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From insight to measurement: A self-assessment tool development for entry-level teachers' instructional competence

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Abstract

This research addresses the critical need for assessing and enhancing instructional competence among entry-level teachers through the development of a quantitative self-assessment tool. The study follows best practices, employing Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA), and reliability testing with a sample of 1000 teachers. The resulting six-factor model includes effective lesson planning and development, alignment with educational and career goals, collaboration and stakeholder engagement, classroom management and leadership, well-being and stress management, and student engagement and passion, validated through CFA with a statistically significant fit. The scale development involves defining constructs, expert opinions, and rigorous statistical analyses, demonstrating high internal consistency in reliability testing. This study offers valuable insights into entry-level teachers' instructional competence, recommending the refinement of the scale, integration into training programs, and prioritization of ongoing professional development. Suggestions for longitudinal impact research and context-specific exploration will deepen understanding. Overall, this research lays a strong foundation for improving teacher induction programs and enhancing the effectiveness of entry-level educators in diverse educational settings.

Keywords: *assessment tool, entry-level teachers, factor analysis, instructional competence, scale development, self-assessment*

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1. Introduction

Educators, particularly those in the early stages of their careers, play a pivotal role in shaping the future of education (Asirit et al., 2022) because they can easily traverse the discernible shifts occurring within the educational landscape (Järvinen-Taubert, 2023). While Asirit et al. (2022) unveiled a significant gap that there exists no standardized measurement tool expressly crafted to assess the instructional competence of newly hired teachers, authorities in education suggest a selection process that yields the best results (Cranston, 2012), continuous evaluation to improve teaching (OECD, 2013), observation and self-evaluation (Nijveldt et al., 2005) and mentoring (Baker-Drayton, 2019). For new teachers, self-assessment and self-reflection are necessary for highlighting their strengths and weaknesses in teaching competencies (Quddus et al., 2019; Majzub, 2013; Manea et al., 2022; Huang, 2022).

The phenomenological study of Asirit et al. (2022) brought attention to the instructional competence of recently appointed public school teachers proposing a scale construction perceived to function as a dependable measurement tool, gauging the preparedness of entry-level teachers in their instructional competence. In fact, previous studies also highlight the potential role of self-assessment tool for entry-level teachers towards augmenting teacher induction programs and enhancing the overall effectiveness of entry-level educators in public school settings (Pellerone, 2021; De Vera et al., 2021; Kotzebue et al., 2021; Lauermann & ten Hagen, 2021; Korir, 2022; Ohle-Peters & Shahat, 2023).

Through an in-depth exploration of the integral role played by self-assessment in shaping effective teaching methods, this research elucidates its significant impact on the cultivation of instructional competence in the context of newly hired teachers. Informed by foundational principles derived from the literature on scale development (DeVellis & Thorpe, 2022; Lamm et al., 2020; Zhou, 2019; Ellis, 2017), this study takes a pivotal turn, shifting from qualitative insights to the creation of a quantitative self-assessment tool. Embarking on this transformative journey, the research seeks to meticulously measure and validate the instructional readiness of entry-level teachers. The overarching objective is to furnish a reliable and empirically validated measurement tool, not only reinforcing qualitative discoveries but also enriching teacher induction programs. This concerted effort is geared towards facilitating the seamless integration of entry-level teachers into the intricate landscape of public school education, thereby constituting a crucial stride towards the perpetual refinement of educational practices.

This study pursued two core goals. Firstly, it sought to examine and establish the foundational elements impacting the instructional competency of entry-level instructors through a thorough analysis of observable variables. Concurrently, the research evaluated the coherence of the proposed component structure, derived from Exploratory Factor Analysis (EFA), when applied to a specific group of novice educators. These dual objectives work in tandem, contributing to a profound understanding of the factors influencing instructional competency and validating the suggested factor structure through Confirmatory Factor Analysis (CFA).

2. Literature Review

2.1. Entry-level teachers' instructional competence

In exploring the instructional competence of entry-level teachers, a comprehensive examination of the existing literature reveals significant insights. Asirit et al. (2022), rooted in Bandura's Self-Efficacy Theory (1997), identified crucial attributes shaping instructional competence such as baseline instructional standards, drivers of instructional improvement, transition of instructional quality, strategizing for quality instruction, managing uncertainties, and health and well-being, which are necessary for well-equipped entry-level educators. While Pellerone (2021) emphasized the influence of self-perceived instructional competence and self-efficacy on teaching effectiveness, De Vera et al. (2021) addressed novice teachers' competence in integrating educational technology within the context of the new normal in education. Furthermore, Kotzebue et al. (2021) highlighted subject-specific competencies for pre-service science teachers within the DiKoLAN framework.

Several studies revealed underscored the importance of aligning training structures with authentic classroom scenarios. For example, Ohle-Peters and Shahat (2023) illuminated on the role of technical pedagogical content knowledge (TPACK) in enhancing instructional quality. Lauermann and ten Hagen (2021) synthesized the relationship between teachers' competence beliefs and students' academic outcomes while Korir (2022) emphasized the teachers' performance appraisal and development. These studies shed light on the critical role of teachers in building meaningful relationships and underscore the imperative for additional professional development centered on technology integration to equip teachers with the necessary skills for contemporary educational landscapes.

2.2. Scale development

Scale development stands as a pivotal component of empirical research, ensuring the acquisition of data that is both valid and reliable. According to Lamm et al. (2020), content validity, internal and external structure validation, and consequential validity are crucial to address the multifaceted process of scale development tailored to specific contexts. Lamm et al. (2020) suggest descriptive analysis, Cronbach's alpha calculations, and factor analysis for internal structure validation. The importance of external structure validity is underscored through data collection within the nomological network of related scales, with a conclusive emphasis on the broader implications of scale results. In terms of validation, Ellis (2017) accentuates the necessity of a validation study before the utilization of a test or scale, which include meticulous planning, expert involvement, and rigorous item analysis.

DeVellis and Thorpe (2022) emphasized the concept of internal consistency reliability using Cronbach's coefficient alpha (α) as a widely embraced metric. A scale attains internal consistency when its items exhibit high intercorrelations, indicative of strong connections to the latent variable. Scale reliability signifies internal consistency with coefficient alpha as an essential metrics in scale development. Moreover, Zhou (2019) integrated qualitative investigation, quantitative surveys, and validation techniques in scale development. By systematically integrating mixed methods, it ensures a nuanced understanding of the scale construct.

2.3. Theoretical framework

The theoretical framework of this study is informed by the principles outlined by DeVellis and Thorpe (2022) in the process of scale development. DeVellis and Thorpe provide a comprehensive guide that blends both theoretical and methodological considerations for creating reliable and valid measurement instruments.

Figure 1

Methodological framework

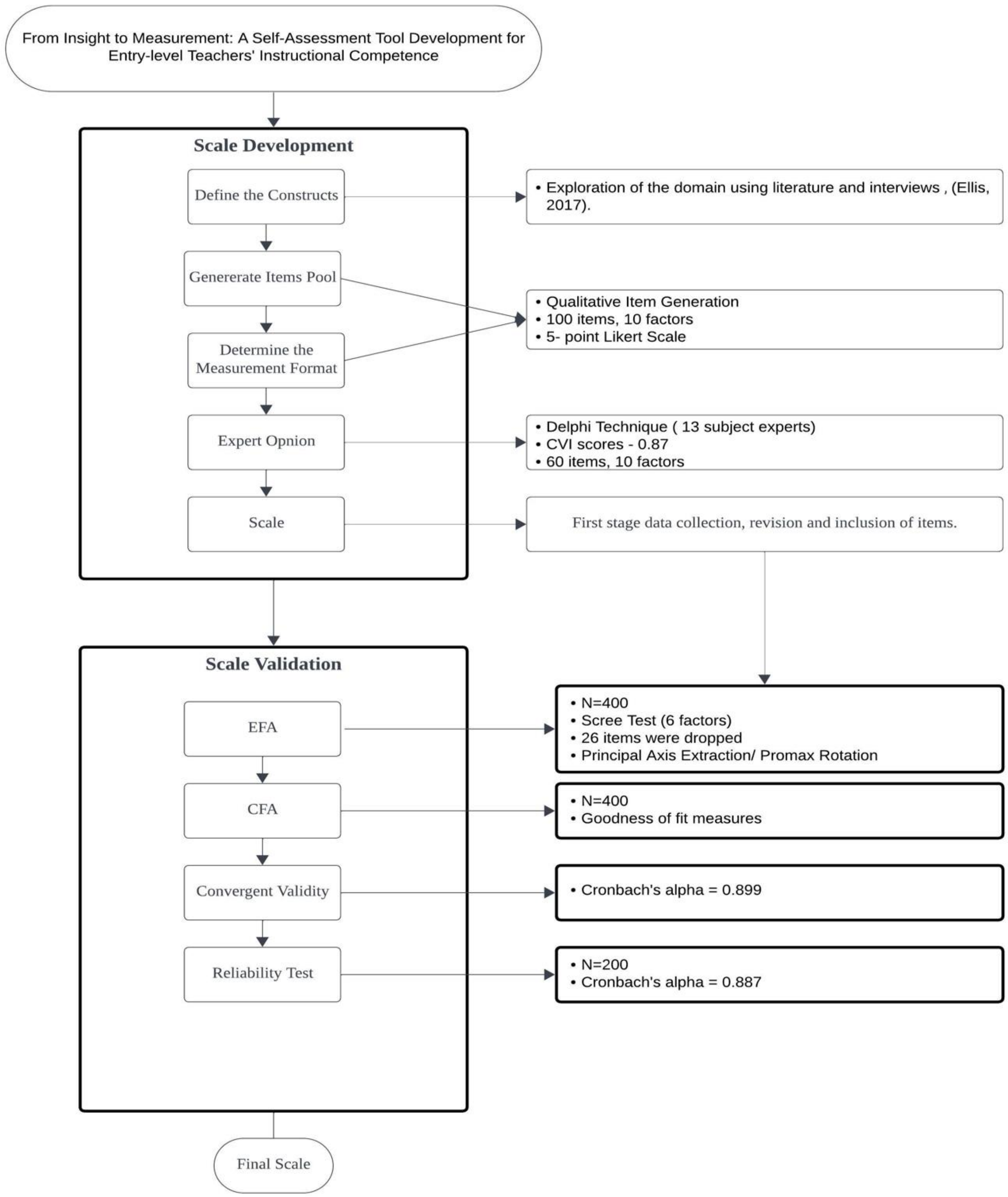


Figure 1 presents the methodological framework of the study divided into two distinctive phases, offering a comprehensive approach to the development and validation of the proposed instructional competence scale for entry-level teachers.

The scale development phase involves defining constructs, generating a comprehensive set of items aligned with instructional competence, and making crucial decisions on measurement formats. Expert input through the Delphi technique refines the scale, culminating in the creation of the initial framework for subsequent validation.

The second phase of scale validation unfolds through a series of analytical procedures. EFA is employed to identify latent factors and unveil the underlying structure of the scale. CFA follows, serving to validate and confirm the factor structure identified through EFA. This analytical process rigorously tests the consistency of the scale's structure and assesses how well the observed data aligns with the hypothesized model. Simultaneously, content validity is scrutinized to ensure the comprehensive coverage of intended constructs. Reliability tests, including measures like Cronbach's alpha, assess the internal consistency and stability of the scale over time.

3. Methodology

3.1. Research design

This quantitative research employs a methodological approach influenced by Finch (2020). The construction and development of the scale utilized EFA to unveil the underlying structure of observed variables. Furthermore, CFA is introduced to validate a pre-defined factor structure, covering critical aspects like identification, model fit, and degrees of freedom.

The comprehensive methodological framework of the study as shown in figure 1 comprises two distinct yet interconnected phases: scale development and scale validation. Guided by Ellis (2017), the scale development initiated with a meticulous definition of study constructs, followed by item generation and format determination. The initial construct list was scrutinized through the Delphi Technique. The final scale, determined by the Content Validity Index, marked the completion of the scale development phase.

3.2. Respondents

The scale validation phase involved randomly selected teachers in the Philippines, specifically targeting those newly appointed or with three years of teaching experience in either private or public schools. A total of 1000 respondents participated in the study, distributed as follows: 400 respondents for EFA, 400 for CFA, and 200 for reliability testing.

Respondents utilized an encrypted online form to answer the scale, ensuring data security, and received reminders for completion to maximize response rates. This comprehensive approach aligns with best practices in scale development and validation, ensuring the robustness of the study's findings.

3.3 Ethical considerations

This study prioritizes participant anonymity, informed consent, and confidentiality. The study ensures participants are well-informed, free from coercion, and maintains transparency regarding sponsorship interests. Ethical considerations include secure data management, bias prevention, and transparent outcome sharing. The research employs the JotForm online survey platform, incorporating data encryption for enhanced participant data security.

4. Results and Discussion

4.1 Scale development

Defining the constructs. The process of identifying and generating scale items for assessing entry-level teachers' instructional competence involves a systematic review of literature. Asirit et al. (2022) serve as a valuable foundation for understanding the dimensions of instructional competence. Following a literature review, the study employed well-established scale construction criteria as outlined by DeVellis and Thorpe (2022). The study outlines a scale for entry-level teachers' instructional competence, consisting of ten indicators, each representing a unique facet. Initially, a list of 100 items corresponding to these indicators was developed to ensure comprehensive coverage of factors that influence instructional competence and enhancing the tool's robustness.

Table 1

Initial items for the entry-level teacher's instructional competence scale

Factor	Dimension	Items
1	Baseline instructional standards	1-10
2	Drivers of instructional improvement	11-20
3	Transition of instructional quality	21-30
4	Strategizing for quality instruction	31-40
5	Managing uncertainties	41-50
6	Teacher's health and well-being	51-60
7	Socio-emotional learning programs	61-70
8	Positive beliefs and teacher performance	71-80
9	Passion and commitment	81-90
10	Competence development	91-100

Measurement format. The measurement format in assessing entry-level teachers' instructional competence utilizes a 5-point Likert scale, as recommended by Ellis (2017) for factor and item analysis. Respondents use this scale to indicate their perceived competence in each skill area as illustrated in table 2. Crafted for reliability and validity, the format ensures a comprehensive representation by formulating items aligned with the chosen domain, allowing for varied responses through the Likert scale's five categories.

Table 2

Likert scale for entry-level teacher's instructional competence

Rating	Description	Interpretation
5	Exceptional	Reflecting extensive experience in the skill area.
4	Proficient	Indicating good experience in the skill area.
3	Adequate	Denoting some experience in the skill area.
2	Developing	Representing little experience in the skill area.
1	Limited	Signifying no experience in the skill area.

Expert opinion. To enhance the content validity of the measurement tool for assessing entry-level teachers' instructional competence, a meticulous refinement process was performed guided by the Delphi Technique as recommended by Haughey (2021). This consensus-building method involved gathering insights from a panel of 13 subject experts to ensure the relevance and appropriateness of the items. Utilizing the Content Validity Index (CVI) as a quantitative measure, the study assessed the agreement among experts regarding item relevance, drawing on the methodology outlined by Yusoff (2019) and Israfilzade (2021).

The results presented in table 3 revealed an impressive CVI score of 0.87 following the evaluation of 100 items by experts, indicating a high level of agreement. Subsequently, 60 items, distributed across 10 dimensions, were identified as acceptable and retained for further investigation.

Table 3

Items from the Delphi technique

Factor	Dimension	Items	CVI
1	Baseline Instructional Standards	1-6	0.86
2	Drivers of Instructional Improvement	7-12	0.88
3	Transition of Instructional Quality	13-18	0.88
4	Strategizing for Quality Instruction	19-24	0.85
5	Managing Uncertainties	25-30	0.89
6	Teacher's Health and Well-being	31-36	0.87
7	Socio-Emotional Learning Programs	37-42	0.88
8	Positive Beliefs and Teacher Performance	43-48	0.87
9	Passion and Commitment	49-54	0.86
10	Competence Development	55-60	0.88
Total No. of Items/ Average CVI		**60**	**0.87**

4.2. Scale Validation

Assumption checking. The scale validation process was initiated with the formulation of 60 questions, validated through expert panel feedback, covering ten distinct factors. These questions were then administered in an online survey during October 2023, marking the initial phase of the study. The assumption-checking results for EFA, encapsulating the Kaiser-Meyer-

Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity, are detailed in table 4. These statistical metrics are pivotal in assessing the dataset's suitability for factor analysis (Shrestha, 2021).

Table 4

Assumption checking for EFA

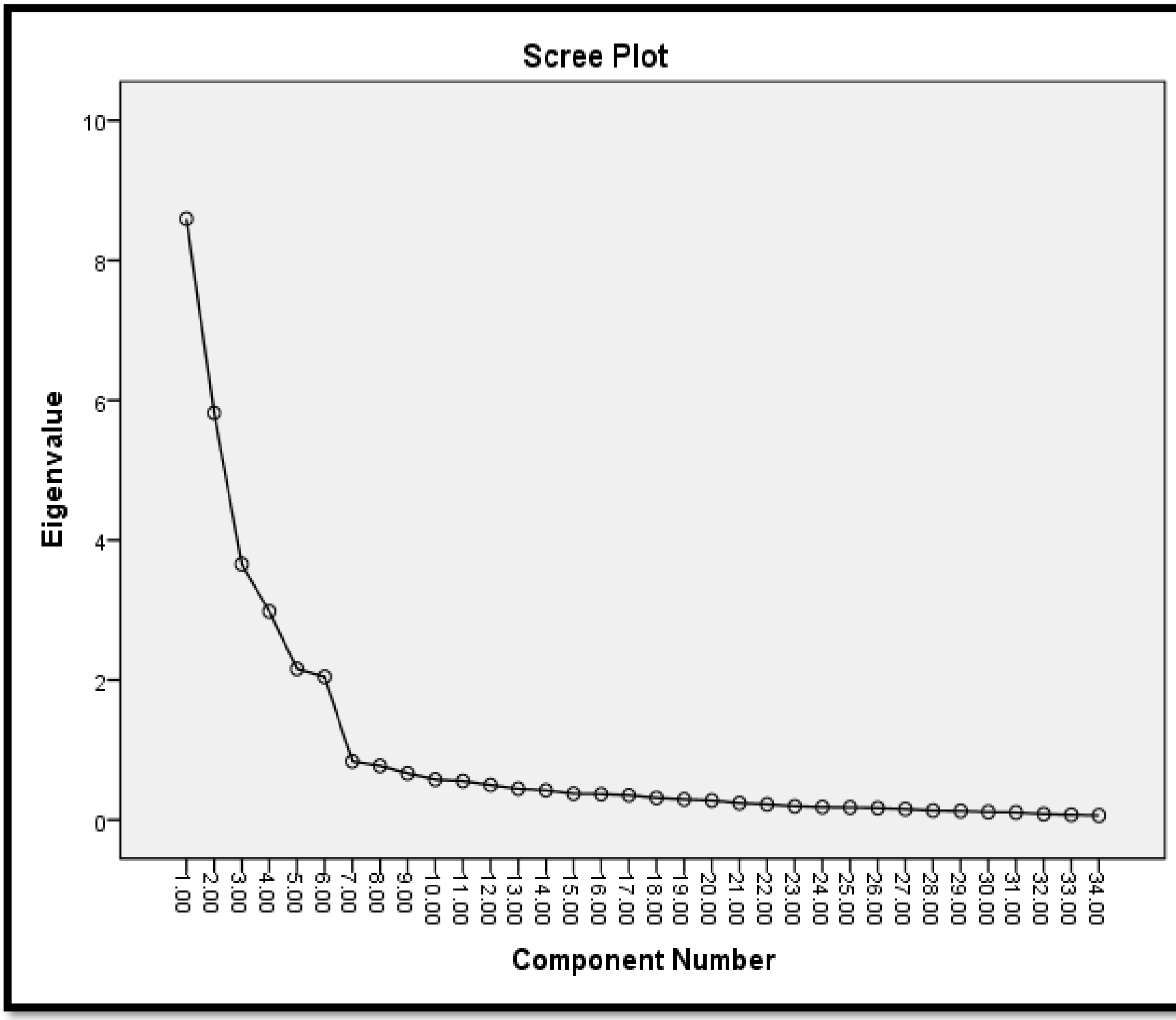
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.862
	Approx. Chi-Square	5879.329
Bartlett's Test of Sphericity	df	561
	Sig.	0.000

The robust KMO score of 0.862 attests to the substantial common variance among variables in the dataset, supporting their meaningful grouping into factors. This underscores the dataset's validity for factor analysis, indicating that the information encapsulated in the variables adequately identifies underlying factors. Additionally, the significant outcome in Bartlett's Test reinforces the dataset's appropriateness for EFA. Rejecting the null hypothesis implies nonzero correlations between variables, providing evidence of ample inter-variable correlations and affirming the dataset's suitability for factor analysis. In summary, the results of assumption checking decisively endorse the choice to undertake Exploratory Factor Analysis on the dataset. The elevated KMO score and the significant Bartlett's Test collectively affirm the dataset's suitability and interrelatedness of variables, justifying the subsequent factor extraction and rotation procedures outlined in the study.

Factor extraction. Incorporating Cattell's (1966) scree test, as explained by Jugessur (2022), constitutes a crucial stage in the process of EFA. The scree plot, depicted in figure 3, visually represents this analytical step.

Figure 3

Scree plot



The scree test serves as a pivotal tool in determining the optimal number of factors to retain from a dataset, avoiding the risks of under- or over-extraction that could result in misleading outcomes. As suggested by Jugessur (2022), a cut-off of an eigenvalue ≥ 1 indicates that retaining 34 components would be appropriate. After the scree test, rotation is employed to enhance interpretability. This study utilizes Promax rotation in conjunction with Principal Axis Extraction. Particularly beneficial for human behavior data or situations where data does not meet a priori assumptions, Promax rotation aims to maximize high item loadings and minimize low item loadings, resulting in a more interpretable and streamlined factor solution.

Exploratory factor analysis. Table 5 displays the factor loadings of the pattern matrix resulting from a Principal Axis EFA on a 34-item construct measuring entry-level teacher's instructional competence. Utilizing Promax rotation with Kaiser Normalization in 5 iterations (McNeish, 2023), the SEM approach deems factor loading critical for assessing variable relevance and strength of identified factors. Factor loadings exceeding 0.7 signify sufficient variance extraction, ensuring construct robustness.

Table 5
Factor loadings

Pattern Matrix[a]						
Items	**Component**					
	1	**2**	**3**	**4**	**5**	**6**
1	0.949					
6	0.933					
5	0.931					
7	0.926					
9	0.923					
12		0.929				
19		0.928				
22		0.904				
18		0.901				
11		0.890				
15			0.867			
16			0.834			
13			0.822			
17			0.787			
23			0.733			
4				0.870		
24				0.867		
27				0.864		
28				0.837		
29				0.835		
60				0.815		
31					0.904	
37					0.897	
39					0.896	
36					0.856	
51						0.805
34						0.801
32						0.797
49						0.796
38						0.786
58						0.784
35						0.782
10						0.764
50						0.724

Notes: Extraction Method: Principal Axis.
Rotation Method: Promax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

The pattern matrix showcases factor loadings for each item across six identified factors, with notable loadings surpassing the 0.7 threshold, indicating strong relationships. Guided by Finch's (2020) systematic evaluation, 26 items were excluded due to low factor loadings, ensuring the final construct retains variables with substantial relationships to underlying factors. Observed factor loadings, ranging from 0.310 to 0.949, predominantly surpass the 0.3 threshold, indicating substantial correlations between variables and identified factors. Factors 1 to 6 exhibit distinct competencies contributing to entry-level instructional competence, providing a comprehensive view of crucial skills and knowledge for effective teaching at the career's outset. Finch (2020) underscores the importance of determining the optimal number of components to retain in exploratory factor analysis. The present study utilizes the pattern matrix to conduct a comprehensive analysis of the identified components, emphasizing their critical role in articulating the underlying constructs.

Naming of factors. The process of naming factors in EFA serves as a crucial link between statistical abstraction and meaningful interpretation. Drawing insights from Shrestha (2021) and Fein et al. (2022), factors are typically labeled based on the characteristics of variables with prominent loadings, signifying their substantial contribution to the factor's variance. This naming strategy ensures that the assigned label encapsulates the core features of the variables within a factor, thereby enhancing the interpretability and relevance of the analysis. Fein et al. (2022) highlight the combination of art and science in factor naming, emphasizing the importance of labels that are not only statistically accurate but also contextually meaningful. Ultimately, the strategic naming of factors aims to transform abstract statistical results into comprehensible and actionable insights, facilitating a more insightful and nuanced understanding of the underlying constructs.

In the factor analysis of entry-level teachers' instructional competence, the naming of factors aligns meticulously with the characteristics of variables showing significant factor loadings. Each factor receives a name based on the thematic coherence of encompassed items, reflecting the underlying competencies measured. For example, Factor 1, termed *"Effective lesson planning and development,"* incorporates items related to lesson planning, time management, assessment design, and skill updates, emphasizing a cohesive theme around effective instructional preparation. Factor 2, labeled *"Alignment with educational and career goals,"* includes items addressing the alignment of teaching goals with broader educational objectives, emphasizing a strategic and goal-oriented dimension. The remaining factors, such as *"Collaboration and stakeholder engagement," "Classroom management and leadership," "Well-being and stress management,"* and *"Student engagement and passion,"* are aptly named, succinctly capturing core competencies reflected in factor loadings and providing a clear, meaningful representation of instructional dimensions.

The naming of components in this analysis shares parallels with the thematic focus observed in Asirit et al. (2022). A comparison between the two studies reveals common ground in supporting the notion that a range of abilities is necessary for successful teaching, emphasizing distinct instructional competencies for educators. Despite potential variations in individual competencies and factor names, this congruence points to a shared understanding of the multifaceted nature of instructional ability in the educational domain.

Table 6

Pattern matrix of 34 - item construct of the entry-level teacher's instructional competence

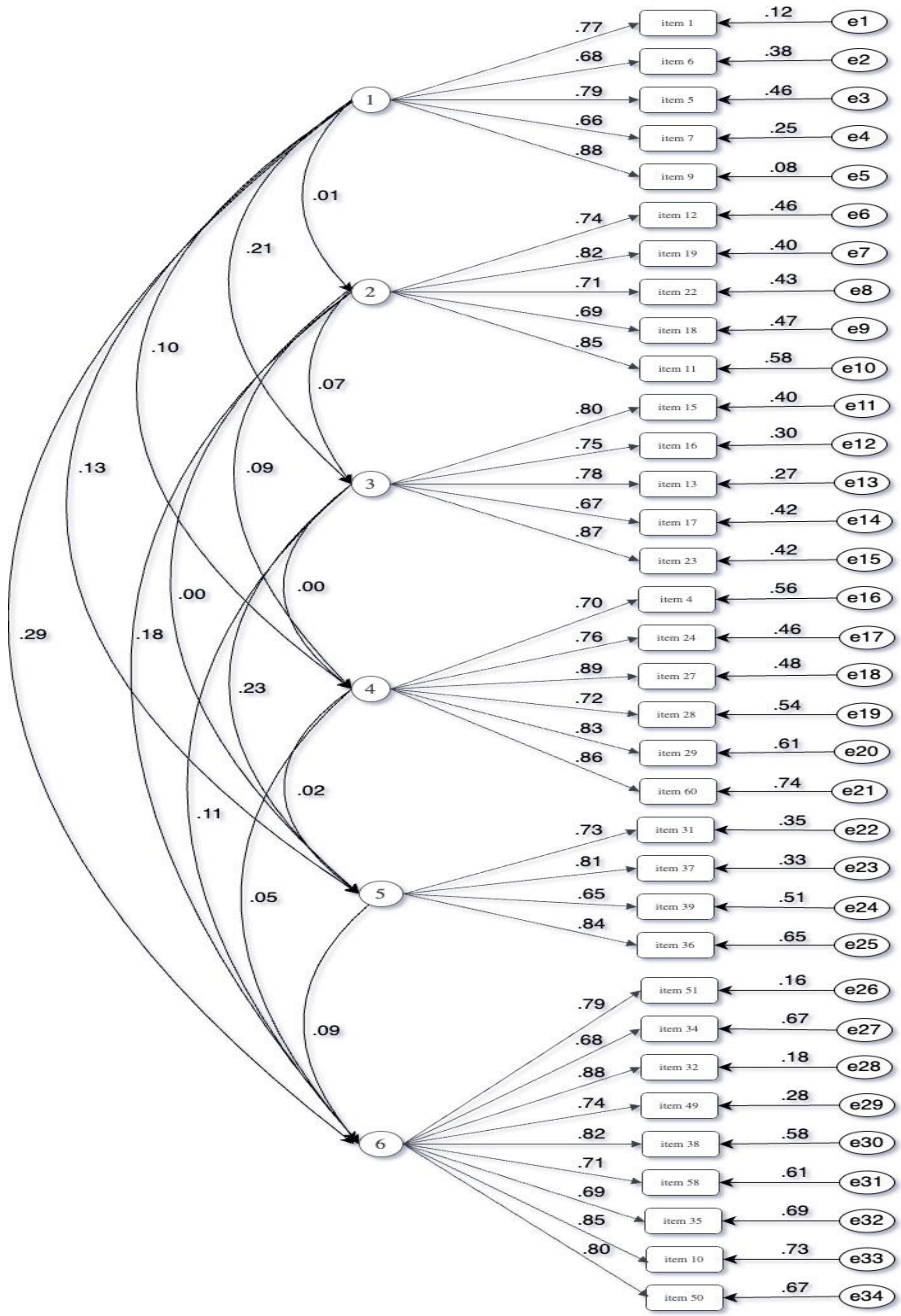
Items	Questions	Factor Loading
Factor 1 : Effective Lesson Planning and Development		
1	How competently do you plan and structure lessons?	0.949
6	How skillfully do you manage time during lesson delivery?	0.933
5	How accurately do you demonstrate competency in designing assessments?	0.931
7	How adeptly do you adjust teaching based on student achievements?	0.926
9	How proactively do you update teaching skills?	0.923
Factor 2: Alignment with Educational and Career Goals		
12	How proficiently do you align teaching goals with overall educational system goals?	0.929
19	How competent are you in applying research-based innovations for quality instruction?	0.928
22	How competent are you in drawing on best practices to enhance your teaching competence?	0.904
18	How strongly do you desire ongoing professional learning for continuous improvement?	0.901
11	How strongly do you prioritize continuous professional learning?	0.890
Factor 3: Collaboration and Stakeholder Engagement		
15	How effectively do you connect with stakeholders to improve instructional competence?	0.867
16	How adeptly do you learn from experienced educators to refine your skills?	0.834
13	How consistently do you take personal initiatives for professional development?	0.822
17	How substantial is the support from others in your professional development?	0.787
23	How competent are you in collaborating with peers to improve instructional practices?	0.733

	Factor 4: Classroom Management and Leadership	
4	How skillfully do you manage positive classroom behavior?	0.870
24	How proficient are you in providing effective leadership in the classroom?	0.867
27	How competent are you in managing uncertainties in teaching?	0.864
28	How competent are you in adapting to organizational changes for the benefit of uncertainties?	0.837
29	How competent are you in using positive emotions to boost confidence in uncertain situations?	0.835
60	How competent are you in using positive reinforcement for instructional competence and ongoing development?	0.815
	Factor 5: Well-being and Stress Management	
31	How adept are you at preserving emotional well-being amid teaching-related stress?	0.904
37	How skillfully do socio-emotional learning programs enhance behavior and ease teacher stress?	0.897
39	How competent are you in using mindfulness or stress management for coping with uncertainty?	0.896
36	How competent are you in prioritizing physical and mental health in your teaching career?	0.856
	Factor 6: Student Engagement and Passion	
51	How competent are you in maintaining passion for the teaching profession?	0.805
34	How competent are you in infusing positivity and optimism into your teaching practices?	0.801
32	How skillfully do you maintain a pleasing personality in interactions with students and colleagues?	0.797
49	How competent are you in channeling passion toward student achievement?	0.796
38	How competent are you in positively engaging students through school programs?	0.786
58	How competent are you in using self-reflection to identify areas for instructional improvement?	0.784
35	How competent are you in managing emotional well-being to mitigate anxiety and depression?	0.782
10	How regularly do you assess your own effectiveness based on student outcomes?	0.764
50	How skillfully do you engage students effectively in the learning process?	0.724

Confirmatory factor analysis. CFA stands out as a robust statistical technique for evaluating the structural validity of measurement instruments, scrutinizing how effectively observed variables represent underlying latent constructs (Bastos, 2021). This method is particularly valuable when a predefined theoretical framework exists or when the dimensionality of an instrument has been established through a prior EFA study.

Figure 4

CFA model on the entry-level teacher's instructional competence



In the context of this study, the objective is to assess the instructional competence of entry-level teachers and confirm the alignment of selected factors with the observed data. Furthermore, emphasizing the importance of item loading magnitude, as highlighted by Perez (2023), proves crucial in accounting for significant unique variance. Following the guidelines of Tabachnick and Fidell (2007, as cited in Perez, 2023), more stringent cut-offs are recommended, with values ranging from 0.32 (poor) to 0.71 (excellent), offering a nuanced evaluation of factor loadings.

The standardized CFA model depicted in figure 4 elucidates the relationships between latent factors and their respective observed items, providing insights into the instructional competence of entry-level teachers. The beta (β) values, representing standardized factor loadings, offer valuable information about the strength and direction of these relationships.

Effective lesson planning and development (Factor 1): The latent factor exhibits substantial factor loadings, ranging from $\beta = 0.66$ to $\beta = 0.88$. Notably, item 9 demonstrates the highest loading at $\beta = 0.88$, signifying its significant contribution to this factor. These robust loadings suggest that the selected items effectively represent the latent construct, aligning with the notion that entry-level teachers proficiently plan and structure lessons, manage time, and update teaching skills.

Alignment with educational and career goals (Factor 2): Factor 2 manifests strong factor loadings ranging from $\beta = 0.69$ to $\beta = 0.85$. Items 12 and 11 exhibit notable loadings of $\beta = 0.74$ and 0.85, respectively, emphasizing the alignment of teaching goals with the educational system and the prioritization of continuous professional learning. This underscores the importance of these competencies in entry-level teachers.

Collaboration and stakeholder engagement (Factor 3): Factor 3 demonstrates robust factor loadings ranging from $\beta = 0.67$ to $\beta = 0.87$. Notably, item 23 shows the highest loading at 0.87, indicating the competency of collaborating with peers to enhance instructional practices. This factor highlights the significance of effective collaboration and stakeholder engagement for entry-level teachers.

Classroom management and leadership (Factor 4): Factor 4 presents factor loadings ranging from $\beta = 0.70$ to $\beta = 0.89$. Item 27 attains the highest loading at $\beta = 0.89$, emphasizing the competence in managing uncertainties in teaching. The high factor loadings across items underscore the critical role of classroom management and leadership skills for entry-level teachers.

Well-being and stress management (Factor 5): Factor 5 showcases factor loadings ranging from β = 0.65 to β = 0.84. These loadings suggest that preserving emotional well-being, utilizing socio-emotional learning programs, and prioritizing physical and mental health are integral aspects of entry-level teachers' competencies.

Student engagement and passion (Factor 6): Factor 6 demonstrates factor loadings ranging from β = 0.68 to β = 0.88. Notably, item 32 shows the highest loading at 0.88, emphasizing competence in maintaining a passion for the teaching profession. These loadings highlight the importance of fostering positive engagement and passion in entry-level teachers.

Goodness of fit of the conceptual model. The evaluation of the fit of the conceptual model is a pivotal step in CFA, assessing the alignment of the proposed model with observed data (Ben-Shachar et al., 2022). This section interprets various commonly used fit indices in CFA, including the chi-squared statistic, adjusted goodness of fit index (AGFI), goodness of fit index (GFI), normed fit index (NFI), non-normed fit index (NNFI), comparative fit index (CFI), relative fit index (RFI), incremental fit index (IFI), parsimony-adjusted measures index, root mean square error of approximation (RMSEA), and (standardized) root mean square residual (SRMR). These fit indices serve as benchmarks for evaluating model adequacy, with recommended cutoffs for each index. For instance, GFI and AGFI should be > .95 and > .90, respectively, while NFI and NNFI are advised to be > .95 and > .90 (or > .95 for NNFI in smaller samples). Similarly, CFI is suggested to be > .96, IFI > 0.90, and RMSEA < .08 (or < .05 for more stringent criteria). The RFI, although not strictly bound between 0 and 1, closer to 1 indicates a good fit. The SRMR should be < .08.

These indices collectively provide a comprehensive assessment of the model fit, allowing researchers to draw meaningful conclusions about the alignment of the proposed model with the observed data in the context of instructional competence evaluation for entry-level teachers. The assessment of the derived six-factor model of the entry-level teacher’s instructional competence scale is crucial for determining its parsimonious fit. Table 7 presents the Likelihood Ratio Chi-Square test results, evaluating the goodness of fit for three models: the default model, the saturated model, and the independence model.

Table 7

Likelihood ratio chi-square

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	117	694.258	238	0.048	1.356
Saturated model	400	0	0	-	-
Independence model	68	2849.468	332	0	5.079

The default model, representing the proposed six-factor model with 117 parameters, yields a likelihood ratio chi-square (CMIN) of 694.258 and 238 degrees of freedom (DF), resulting in a statistically significant p-value of 0.048. The CMIN/DF ratio of 1.356 indicates a reasonably good fit, with lower values generally desired. Contrastingly, the saturated model, boasting 400 parameters, achieves a perfect fit with a CMIN of 0, but its overfitting nature limits its practical utility. The independence model, treating variables as independent, exhibits a lack of fit with a CMIN of 2849.468, DF of 332, and a p-value of 0, resulting in a high CMIN/DF ratio of 5.079, indicative of poor fit compared to the default model. In conclusion, the Likelihood Ratio Chi-Square results affirm that the proposed six-factor model (default) demonstrates a statistically significant and reasonably good fit, emphasizing its practical utility. The saturated model, while idealized, lacks practical value, and the independence model underscores the importance of considering the proposed model's parameters and structure in fit assessment.

Table 9

Baseline comparison of the relative fit indices

Model	NFI	RFI	IFI	TLI	CFI
	Delta1	rho1	Delta2	rho2	
Default model	0.756	0.733	0.922	0.913	0.920
Saturated model	1	-	1	-	1
Independence model	0	0	0	0	0

Table 9 presents a baseline comparison of relative fit indices for three different models: the default model, the saturated model, and the independence model. These indices include normed fit index (NFI), relative fit index (RFI), incremental fit index (IFI), Tucker-Lewis index (TLI), and comparative fit index (CFI). Additionally, the table includes delta (Δ) values and rho (ρ) values for selected indices.

The default model reveals a commendable fit, with NFI (0.756), RFI 0.733), IFI (0.922), TLI (0.913), and CFI (0.920), collectively suggesting strong alignment with the observed data. The Δ1 (Delta1) and ρ1 (rho1) values further highlight improved fit indices compared to the Independence model, affirming the default model's efficacy in capturing and explaining observed patterns. In contrast, the saturated model, serving as an ideal benchmark, boasts perfect fit indices (1 for NFI, IFI and CFI). While representing an optimal fit, it's crucial to acknowledge the rarity or impracticality of achieving such perfection in real-world scenarios. Conversely, the independence model demonstrates a lack of fit, with all indices registering values of 0, aligning with its assumption of treating variables as independent. This underscores the significance of considering relationships among variables for a meaningful and accurate representation of data.

The assessment of default, saturated, and independence models provides key insights into the entry-level teacher's instructional competence scale. The default model, aligning well with observed data, suggests a strong fit for the six-factor model, as emphasized by Δ1 and ρ1. While the saturated model is an ideal fit, acknowledging practical limitations makes the default model a more realistic representation.

The lack of fit in the independence model underscores the need for a sophisticated model considering variable relationships, crucial for accurate instructional competence representation. This comprehensive assessment informs model refinement for enhanced teacher competence assessment among researchers and practitioners.

Table 10 presents the Root Mean Square Error of Approximation (RMSEA) for both the default and independence models. The RMSEA is a crucial fit index that assesses how well the model approximates the population covariance matrix, with lower values indicating a better fit (Glen, 2023).

Table 10

Root mean square error of approximation

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	0.042	0.034	0.05	0.949
Independence model	0.143	0.138	0.148	0

In the default model, the impressively low RMSEA of 0.042, coupled with a narrow 90% confidence interval (0.034 to 0.05) and a high PCLOSE value of 0.949, indicates a precise and excellent alignment with the observed data. Conversely, the independence model shows a substantially higher RMSEA of 0.143, accompanied by a wider confidence interval (0.138 to 0.148) and a PCLOSE value of 0, signifying a poor fit compared to the default model. These RMSEA results contribute to a nuanced assessment of the entry-level teacher’s instructional competence scale, offering valuable insights for model refinement.

Reliability test. The reliability of the instrument was assessed to gauge the internal consistency of its items. As presented in table 7, the overall reliability is notably high, with a Cronbach’s alpha value of .953. Additionally, the individual subscales or dimensions, namely work conditions (α=.936), work gain (α=.871), and work relationship (α=.773), all surpass the commonly accepted reliability criterion of .70 alpha. These findings affirm that the instrument exhibits strong internal consistency across both the overall scale and its specific dimensions. This aligns with Nunnally (1978, as cited in Woodruff et al., 2023) that instruments utilized in basic research should ideally demonstrate a reliability of .70 or higher.

Examining the individual factors, effective lesson planning and development stands out with an exceptionally high Cronbach's alpha of 0.975, indicating an extremely high level of internal consistency within this factor. Alignment with educational and career goals (α=0.935), well-being and stress management (α=0.972), and student engagement and passion (α=0.929) also demonstrate strong internal consistency, each exceeding the .70 alpha criterion.

While collaboration and stakeholder engagement (α=0.857) and classroom management and leadership (α=0.854) exhibit slightly lower Cronbach's alpha values, they still surpass the .70 threshold, suggesting satisfactory internal consistency within these factors.

Table 11

Reliability analysis of variables

Factors	N of Items	Cronbach's Alpha
Effective Lesson Planning and Development	5	0.975
Alignment with Educational and Career Goals	5	0.935
Collaboration and Stakeholder Engagement	5	0.857
Classroom Management and Leadership	6	0.854
Well-being and Stress Management	4	0.972
Student Engagement and Passion	9	0.929
Total	**34**	**0.920**

Considering the reliability of the instrument's total score, which combines all factors, a Cronbach's alpha of 0.920 reinforces the overall robustness and internal consistency of the entire instrument.

5. Conclusion and Recommendation

This study has yielded valuable insights into the instructional competence of entry-level teachers, utilizing a comprehensive research design that integrates both EFA and CFA. The identification of six factors—effective lesson planning and development, alignment with educational and career goals, collaboration and stakeholder engagement, classroom management and leadership, well-being and stress management, and student engagement and passion—contributes to a nuanced understanding of the multifaceted dimensions shaping instructional competence.

The CFA affirms the robustness of the proposed model, showcasing a statistically significant and reasonably good fit. Factor loadings underscore the strength and direction of relationships, validating the effectiveness of these factors in capturing observed data. The detailed assessment of model fit, encompassing relative fit indices and root mean square error of approximation, provides a comprehensive perspective on the entry-level teacher's instructional competence scale.

In light of the insights gleaned from this study on entry-level teachers' instructional competence, the following recommendations are proposed;

Refinement of instructional competence scale. Enhance the instructional competence scale by incorporating the factors identified in this study for improved accuracy and applicability in assessing entry-level teachers.

Integration into teacher training programs. Integrate identified factors into teacher training curricula to comprehensively prepare entry-level teachers. Develop targeted interventions to enhance specific competencies.

Ongoing professional development: Prioritize continuous professional development for entry-level teachers, focusing on factors like collaboration, classroom management, and alignment with educational goals for sustained improvement.

Longitudinal impact research: Explore the longitudinal impact of instructional competence factors on teacher performance and student outcomes for valuable insights into long-term success in the teaching profession.

Context-specific exploration: Investigate context-specific factors, including school culture, community dynamics, and regional variations, to better understand their influence on entry-level teachers' instructional capabilities.

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