variance and account for potential non-normality, consistent with methodological best practices (Fabrigar et al. 1999). Although parallel analysis suggested up to six factors, a four-factor solution was retained based on parsimony, simple structure, and theoretical interpretability, reflecting recommendations to weigh interpretability alongside statistical criteria (Zwick and Velicer 1986; Hayton et al. 2004; Hair et al. 2019).

The four factors map meaningfully onto broader conceptualisations of faculty self-efficacy and role performance in higher education. The Professional Competence and Institutional Engagement factor encompasses beliefs about professional development, use of research technologies, and fulfillment of institutional responsibilities such as committee work and time management. These findings are consistent with Bandura's (1997) social-cognitive theory and prior work on academic self-efficacy, which highlight the influence of efficacy beliefs on professional behavior (Lent et al. 1994). Recent studies reinforce this relationship, for instance, Li et al. (2025) found that faculty intrinsic motivation and self-efficacy interact to enhance innovation in teaching, indicating that self-efficacy extends beyond skill mastery to broader professional agency. Similarly, Zhang et al. (2024) showed that perceptions of supportive institutional climate positively influence faculty self-efficacy and well-being, highlighting the importance of organisational context in shaping efficacy beliefs.

The Adaptive Leadership and Technology Integration factor integrates competencies in leveraging technology for pedagogy with skills in policy navigation, initiative guidance, and departmental representation. This reflects faculty leadership efficacy in dynamic, change-oriented environments (Evans 2014). Recent research underscores the relevance of digital self-efficacy in higher education, demonstrating that confidence in technology integration predicts successful adoption of new teaching practices and contributes to institutional innovation (Sun and Yoon 2025). Such findings position faculty self-efficacy as a key driver of both instructional and organisational outcomes, especially in increasingly digital learning environments. Emerging research on faculty artificial intelligence literacy also emphasizes that effective faculty performance increasingly depends on confidence in navigating digital technologies, evaluating emerging tools, and engaging in continuous professional learning (Song et al. 2026). Furthermore, Chen et al. (2025) reported that structured professional development and institutional support significantly enhance faculty confidence and readiness to implement innovative teaching strategies.

Instructional Assessment and Alignment captures core teaching self-efficacy, including assessment design, alignment, grading, and feedback provision. This factor aligns with established teacher-efficacy domains that emphasise instructional strategies and assessment competence (Tschannen-Moran and Woolfolk Hoy 2001; Brookhart 2013). Current research supports the notion that higher self-efficacy in assessment practices encourages pedagogical innovation and the implementation of student-centered teaching strategies, particularly when combined with institutional support and professional development opportunities (Li et al. 2025).

The Stress Management factor reflects faculty confidence in coping with job-related stressors. Evidence increasingly suggests that self-efficacy is a crucial psychological resource for maintaining well-being and instructional performance under pressure. Zhang et al. (2024) demonstrated that self-efficacy mediates the relationship between institutional climate and faculty mental health, highlighting its central role in fostering resilience. These findings complement earlier work linking well-being beliefs with sustained instructional effectiveness (Skaalvik and Skaalvik 2017; Collie et al. 2012), suggesting that stress management is an integral dimension of comprehensive faculty self-efficacy.

Internal consistencies were excellent across the four subscales (α = .928-.952), and the total scale reliability was high (α= .950). While a total score is defensible, the multidimensional structure of the scale justifies interpretation at the subscale level, consistent with psychometric recommendations for layered constructs (McDonald 1999; Raykov 1997). These distinctions align with theoretical frameworks that differentiate organisational and strategic competencies from classroom-level practices (Fullan 2016; Mishra and Koehler 2006). Methodological choices, including PAF extraction, combined retention criteria, Varimax rotation for simple structure, and careful item retention, ensure that the factors are both statistically robust and conceptually coherent (Fabrigar et al. 1999; Horn 1965; Zwick and Velicer 1986; Stevens 2002; Worthington and Whittaker 2006).

The scale has practical implications for faculty development and quality assurance. By profiling efficacy across professional functioning, adaptive leadership with technology, instructional assessment, and stress resilience, institutions can tailor interventions to specific areas of need. For example, targeted programs can enhance research and time-management skills (F1), develop leadership and policy literacy (F2), provide coaching in assessment design (F3), and implement well-being initiatives (F4). These strategies are supported by recent evidence that structured support, combined with intrinsic motivation, significantly enhances faculty self-efficacy and teaching innovation (Li et al. 2025; Sun and Yoon 2025).

Despite these strengths, limitations should be noted. The sample size (N = 238) satisfied general EFA guidelines (>200 participants and >3–5 participants per item), yet replication in larger and more diverse faculty populations is necessary to ensure stability (MacCallum et al. 1999). Future research should employ confirmatory factor analysis to evaluate model fit and discriminant validity, examine composite reliability and McDonald's ω, and assess measurement invariance across faculty rank, discipline, and institution type to enhance generalizability (Fornell and Larcker 1981; McDonald 1999; Hair et al. 2019).

CONCLUSION

This study successfully developed a concise, multidomain measure of faculty self-efficacy specifically for higher education, resulting in a 28-item, four-factor structure with strong internal consistency. The factors, Professional Competence and Institutional Engagement, Adaptive Leadership and Technology Integration, Instructional Assessment and Alignment, and Stress Management, reflect key capabilities required beyond classroom teaching. The instrument provides a clear profile of faculty strengths and areas for growth, offering practical insights for institutional leaders and faculty developers to guide programming, monitor development, and evaluate initiatives. The findings demonstrate a robust initial structure suitable for diagnostic use and lay the groundwork for further validation.

RECOMMENDATIONS

Institutions should utilise the scale at the subscale level to inform targeted supports, such as assessment design, policy navigation, digital pedagogy, and well-being initiatives. Future research should conduct confirmatory factor analysis with new samples, assess measurement invariance across ranks, disciplines, and campuses, and examine convergent, discriminant, and predictive validity in relation to teaching quality, research outputs, service participation, and retention. Additional work should evaluate test-retest reliability, sensitivity to change, and develop local benchmarks or cut scores. Consideration should also be given to creating short forms or culturally adapted translations. Embedding the instrument within routine faculty development cycles, including baseline assessment, tailored intervention, and follow-up measurement, can support data-informed decision-making and track progress in building a resilient, high-performing academic workforce.

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