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Article

Validation of the Professional Competency Model of Chemistry Teachers: A Study from Diwaniyah City, Iraq

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Abstract: Purpose: Given the critical role of teachers' professional competencies in advancing educational systems, the present study aimed to examine and validate a professional competency model for chemistry teachers that had previously been developed through empirical research in Iran, within the educational context of Iraq. Specifically, this study sought to address the debatable question of whether the professional competency model of chemistry teachers developed in Iran—considering the cultural similarities between Iran and Iraq—can be effectively applied and validated among chemistry teachers in Iraq. Method: This research adopted a quantitative approach using a descriptive–validation design, employing exploratory and confirmatory factor analyses. The research population consisted of 1,020 upper secondary school chemistry teachers in Diwaniyah City, Iraq (588 female and 432 male teachers). The sample size was determined using Cochran's formula, yielding 279 participants. A proportional stratified random sampling method was used to select the sample. Data were collected using a researcher-developed Chemistry Teachers' Professional Competency Questionnaire consisting of 59 items, rated on a five-point Likert scale ranging from 1 (very low) to 5 (very high). Findings: The main findings were obtained through exploratory factor analysis. To achieve a simpler factor structure, Varimax rotation was applied. Examination of communalities revealed that 20 items had low communalities (below 0.30) or substantial overlap with other factors; therefore, these items were removed from the questionnaire. After item elimination, three factors with eigenvalues greater than one were extracted, collectively explaining 23.06% of the total variance. The first factor, labeled Knowledge and Skills, with an eigenvalue of 3.59, accounted for 7.99% of the total variance. The second factor, titled Attitudes, Personal Traits, and Behavioral Characteristics, with an eigenvalue of 3.39, explained 7.53% of the variance. The third factor, named Instructional Tools, Equipment, and Educational Facilities, with an eigenvalue of 3.38, accounted for 7.53% of the total variance. Subsequently, confirmatory factor analysis was conducted to validate the extracted factors. The results indicated that, after model modification, the structural model of teachers' professional competencies demonstrated a good fit. The comparative fit index (CFI) was 0.99 and the incremental fit index (IFI) was 0.95, both indicating acceptable model fit. Additionally, the parsimonious fit indices showed an RMSEA value of 0.05 and a CMIN/DF value of 1.77. Based on Brown and Klein's criteria, the model exhibited an excellent fit. Conclusion: The findings of the present study demonstrated that the professional competency model for chemistry teachers previously developed by Oli et al. in Iran was successfully validated within the Iraqi educational context through exploratory and confirmatory factor analyses. This indicates that the model possesses adequate validity and can be considered an appropriate framework for assessing and developing the professional competencies of chemistry teachers in Iraq.

Keywords: Validation; Professional competency; Chemistry teachers

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1. Introduction

Education, as a fundamental pillar of individual and social development and a driving force behind national progress, has consistently occupied a central position in macro-level policymaking. Nevertheless, the accelerating pace of technological advancement, the emergence of modern management models, and the growing complexity of the contemporary world have made it more imperative than ever to reconceptualize the notion of "quality" in the preparation of an effective and competent workforce. In response to this global demand, the competency-based education (CBE) approach has emerged as a leading paradigm in technical, vocational, and specialized education. This paradigm shifts the focus from merely "what is taught" to observable, measurable, and assessable "performance outcomes," implying that learning is achieved only when individuals acquire a clearly defined set of knowledge, skills, and attitudes that meet the required professional performance standards [1] . Emphasizing outcome orientation, flexibility in learning pathways, and criterion-referenced assessment, this system has become a core component of vocational education and training frameworks in developed countries such as Australia and the United States [1], [2]. At the core of the CBE model lies the concept of "competency," for which multiple definitions have been proposed. Competency is generally defined as a set of related behaviors or activities, encompassing various forms of knowledge, skills, and motivations that constitute the behavioral, technical, and motivational prerequisites for successful performance in a specific role or occupation [3]. From the perspective of the International Organization for Management (IOM, 2018), competency refers to an integrated set of knowledge, skills, attitudes, and values that effectively generate the capacity to respond appropriately to specific situations in alignment with contextual and occupational demands. In the present study, these components are differentiated based on established theoretical models: knowledge is defined as the result of acquiring relevant information, principles, theories, and procedures; skills refer to the practical ability to apply such knowledge, techniques, and technologies to accomplish tasks; and attitudes are conceptualized as intrinsic motivational drivers of performance that facilitate sustained and high-quality professional practice. Prior learning experiences and personal backgrounds play a significant role in integrating these three components. Teacher competencies are typically classified into two main categories: general competencies, which include ethical and religious commitment, leadership ability, communication skills, and a positive attitude toward education; and professional competencies, which encompass subject-specific knowledge and skills—such as those required for chemistry—and precise performance indicators related to teaching that discipline [4]. These classifications indicate that teaching competence extends beyond mere subject-matter expertise. The modern formulation of competency-based methodology was systematically introduced by David McClelland, a prominent psychologist, in the late 1960s and early 1970s. By identifying competency variables capable of predicting job performance, he laid the theoretical foundations for this approach [5]. However, the lack of a single, universally accepted definition of competency in the literature has resulted in conceptual divergence across studies (Momeni Mahmuei, 2018). From the perspective of impact level, competencies are classified into three categories: the individual level (teachers' potential knowledge and skills), the organizational level (the integration of knowledge and skills within the context of school resources), and the strategic level (the utilization of competencies to achieve competitive advantage within the educational system) [5]. Additional classifications include behavioral versus technical competencies, individual versus organizational competencies (Elson & Bolton, 2002), and hard versus soft competencies (Raptam & Job, 1995), each emphasizing specific dimensions of teacher qualifications. Developing any competency model requires a degree of consensus; nevertheless, existing models are largely grounded in clusters such as knowledge, skills, abilities, motivation, beliefs, values, and interests, all of which are amenable to improvement through structured training programs (Oli et al., 2019). The critical role of teachers in the teaching–learning process firmly establishes them as the primary determinants of educational system effectiveness. In light of rising societal expectations and the increasing complexity of modern curricula, the demand for teachers' skills and knowledge has grown exponentially. Structural transformations in curricula have challenged teachers' professional identities, rendering the reconstruction of competency frameworks a necessity rather than a choice [6]. In Iran, considerable attention has been devoted to this approach, resulting in the development of models such as the framework proposed by Oli et al. (2019), which seeks to conceptualize teacher competency based on robust theoretical foundations and culturally contextualized considerations. A review of the existing literature reveals that numerous studies have addressed the design of competency models. Some have focused on needs assessment and instrument validation in various sectors, including the Ministry of Health (Jafari, 2014), research-oriented organizations (Panahi, 2018), and electricity company managers (Karami et al., 2019). Additionally, Oli et al. (2019), Tavakoli (2011), and Abedian have conducted studies specifically on the development of teacher competency models. At the international level, certain studies have examined the Iraqi educational context. For example, Al-Sammari et al. (2022) employed a mixed-methods approach to identify the professional competencies required for Iraqi teachers in digital learning environments, while Othman Saleh Tantawi et al. (2024), using a descriptive design, investigated the role of experience in the professional competence of primary science teachers. Despite these efforts and the emphasis on general competencies or technology-related qualifications, a notable gap remains. None of the aforementioned studies have systematically designed or, more importantly, validated a comprehensive and coherent professional competency model tailored to Iraq's specific cultural and disciplinary context—particularly for chemistry teachers in Diwaniyah City. This research gap constitutes the central problem addressed in the present study. Accordingly, this research aims to implement and validate the professional competency model for chemistry teachers originally developed by Oli et al. (2019) within the Iraqi context. The study seeks to answer the following critical question: Does the chemistry teacher competency model developed in Iran, given the cultural similarities between the two countries, demonstrate sufficient applicability and validity among Iraqi chemistry teachers, and can it serve as a foundation for designing a national competency framework for chemistry teachers in Iraq?

Theoretical Background and Literature Review

The concept of competency originates from the Latin term competere, meaning "to be suitable," and was defined by Adelsberger as an individual's ability to respond effectively to environmental demands. In another definition, Mullins conceptualizes competencies as behavioral attributes that influence effective performance, encompassing a system of knowledge, attitudes, abilities, and skills required for successful task execution. In the field of education, teacher competency refers to mastery of the core instructional role and the possession of attitudes and skills necessary to support learning success, thereby reflecting a teacher's true quality (Nadia, 2020, p. 33). From a human resources perspective, Pudengge et al. (2020, p. 69) describe competency as the ability to perform a role efficiently or to be adequately qualified for it. In contrast, Adodo (2014, p. 48) defines competency in education as the teacher's capacity to demonstrate skills and knowledge acquired through training in professional practice, while Arfin (2015, p. 38) views competency as a criterion for assessing employee service quality, requiring an integration of theoretical behavior, values, practical knowledge, and cognitive skills. The importance of teacher competency in modern classrooms is such that Zamri and Hamzah (2019) regard it as a primary benchmark, emphasizing that teachers must demonstrate competency in classroom assessment, curriculum planning, instruction, professional development, and evaluation. They further highlight that chemistry teachers' instructional skills directly influence students' interest and academic performance [7]. These findings align with those of Hindayani (2017) and Nawafur (2023, p. 366), who linked enhanced teacher skills to improved student academic achievement, identifying chemistry teachers as requiring exceptional competencies to design and effectively influence learning processes. Similarly, Gini (2020) defines teacher competency as a set of knowledge, skills, and abilities involved in creating meaningful learning experiences through the organization of instructional activities, emphasizing the teacher's capacity to design and implement laboratory and practical work to enhance conceptual understanding and science process skills. From a theoretical standpoint, competency theory, conceptualized as integrated vocationalism [8], defines competency as an integrated capacity to achieve outcomes, emphasizing the balanced integration of knowledge, skills, and attitudes. Chemistry teachers' competencies generally encompass three primary domains. First, pedagogical competency, which involves understanding the relationship between teaching and learning to promote learner development (Brint et al., 2001), with Harlan (1997) broadly defining pedagogy as the science of teaching. Second, competency in science process skills; Chma (2019, p. 28) warns that insufficient conceptual understanding of these skills among teachers leads to ineffectiveness in process-oriented instruction. Third, content knowledge and scientific understanding are essential, as effective teachers must possess deep conceptual mastery to apply scientific principles in the design and evaluation of instructional practices (McConnell, Parker, & Eberhardt, 2017). Findings from related empirical studies reveal mixed results. Ibrahim and Al-Qaisi (2023) reported that chemistry teachers demonstrated "good" levels of instructional competencies, except in the areas of assessment and instructional aids [9]. Da'i (2023) found that the level of pedagogical knowledge among chemistry teachers in distinguished schools was below the weighted mean, although variations were observed across areas such as instructional methods, classroom interaction, content organization, active teaching, and assessment. In another study, Sagimbayeva et al. (2024) proposed a model for developing subject-specific competencies among chemistry teachers, focusing on increasing awareness of linguistic heterogeneity in chemistry classrooms and designing instructional materials through the integration of reading strategies [10].

2. Materials and Methods

This study employed a quantitative approach using a descriptive–validation design incorporating exploratory and confirmatory factor analyses. The research population consisted of all upper secondary school chemistry teachers in Diwaniyah City, Iraq, totaling 1,020 individuals. The selection of this population was based on its direct theoretical relevance to the research objectives. Using Cochran's formula, a sample of 279 teachers was determined and selected through stratified random sampling from among upper secondary school chemistry teachers.

Data were collected using field-based methods. The questionnaires were distributed to the participating teachers, and upon completion and return, the data were extracted for analysis.

Instrument

The primary measurement instrument was a researcher-developed Chemistry Teachers' Competency Questionnaire. The items were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire items were developed through an extensive review of the literature on educational development dimensions and indicators, as well as theoretical foundations—including theories, approaches, models, and frameworks—related to chemistry teachers' professional competencies.

The questionnaire assessed three domains:

1. Teachers' Knowledge and Skills (Items 1–36)
2. Teachers' Attitudes, Traits, and Behavioral Characteristics (Items 37–54)
3. Tools, Equipment, and Required Facilities (Items 55–59)

Content validity and item relevance were reviewed and confirmed by five faculty members and experts in chemistry education. Subsequently, the questionnaire was pilot-tested with 30 participants from the target population, and issues related to translation and clarity were addressed. In the initial administration, the overall Cronbach's alpha coefficient was 0.90. The reliability coefficients for the three domains—knowledge and skills, attitudes and behavioral traits, and tools and facilities—were 0.89, 0.79, and 0.86, respectively.

3. Results and Discussion

Prior to conducting factor analysis, the suitability of the data for factor extraction was examined using the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. As presented in Table 1, the KMO value for the Chemistry Teachers' Professional Competency Questionnaire was 0.77. Given that KMO values greater than 0.70 indicate adequate sampling adequacy, the data were deemed suitable for factor analysis.

In addition, Bartlett's test of sphericity was statistically significant ($\chi^2 = 12204$, df = 1165, $p < 0.001$), indicating that the correlation matrix was not an identity matrix. Therefore, in addition to sufficient sampling adequacy, the application of factor analysis was statistically justified.

Table 1 KMO Measure and Bartlett's Test of Sphericity for the Chemistry Teachers' Professional Competency Questionnaire

0.77	Kaiser–Meyer–Olkin (KMO) Measure of Sampling Adequacy	
122/04	Approximate Chi-Square	Bartlett's Test of Sphericity
1165	Degrees of Freedom	
$p < 0.001$	Significance Level	

The initial exploratory factor analysis (EFA), conducted on all items of the professional competency questionnaire prior to rotation, resulted in the extraction of four factors with eigenvalues greater than 1. These four factors together accounted for 27.03% of the total variance. To achieve a clearer and more interpretable factor structure, Varimax rotation was subsequently applied.

Examination of item communalities revealed that 20 items (items 3, 5, 10, 11, 13, 14, 15, 19, 23, 24, 27, 28, 29, 37, 41, 44, 45, 49, 52, and 54) exhibited low communalities (below 0.30) or cross-loadings across multiple factors. Consequently, these items were removed from further analysis.

Following the removal of these items, a revised EFA was conducted, yielding three factors with eigenvalues greater than 1, which together explained 23.06% of the total variance. The first factor, labeled Knowledge and Skills, had an eigenvalue of 3.59 and independently explained 7.99% of the total variance. The second factor, entitled Attitudes, Traits, and Behavioral Characteristics, had an eigenvalue of 3.39 and accounted for 7.53% of the total variance. The third factor, labeled Tools, Equipment, and Educational Facilities, had an eigenvalue of 3.38 and likewise explained 7.53% of the total variance. As shown in Table 2, the cumulative variance explained by these three factors was 23.06%.

Table 2 Eigenvalues and Explained Variance of Factors Extracted from Exploratory Factor Analysis

Cumulative Percentage of Variance	Percentage of Variance	**Eigenvalue**	Factor
7.99	7.99	3.59	1
15.53	7.53	3.39	2
23.06	7.53	3.38	3

Furthermore, inspection of the scree plot (Figure 1) indicates a clear inflection point after the third factor. Based on the slope of the curve, three factors were positioned above the point of inflection, whereas the remaining factors clustered closely together and exhibited shallow slopes. This pattern provides further empirical support for the three-factor structure underlying the Chemistry Teachers' Professional Competency Questionnaire.

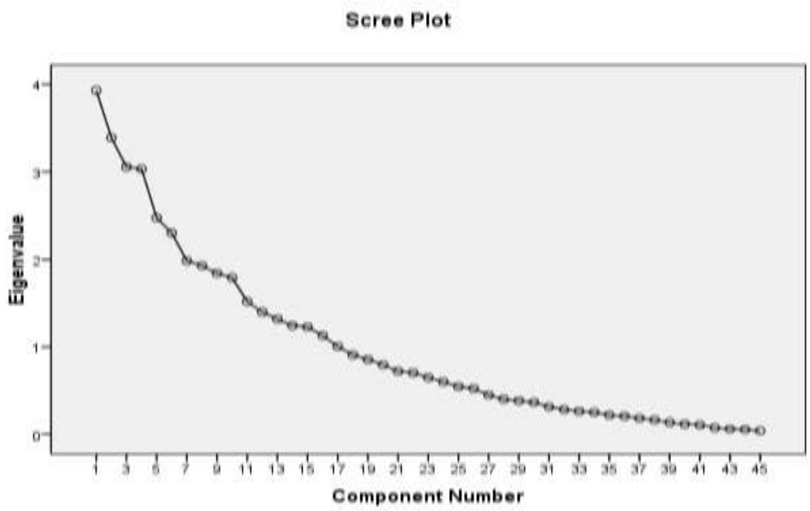

Figure 1. Cattell's Scree Plot for Determining the Number of Factors of the Teachers' Professional Competency Questionnaire

In the factor analysis, items with factor loadings greater than 0.30 were retained and assigned to the corresponding factors. The items associated with each factor are presented in Table 3.

Table 3. Varimax-Rotated Factor Matrix

Factors			Item
Factor 3	**Factor 2**	**Factor 1**	
		0.60	Q1
		0.57	Q2
		0.51	Q4
		0.41	Q6
		0.48	Q7
		0.79	Q8
		0.83	Q9
		0.78	Q12
		0.81	Q16
		0.78	Q17
		0.86	Q18
		0.67	Q20
		0.85	Q21
		0.67	Q22
		0.79	Q25
		0.66	Q26
		0.78	Q30
		0.81	Q31
		0.78	Q32
		0.76	Q33
		0.58	Q34
		0.76	Q35
	0.78		Q36
	0.81		Q38
	0.787		Q39
	0.76		Q40
	0.67		Q42

Factors			Item
Factor 3	Factor 2	Factor 1	
	0.79		Q43
	0.63		Q46
	0.78		Q47
	0.81		Q48
	0.78		Q50
	0.76		Q51
	0.67		Q53
0.61			Q55
0.74			Q56
0.58			Q57
0.78			Q58
0.65			Q59

The alignment of the items with the extracted factors demonstrates consistency with the factor structure proposed in the Teachers' Professional Competency Instrument. Specifically, the first factor comprised 21 items, the second factor included 12 items, and the third factor consisted of 6 items. Based on the nature and conceptual meaning of these factors, they were appropriately labeled. The labeling of each factor according to its underlying construct is presented in Table 4.

The results further indicate that 20 items (items 3, 5, 10, 11, 13, 14, 15, 19, 23, 24, 27, 29, 37, 41, 44, 45, 49, and 52) out of the original 59 items were removed due to factor loadings lower than 0.30 or substantial cross-loadings on multiple factors.

Table 4. Items Associated with the Three Factors of the Chemistry Teachers' Professional Competency Instrument

Item Numbers	Number of Items	Name	Factor
1, 2, 4, 6, 7, 8, 9, 12, 16, 17, 18, 20, 21, 22, 25, 26, 30, 31, 32, 33, 34, 35	21	Knowledge and Skills	1
36, 38, 39, 40, 42, 43, 46, 47, 48, 50, 51, 53	12	Attitudes, Traits, and Behavioral Characteristics	2
54, 55, 56, 57, 58, 59	6	Tools, Equipment, and Educational Facilities	3
1, 2, 4, 6, 7, 8, 9, 12, 16, 17, 18, 20, 21, 22, 25, 26, 30, 31, 32, 33, 34, 35, 36, 38, 39, 40, 42, 43, 46, 47, 48, 50, 51, 53, 55, 56, 57, 58, 59	39	Total	

The results of the confirmatory factor analysis are presented in Table 6.

Table 6. Results of Confirmatory Factor Analysis of the Factors of the Professional Competency Questionnaire for Chemistry Teachers

GFI *Goodness of Fit Index*	NFI Normed Fit Index	TLI Tucker–Lewis Index	CFI Comparative Fit Index	RMSEA Root Mean Square Error of Approximation	CMIN/DF Normed Chi-square
0.99	0.94	0.95	0.99	0.05	1.77

Given that the CMIN/DF value is less than 3, and considering that the other model fit indices also indicate an acceptable to good fit, it can be concluded that the proposed model demonstrates an adequate fit with the data, and the five-factor structure of the Professional Development Questionnaire is confirmed. Furthermore, Figure 2 presents the standardized and unstandardized estimates of the structural model of chemistry teachers' professional competencies.

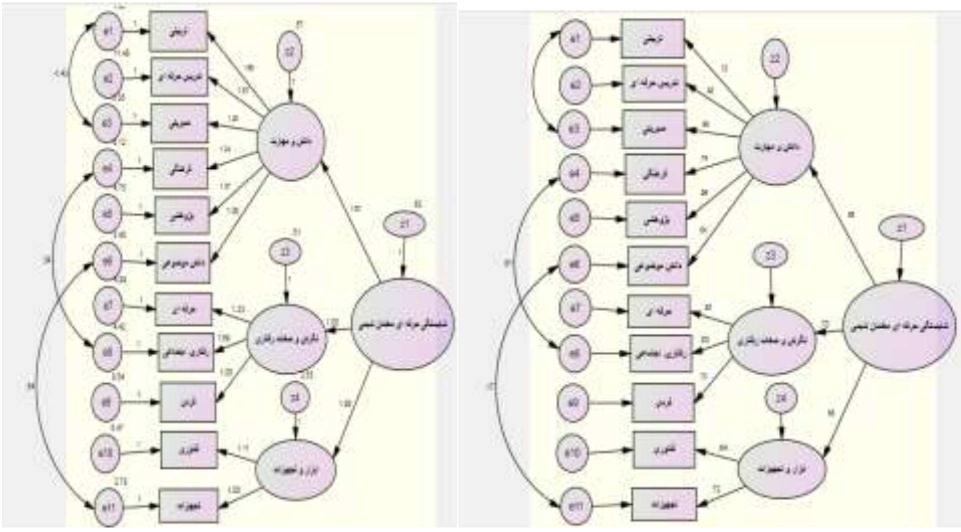

Figure 2. Structural Model of Chemistry Teachers' Professional Competencies: (a) Unstandardized Estimates, (b) Standardized Estimates

Table 7. Standardized and Unstandardized Estimates of Factor Loadings of the Structural Model of Teachers' Professional Competencies Before and After Model Modification

description	sing	Estimatel un stsnandarized		stsnandarized		Path	Parametr
		After	Before	after	before		
Regression Weight of Teachers' Professional Competency on Knowledge and Skills	0.001	1.03	0.18	0.85	0.42	Teachers' Professional Competencies → Knowledge and Skills	Lambda
Regression Weight of Teachers' Professional Competency on Attitudes	0.001	1.00	1.00	0.75	0.72	Teachers' Professional Competencies → Attitude	Lambda
Regression Weight of Teachers' Professional Competency on Tools and Equipment	0.001	1.00	1.00	0.65	0.40	Teachers' Professional Competencies → Tools and Equipment	Lambda

description	sing	Estimatel un stsnandarized After	Estimatel un stsnandarized Before	Estimatel stsnandarized after	Estimatel stsnandarized before	Path	Parmetr
Regression Weight of Teachers' Knowledge and Skills on Educational Aspects	0.001	1.98	2.39	0.72	0.92	Knowledge and Skills → Pedagogical	Lambda
Regression Weight of Teachers' Knowledge and Skills on Professional Teaching	0.001	1.81	1.79	0.83	0.45	Knowledge and Skills → Professional Teaching	Lambda
Regression Weight of Teachers' Knowledge and Skills on Managerial Competency	0.001	1.00	0.11	0.95	0.20	Knowledge and Skills → Managerial	Lambda
Regression Weight of Teachers' Knowledge and Skills on Cultural Competency	0.001	1.24	0.04	0.79	0.30	Knowledge and Skills → Cultural	Lambda
Regression Weight of Teachers' Knowledge and Skills on Research Competency	0.001	1.07	0.30	0.89	0.13	Knowledge and Skills → Research-based	Lambda
Regression Weight of Teachers' Knowledge and Skills on Subject Matter Knowledge	0.001	1.06	1.00	0.64	0.45	Knowledge and Skills → Subject Matter Knowledge	**Lambda**
Regression Weight of Teachers' Attitudes on Professional Teaching	0.001	1.22	1.21	0.92	0.46	Attitudes and Behavioral Traits → Professional	**Lambda**

description	sing	Estimatel un stsnandarized After	Estimatel un stsnandarized Before	Estimatel stsnandarized after	Estimatel stsnandarized before	Path	Parmetr
Regression Weight of Teachers' Attitudes on Behavioral Competency	0.001	1.69	1.71	0.63	0.63	Attitudes and Behavioral Traits → Socio-behavioral	**Lambda**
Regression Weight of Teachers' Attitudes on Individual Competency	0.001	1.00	1.00	0.75	0.32	Attitudes and Behavioral Traits → Personal	**Lambda**
Regression Weight of Tools and Equipment on Technology Integration	0.001	1.11	1.04	0.64	0.62	Tools and Equipment → Technology	**Lambda**
Regression Weight of Tools and Equipment on Laboratory Facilities	0.001	1.00	1.00	0.72	0.75	Tools and Equipment → Laboratory	**Lambda**

Table 7 reports the standardized and unstandardized estimates of the lambda coefficients associated with the factors of teachers' professional competencies in the modified model. The results indicate that all coefficients are statistically significant ($p \leq 0.001$). Considering the fit indices as well as the estimated lambda parameters, the modified model demonstrated an adequate fit and was therefore accepted as the final model.

4. Conclusion

The findings of the present study indicate that the competency model of chemistry teachers developed and validated in Iran by Oli et al. (2019) was successfully validated in the Iraqi context, specifically among chemistry teachers in Diwaniyah City, using both exploratory and confirmatory factor analyses. This suggests that the model demonstrates acceptable validity and can serve as an appropriate framework for explaining the professional competencies of chemistry teachers in Iraq. The components of this model include: (1) attitudes and behavioral traits (professional, socio-behavioral, and individual), (2) knowledge and skills (educational, professional teaching, managerial, cultural, subject matter knowledge, and research competencies), and (3) tools, equipment, and required facilities (laboratory tools and equipment, and technology).

In line with the findings of the present study, several previous studies have reported results that are either consistent with or comparable to these findings. Among studies conducted in Iraq, the works of Ibrahim and Al Luqaisi (2023), Daei (2023), Hussein et al. (2023), Abdullah and Ayand (2022), and Taha et al. (2008) reported findings aligned with those of the present study [11], [12], [13], [14], [15], [16], as these studies addressed and identified various components of teacher competency, including professional, socio-behavioral, individual–educational, professional teaching, managerial, cultural, subject matter, research, laboratory, and technological competencies. Similarly, international studies such as those conducted by Karmanova et al. (2024), Yildirim and Akın (2024), Sagimayeva et al. (2024), Mana Risip et al. (2023), Nawafor et al. (2023), Sutoyo and Supardi (2023), and Wang (2021) reported comparable dimensions of teacher professional competency [17], [18], [19], [20], [21], [22]. Therefore, a chemistry teacher competency model previously validated in Iran was also validated in the present study in the Iraqi context, and the findings support the confirmation of the proposed model.

Although this confirmation is valuable and warrants consideration, it should not be interpreted without caution. Interpreting this model as a final and fully efficient framework requires careful reflection, as certain considerations should not be overlooked. These considerations can be examined from both operational and ideological perspectives. From an operational standpoint, professional competency is a broad, abstract, and complex construct, and no single model—including the one examined in this study—can fully capture all of its dimensions. While the present model focuses on one instrumental aspect and two psychological aspects—namely tools and equipment, knowledge and skills, and attitudes and behavioral traits—and although these components are undoubtedly valuable, the concept of chemistry teacher competency cannot be reduced solely to these dimensions. Nevertheless, the question of why such a reduced model continues to be endorsed by Iraqi chemistry teachers may itself invite political and social interpretations. In contexts where opportunities for political dialogue and intercultural exchange among parties and social groups are limited, social and political mechanisms tend to steer dominant discourses toward simplified and reductionist frameworks. In other words, one of the functions of relatively closed societies is to reduce large-scale political and economic issues to micro-level psychological and instrumental matters. Through such mechanisms, political systems may guide public consciousness and social currents toward the formation and acceptance of stereotypical or even superficial beliefs, thereby restricting the space for genuine public discourse. Such processes foster a highly individualistic culture in which the successes and failures of a social system are attributed to individual competencies or technological resources, while deficiencies in policymaking are marginalized.

From an ideological perspective, the discourse of competency and meritocracy itself requires critical reconsideration and deconstructive analysis. The findings of the present study implicitly indicate that chemistry teachers have accepted the competency discourse and regard it as an appropriate framework for application in the Iraqi educational system. However, historical experience demonstrates that meritocracy, if not accompanied by political and economic democracy, may generate harmful consequences and potentially lead to what can be described as a dictatorship of the competent elite. In recent years, a growing global wave of criticism has emerged against meritocracy, arguing that uncritical support for competency-based frameworks is unjustified. According to this perspective, what is currently promoted under the label of meritocracy represents another form of inequality and discrimination that conflicts with democracy and altruism [23], [24]. Although meritocracy ostensibly creates open opportunities for individuals with higher competencies to advance and attain appropriate positions, it often ignores the reality that disadvantaged social classes enter such competition with unequal starting conditions. Some studies have shown that certain cognitive deficiencies may begin during the prenatal period, and thus marginalized social groups, who are consistently exposed to poverty, discrimination, and social stress, are more likely to give birth to children with lower cognitive capacities [25]. Bernstein further argued that the narratives and linguistic codes of lower social classes are largely excluded from school curricula and educational policies; because the language of schooling does not correspond to the linguistic practices of marginalized groups, these students tend to experience weaker academic outcomes [26], [27]. On this basis, discussing competency without considering such structural inequalities may appear discriminatory and unjust. Moreover, some studies suggest that labeling individuals or groups as superior or more competent—even on ethical grounds—may gradually lead them to perceive themselves as exempt from judgment, criticism, or accountability, a tendency fundamentally incompatible with the spirit of democracy and equality [28]. For this reason, many contemporary studies advocate a shift away from meritocracy and emphasize equality and democracy as preferable alternatives [29].

Finally, since the data in this study were collected through a self-report questionnaire, the findings may differ from actual practices within educational organizations. Moreover, the present study focused solely on validating the chemistry teacher competency model among teachers in Diwaniyah City, and therefore the findings cannot be generalized to other organizations, cities, or provinces in Iraq. Nevertheless, given that laboratory tools and scientific equipment emerged as one of the key components of chemistry teacher competency, it is recommended that school laboratories in Diwaniyah be adequately equipped to enhance teachers' professional competencies. Furthermore, as attitudes and behavioral traits, along with knowledge and skills in chemistry, were identified as decisive components of teachers' professional competency, it is recommended that appropriate and effective professional development and empowerment programs be implemented to enhance these competencies among chemistry teachers in Diwaniyah.

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