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Validating the Teacher Collective Efficacy Scale in the Cambodian Context: Exploratory and Confirmatory Factor Analyses

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ABSTRACT

Purpose of the Study: This study is part of a bigger quantitative research design aiming to extract the initial teacher collective efficacy and convergent validity.

Methodology: This study collected data from 619 teachers in secondary resource schools. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were employed using SPSS and Mplus software to assess validity and reliability.

Main Findings: EFA identified two factors with eigenvalues of 5.13 and 1.54, accounting for 55.58% of the variation in teacher collective efficacy. The EFA results showed a single-dimensional factor representing teacher collective efficacy. CFA confirmed that all nine indicators had strong, statistically significant loadings ($p < 0.001$) ranging from 0.65 to 0.78. Fit indices (CFI = 0.97, TLI = 0.96, SRMR = 0.028, RMSEA = 0.057) indicated a very good model fit, supporting the construct validity of the scale.

Novelty/Originality of This Study: This study advances knowledge by validating the measurement of teacher collective efficacy through rigorous statistical analysis. It provides empirical evidence supporting the reliability and validity of the scale, contributing to a better understanding of collective efficacy in secondary resource schools.

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1. INTRODUCTION

Collaborative teacher efficacy is the notion that we can make a positive difference in student learning, classroom issues, and adapting to changing situations [1]-[4]. Organized groups attain goals through collaborative effort in most occupational tasks. Collective action requires more complicated, socially mediated ways to influence than self-direction. Tasks and complementary roles require interdependence. Teamwork needs interconnected tasks, talents, and roles. Coworkers' beliefs, motivation, and performance affect group members, who must coordinate their work with others. Collective efficacy beliefs affect a system's mission and purpose, common commitment to its goals, the group's ability to collaborate and generate outcomes, and its resilience in the face of challenges [5]. Although collective efficacy plays a crucial role in influencing teamwork, school success [6] and student learning achievement [7], the development of teacher collective efficacy scales has evolved with varying numbers of indicators (ranging from 30 to 12) [8], [9] and sub-components (ranging from four to one) [10], [11].

Several studies highlighted the challenges in student academic achievement within Cambodia. For example, PISA-D 2018 indicated that only 8% of 15-year-old students were able to read at a basic level, while

10% and 5% of students of the same age could get basic proficiency in Mathematics and science, respectively [12]. Additionally, in PISA 2022, Cambodian students attained the mean score of 336 in Mathematics, 329 in Reading, and 347 in Science. Their scores were below level 2 and even level 1a in all subjects, except for Science, where they scored slightly above level 1a [13]. These academic challenges underscore the urgent need to improve teacher collective efficacy (TCE) as a useful lever for addressing these issues. Collaborative teacher efficacy is the notion that we can make a positive difference in student learning, classroom issues, and adapting in changing situations [2], [14].

Although prior studies on Collective Teacher Efficacy (CTE) have particularly emphasized distant or broad factors, there is a notable gap in understanding the adjustable contextual factors that directly contribute to the development of TCE tools. Only a limited number of studies have looked into the immediate sources that are crucial for shaping CTE, such as empowered teachers, supportive leadership, and collaboration among teachers. Moreover, the current CTE scales do not adequately account for these contextual factors, which restricts their practical use in educational environments. The instrument developed to measure collective efficacy [15], [16] is useful but possesses theoretical and methodological limitations. Therefore, it would be necessary to assess this scale in a more validated and reliable way. This study seeks to fill these gaps by validating a CTE scale tailored to the Cambodian education system, elucidating the contributions of different factors, and offering practical guidance for educational leaders to bolster collective efficacy in schools [17].

Since most existing TCE scales have been developed and tested in Western or non-Cambodian contexts, this study makes a meaningful contribution by developing and validating a contextually relevant TCE scale, which has not yet been done for Cambodia. There are two main objectives of the present research as follows:

1. To investigate how the initial instruments of teacher collective efficacy can be validated within the Cambodian context using exploratory factor analysis (EFA).
2. To examine the convergent and discriminant validity of the teacher collective efficacy scale after it has been validated and refined.

2. LITERATURE REVIEW

2.1. The Original Construction and Development of Teacher Collective Efficacy (TCE)

Gibson and Dembo's [8] instrument was modified to align with the theoretical model that was established by Tschannen-Moran et al. [18]. This allowed for the development of the collective teacher efficacy instrument that was utilized in the earlier investigations. Gibson and Dembo [8] were the ones who initially developed the 30 items that make up the collective teacher efficacy instrument. When they looked at the internal consistency reliabilities, they found that only sixteen of the thirty items had significant loadings on two factors: personal teaching efficacy and teaching efficacy, which finally loaded on a single dimension, teacher collective efficacy. This fits with Bandura's two-factor model of collective efficacy. Goddard [11], who was always working on ways to measure teacher collective efficacy, began by analyzing the original Gibson and Dembo's [8] instrument. This helped him make a collective teacher efficacy instrument with all of the above wordings. Goddard [11] discovered that the 16 items on the original Gibson and Dembo's [8] instrument only contained positive group competence (GC+) and negative task analysis (TA-). To address this issue, Goddard [11] included several measures that evaluated both the negative competency (GC-) and the positive task analysis (TA+), but found that the items still loaded on a single factor. In the following step, Goddard et al. [10] utilized the 16-item version of Gibson and Dembo's instrument as a starting point in the process of building their scale. They modified the items such that they adhered to the four categories that were specified as (GC +, GC -, TA +, and TA -), resulting in a total of 21 items. They needed to develop items with negative wording to address competence and items with positive wording to address tasks to ensure that their model accurately reflected all four types involved.

Initially, we took the collective teacher efficacy measure from Goddard et al. [10]. This measure incorporates both positive and negative for group competence as well as task analysis. In this modification, Goddard eliminated items that had low factor loadings and added three new items to the group competency dimension. Additionally, he added additional items to the task analysis dimension. Following that, Goddard et al. [9] conducted a study in which they investigated the impact that collective efficacy beliefs have in facilitating student learning. They employed a 12-item short form that was developed from Goddard et al. [9], and they subjected three parcels of these items to confirmatory factor analysis (CFA) using Mplus. These parcels included six items that were related to group competence, three items that were positively written about task analysis, and three items that were negatively worded regarding task analysis. They used Cronbach's alpha to assess the level of internal consistency.

In the same way, Goddard et al. [19] looked into the collective efficacy measure by using Mplus to do CFA on three observed parcels. These parcels included 1) group competence indicators, 2) positively worded task analysis items, and 3) negatively worded task analysis items. Each parcel had strong factor loadings of 0.89, 0.88, and 0.85, respectively, according to the CFA, which supported the existence of a single factor between them.

Skaalvik and Skaalvik [16] used a seven-item scale to measure teacher collective efficacy in a study that was done with Norwegian elementary and middle school teachers. The items were emphasized on teaching, motivation, meeting the students' needs, controlling their conduct, and creating a safe environment. All of the items on the teacher self-efficacy measure focused on what "we" or "teachers at this school" were able to accomplish. They did this to clearly distinguish the differences between items on the scale. "As teachers at this school, we can get even the most difficult students engaged in their schoolwork" is an example of a statement that might be included in this category. They asked participants to rate their responses on a scale ranging from "False" (1) to "True" (6). Unfortunately, there is not much research that investigates the relationships between perceived collective efficacy and individual teacher self-efficacy on a large scale. Some of the few studies that have been done, like those by Goddard and Goddard [20] and Skaalvik and Skaalvik [16], show that perceived collective efficacy and individual teacher self-efficacy are somewhat positively related.

In conclusion, the scales of teacher collective efficacy have been developed and revised several times in the American context, and the number of its subcomponents has appeared different. First, there are four sub-components: (1) positive group competence, (2) negative group competence, (3) positive task analysis, and (4) negative task analysis with 16 items [10]. Second, the researchers subjected three sub-constructs of teacher collective efficacy with 12 items (6 group competence items, 3 positively worded task analysis items, and 3 negatively worded task analysis items) [9]. Third, there is the one-dimensional construct of teacher collective efficacy with seven items used in the Norwegian context [16]. However, there are few studies on the validity and refinement of teacher collective efficacy, mainly in Asian contexts.

2.2. Definition of Teacher Collective Efficacy

Collective efficacy refers to an organization's members' perceptions of "the performance capability of a social system as a whole" [5]. The relationship between performance and efficacy perceptions is strong. Similar to perceived self-efficacy, collective efficacy beliefs affect group tasks, effort, persistence, shared thinking, stress, and achievement. To understand collective efficacy's normative impact, one must appreciate that schools and their cultures create complex and influential social settings for students and teachers [19]. According to Bandura [5], *Analysis of the culture of organizations should be concerned not only with traditions of how things are done but also with shared beliefs about the organization's capabilities to innovate and perform effectively. Because of their diverse impact, an organization's beliefs about its efficacy in producing results are undoubtedly an important feature of its operative culture. (p. 476).*

2.3. The Role of Collective Efficacy in Promoting Student Achievement and Equity

The concept of collective teacher efficacy can be defined as the evaluation of instructors' perceptions of the collective capacity of the faculty to influence student accomplishment. There is a term known as "collective teacher efficacy," which is the idea held by the typical educator that faculty activities will lead to increased student achievement. A debate exists regarding whether or not an evaluation of collective teacher efficacy should ask teachers about themselves or the faculty as a whole. It is needed to consider this. The differences between these two choices are illustrated by the following examples of teacher competency items: 1) A focus on the individual: "I can connect with the most challenging students." 2) Group orientation: "The teachers at this school can connect with the most challenging students." [11]. While this was going on, Tschannen-Moran and Hoy [21] further enlarged the concept of collective teacher efficacy by drawing on the self-efficacy formulation that Bandura [5] had established. According to Goddard and Goddard [20], the term "collective teacher efficacy" (CTE) is used to characterize the influence that the combined efforts of the teaching staff have on the academic performance of the students.

Individual teacher efficacy beliefs help to explain, at least in part, how teachers affect student achievement; for example, Anderson et al. [22] and Ashton and Webb [23]. Similarly, collective efficacy helps to explain, from an organizational point of view, how schools affect teachers and students in different ways. This has been found in the studies by Bandura [24], Goddard [7], Goddard et al. [25], Goddard and Goddard [20], and Ross [26]. This is because a robust feeling of collective efficacy among educators tends to inspire the kinds of effort, inventiveness, and perseverance that are necessary to improve student learning. Specifically, we contend that consistent effort not only leads to increased overall accomplishment but also helps to narrow the achievement gap between different groups of students. As a result, the social cognitive theories we will talk about next have been used in the past to explain differences in average results between groups. However, we think that these same theories may work in schools to promote equity by closing the achievement gap [19].

2.4. The Role of Collective Efficacy in Group Functioning and Organizational Success

According to Sampson et al. [6], collective efficacy ideas can impact both individual and group behavior by establishing expectations that encourage positive behaviors while discouraging negative behaviors that may hinder progress. Sampson and his colleagues say that collective efficacy is an important part of how groups work because it explains how coordinated action produces results. Relational networks that are dense and trustworthy may be an indication of a significant amount of social capital in a group. Sampson and colleagues' results, on the other hand, suggest that social resources can most significantly change outcomes when the collective efficacy of

a group is high enough to motivate its members to reach organizational goals. Human agency, a central assumption in the field of social cognition theory, can explain this relationship between efficacy beliefs and action. The effectiveness of various endeavors significantly influences the decisions that individuals and groups (via individual members) make. The concept of collective efficacy is vital to the concept of organizational agency because it motivates organizations to continuously work toward goals that they believe they are capable of achieving. A strong sense of group efficacy and high expectations are two factors that enhance the achievement of long-term business goals. In this way, collective efficacy beliefs can predict group outcomes [19].

2.5. Task Analysis and Group Competence as Key Factors in Teacher Collective Efficacy

Two variables are necessary for a model of teacher collective efficacy [27]. These two factors are task analysis and group competence. They also believe that teachers' evaluations of group competency depend on the difficulty of the teaching assignment. Despite discussing the teaching task and group competency individually, teachers build impressions of collective efficacy by weighing them together [10]. To achieve collective efficacy, instructional task analysis is the basis. By conducting a teaching task analysis, teachers can determine what exactly they are required to teach. They conduct analyses at both the individual and school levels. Using the research, one could extrapolate what that school's teachers need to succeed. The objectives of the task analysis are determined by the capabilities and motivations of the students, the educational materials, the community resources and limitations, and the physical facilities of the school. In conclusion, instructors evaluate the teaching accomplishments of their school, as well as the obstacles and resources that are available to them [10]. For the group competencies, teachers directly evaluate the teaching abilities of their colleagues based on the teaching task that is assigned to them at their school. At the school level, teaching competence analysis reveals the capabilities, approaches, training, and expertise of the teaching staff. There is a possibility that teaching competency can also be termed positive faculty views on the success of their pupils [10]. However, teacher collective efficacy is measured by a single-dimensional factor. According to Skaalvik and Skaalvik [16], the items included topics such as instruction, motivation, student behavior management, student needs, and concerns around safety.

2.6. One-Dimensional Construct of Teacher Collective Efficacy (TCE)

The numerous loadings in Goddard's [11] study imply that collective teacher efficacy is actually a single construct and is also based on the relationship between teachers' opinions of group competence and task analysis. This is in contrast to the perception that collective teacher efficacy is comprised of two separate and independent conceptions. A model of teacher efficacy developed by Tschannen-Moran et al. [18] is consistent with a single collective efficacy construct. To put it another way, it is difficult for educators to differentiate between their perspectives on the teaching task analysis and their perspectives on the competency of the group. This viewpoint is shared by Pajares [28], who maintains that perceptions of efficacy are task-specific. In a similar manner, all 21 items of the scale loaded significantly on a single factor [29]. After that, they carried out a principal axis factor analysis on the twelve items that were chosen for the condensed questionnaire. The findings indicate that a single component was recovered from a solution that only took into account one factor. This component is responsible for 64.10 percent of the variance and has an eigenvalue of 7.69 [15].

3. RESEARCH METHODOLOGY

3.1. Research design

In this study, a quantitative research design is used to validate and refine the Teacher Collective Efficacy Scale in the context of education in Cambodia. Exploratory Factor Analysis (EFA) was performed to investigate the factor structure of the instrument and confirm its suitability for the Cambodian context. After the validation process, Confirmatory Factor Analysis (CFA) was conducted to evaluate the convergent and discriminant validity of the refined scale.

3.2. Instrumentation

The measures of teacher collective efficacy were based on teacher reports taken from a self-assessment survey. The measurement was adapted from Goddard et al. [9], who used an iterative process related to knowledge of previous studies, principal component factor analysis, and judgments of model fit. The measures of teacher collective efficacy consisted of 12 items from three sub-constructs, including positive group competency (6 items), positive task analysis (3 items), and negative task analysis (3 items). With each subset of task analysis items, half are worded positively, such as "teachers can…" and half are worded negatively, for example, "teachers here cannot…" The negatively worded items were reversed-coded for analysis with the positive items (see Table 1)

3.3. Data Collection Procedure

Researchers collected data using basic measures of collective efficacy created in American contexts [9]. The goal of this research was to get a full grasp of the level of teacher collective efficacy in the context of Cambodian education. The purpose of the survey was to first validate and refine the basic measures and then to evaluate the convergent validity of the instruments in the Cambodian context. Within the context of the criteria

offered by Stanley and Wise [30], this study emphasized the ethical concerns that arise when it comes to the guarantee of privacy, the maintenance of anonymity, and confidentiality. The rationale behind this decision is to lessen the likelihood that the volunteers would experience any psychological hurt, discomfort, or stress. Because of this, participation was entirely voluntary and secure. To ensure that the participants have a complete understanding of the decision they are making, comprehensive information regarding the study was provided to them.

Cambodian educational authorities were contacted to obtain their informed agreement before the study could be carried out in the selected secondary resource schools. The researcher was successful in obtaining authorization from the following authorities: (a) the Ministry of Education Youth and Sports, (b) the head of the Provincial Office of Education Youth and Sport, (c) directors of the 12 schools, and (d) teachers of the schools in three regions that were sampled.

3.4. Sample Demographic Characteristics

The sample selection process involved two stages. In the first stage, 12 secondary resource schools were randomly selected from 50 such schools across four regions in Cambodia, representing three distinct regions. In the second stage, 619 secondary resource school teachers (356 males and 263 females) were randomly chosen from these 12 schools across six provinces. This sample was then used for exploratory factor analysis (EFA) to validate and refine the factors in the Cambodian context, based on the initial factors. Following this, the same sample was used for Confirmatory Factor Analysis (CFA) to assess convergent validity and evaluate model fit [31].

3.5. Data Analysis

3.5.1. Stage 1: Exploratory Factor Analysis

EFA is widely used in the early stages of instrument development to assess whether the items in a questionnaire align with the intended constructs. EFA aims to determine the smaller set of structures of teacher collective efficacy that is best explained by its fundamental items.The axis factor analysis method and oblimin rotation are used to produce the correlated extracted factors with eigenvalues greater than 1.0 using SPSS version 23.0. The initial label of each basic dimension of teacher collective efficacy was reinterpreted to identify the consistency of conceptual meaning revealed by the corresponding items. There are two measures to investigate the fundamental items for the extracted factor structure of each sub-construct: standardized factor loadings and Cronbach's alpha. The accepted cutoff value of standardized factor loading is greater than 0.50 [32], whereas Cronbach's alpha is greater than 0.7 [33].

If some items do not load well on the expected factors, they can be modified or removed before the main study [34]. Although a study may not provide definitive answers, using EFA in the initial stages can help determine whether the constructs being measured make sense and whether the instrument has reasonable construct validity [35]. EFA also plays a critical role in refining a scale by suggesting which items should be retained, revised, or discarded, thereby improving the overall factor structure and ensuring a more reliable final instrument [36]. In this study, Exploratory Factor Analysis (EFA) is used to identify how well the items of each variable group together.

3.5.2 Stage 2: Confirmatory Factor Analysis

Confirmatory Factor Analysis (CFA) is conducted to validate the Teacher Collective Efficacy Scale in terms of convergent and discriminant validity after EFA [37]. Convergent validity was checked through (a) standardized factor loadings, (b) construct reliability (CR), and (c) average variance extracted (AVE)[32]. Discriminant validity was checked by comparing the square root of the AVE of each latent construct with the correlation between that construct and other latent constructs in the model [38]. CFA was conducted using Mplus 7.11. Standardized factor loading denotes the correlation between the variables and the factors. Meanwhile, AVE is a measure of the convergence among a set of items representing a latent construct in Structural Equation Modeling (SEM). It is computed as an average percentage of variance explained among the items of a construct [32]. CR refers to a measure of reliability and internal consistency of the items that represent a latent construct in SEM. The adopted cutoff values of these three statistical measures are as follows: (a) Standardized factor loading is 0.5 and above, AVE is 0.5 and above, and composite validity is 0.7 and above. All the cutoff values are suggested by Hair et al. [32].

Model fit was evaluated to examine whether the CFA model fits the data, based on several fit indices and their cutoff values including chi-square ($3.0 \leq \chi^2/df \leq 5.0$), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Squared Residual (SRMR), and Root Mean Squared Error of Approximation (RMSEA) [32], [39]. When there are more than 250 participants and 30 or more observed variables, the characteristics of model fit are chi-square with significant p-values, CFI or TLI of above 0.92, SRMR of 0.08 or less with CFI above 0.92, and RMSEA of less than 0.07 with CFI of 0.92 or higher [32]. As Kline [39] suggests, it is an excellent fit when RMSEA is less than 0.05, and it is an acceptable fit when RMSEA is below 0.08.

4. RESULTS AND DISCUSSION

4.1. Findings

4.1.1. Validating Tools of Teacher Collective Efficacy

The instrument was certified by a panel consisting of three experts from the Ministry of Education, Youth and Sports, all of whom have doctorates and experience teaching and research at universities, that the survey items selected for this study accurately reflect the substance of collective teacher efficacy. Consequently, we made modifications based on their feedback. Immediately after this, a field test was conducted with the instrument that is detailed in Table 1. Six teachers who took part in the research field test were requested by the researchers to submit comments on the instrument, including their thoughts on its length, item appropriateness, clarity, and any other reactions they had to it. The researchers utilized the feedback from these teachers to enhance the survey instrument before conducting the survey research. None of the educators who participated in the test mentioned any concerns or problems with the instrument.

Table 1. TCE Scales Developed through Feedback from a Panel of Experts

No	ITEM	GC	TA+	TA-
1	We teachers in this school have the ability to get even the most difficult students engaged in their schoolwork.	X		
2	Teachers in this school can prevent mobbing effectively.	X		
3	We teachers in this school are confident that we can motivate students to learn.	X		
4	Teachers in this school can address individual students' needs successfully.	X		
5	We teachers in this school can create a safe and respectful atmosphere even in the most difficult classes.	X		
6	We teachers in this school can succeed in teaching even low-ability students.	X		
7	The students come to school ready to learn		X	
8	The home environment provides so many advantages that students here are likely to learn.		X	
9	The communities provide opportunities that can help students learn successfully.		X	
10	Students in this school are just not motivated to learn			X
11	Learning in this school is much more difficult because students are worried about safety.			X
12	Drug and alcohol abuse in the community makes learning difficult for students here.			X

Following the field test, teachers from 12 secondary resource schools in 12 provinces of Cambodia completed the updated collective teacher efficacy instrument shown in Table 2.

4.1.2. The Results of Exploratory Factor Analysis for TCE

Teachers rated between 1 (strongly disagree) and 5 (strongly agree) on the 12 collective teacher efficacy constructs. The researchers subjected teacher responses to axis factor analysis and oblimin rotation to ascertain the relationship between the items. Two elements became apparent. Table 2 shows the rotational factor loading for each item in the collective teacher efficacy assessment.

Table 2. Rotated Component Matrix for TCE

No	ITEM	Factor one	Factor Two
2	Teachers in this school can prevent mobbing effectively (GC2).	0.80	
6	We teachers in this school can succeed in teaching even low-ability students (GC6).	0.79	-0.104
7	The students come to school ready to learn (TD1).	0.79	
5	We teachers in this school can create a safe and respectful atmosphere even in the most difficult classes (GC5).	0.76	
8	The home environment provides so many advantages that students here are likely to learn (TD2).	0.74	
9	The communities provide opportunities that can help students learn successfully (TD3).	0.74	
4	Teachers in this school can address individual students' needs successfully (GC4).	0.72	

1	We teachers in this school have the ability to get even the most difficult students engaged in their schoolwork (GC1).	0.72	
3	We teachers in this school are confident that we can motivate students to learn (GC3).	0.65	0.26
12	Drug and alcohol abuse in the community makes learning difficult for students here (TD6).	0.29	
10	Students in this school just are not motivated to learn (TD4)		0.86
11	Learning in this school is much more difficult because students are worried about safety (TD5).		0.85

Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy index with the value of 0.874, and Bartlett's test of Sphericity was significant with X^2 (66, N = 619) = 2180.309, $p < 0.001$). This indicated that the data were appropriate for factor analysis. Preliminary factor analysis helped in Table 2 to identify two factors from the collective efficacy items. It was these two factors, with eigenvalues of 5.13 and 1.54, that explained 55.58% of the variation in the collective teacher efficacy items. One exception to this rule is that the items that load on both factor one and factor two (items 3 and 6) primarily reflect the group competence and task analysis dimensions of collective efficacy. This can be seen by looking closely at the factor loading in Table 2 conversely, the two items (item 3 and item 6) demonstrated a slightly higher loading on the expected factor. They significantly score higher on the intended evaluation of the group competency component.

The four items (items 7, 8, 9, and 12) created to gauge the teachers' opinions of the task analysis factor did not load on the intended factor, but they did load highly on the group competence factor, except item 12, which had minimal loading (0.29) on the group competence factor. Since they did not show a strong correlation with their respective components, items with loadings less than 0.40 were deemed to be deleted. The literature's recognized criteria [32], [40], [41] suggest that items with low loadings may not significantly contribute to the tested construct. This criterion is in keeping with such guidelines.

4.1.3. Item Deletion for Negative Task Analysis Factor

There are four main arguments in favor of the idea that collective teacher efficacy is a single component that combines positive task analysis and group competence in the Cambodian context. Initially, the oblique rotation shows that the task analysis component accounts for only 12.81 percent of the variance, significantly less than the group competence factor, which contributes 42.77%. This significant imbalance implies that the teacher collective efficacy construct does not meaningfully incorporate the task analysis component. Well-established research [42] prioritizes the components that offer significant explanatory power to ensure the validity of our assessment scale. Second, one component does not contain sufficient items. The results of the exploratory factor analysis showed that only two items (items 10 and 11) were included in the task analysis component. This clearly showed that the task analysis factor was underrepresented. According to the American Psychological Association [43], the claim is consistent with the requirement that a factor must have sufficient items to support its existence. To ensure a consistent and reliable assessment, we justified the exclusion of related items, as Factor 2 did not meet this requirement. Third, the researcher reverse-coded three items related to the task analysis factor to capture the negative features of collective efficacy. These items may cause respondents to become confused and generate answer bias, which could compromise the measure's clarity, according to the EFA results. Paulhus [44] also mentions the possibility that reverse-coded items could skew response validity, which supports our decision to remove these items to emphasize the advantages of collective efficacy. Fourthly, the noblemen's rotation indicates a 0.96 correlation between task analysis and group competence. This has an extremely high correlation. According to Brown [45], the literature suggests that a one-factor solution would be more suitable, as highly linked components (often above 0.85) may not be sufficiently different to warrant their separation. All things considered, the findings offer scientific evidence that collective teacher efficacy is a single component, which is in line with earlier studies' conclusions [11]-[18].

Finally, it was decided not to include negative task analysis (Factor 2) after a careful look at its low contribution, item loadings, insufficient representation, and the difficulties that come with reverse-coded negative items. This methodology guarantees the validity, reliability, and alignment of our teacher collective efficacy metric with our theoretical framework.

Table 3. Validated and Refined Tools for a Single TCE Factor

No	Item	Factor 1
2	Teachers in this school can prevent mobbing effectively (GC2).	0.78
6	We teachers in this school can succeed in teaching even low-ability students (GC6).	0.78
7	The students come to school ready to learn (TD1)	0.76

5	We teachers in this school can create a safe and respectful atmosphere even in the most difficult classes (GC5).	0.73
8	The home environment provides so many advantages that students here are likely to learn (TD2).	0.71
9	The communities provide opportunities that can help students learn successfully (TD3).	0.70
4	Teachers in this school can address individual students' needs successfully (GC4).	0.68
1	We teachers in this school have the ability to get even the most difficult students engaged in their schoolwork (GC1).	0.67
3	We teachers in this school are confident that we can motivate students to learn (GC3).	0.60

4.1.4. Confirmatory Factor Analysis

Table 4. The factor loadings of teacher collective efficacy

Latent Variable	Indicator	Estimate	S.E.	Est./S.E.	Two-Tailed *P*-Value
TCE by	GC1	0.72	0.030	20.398	0.000
	GC2	0.73	0.028	23.355	0.000
	GC3	0.65	0.031	18.619	0.000
	GC4	0.69	0.027	24.015	0.000
	GC5	0.75	0.029	21.171	0.000
	GC6	0.71	0.026	25.214	0.000
	GC7	0.76	0.027	24.530	0.000
	GC8	0.78	0.029	21.023	0.000
	GC9	0.73	0.030	20.327	0.000

The teacher collective efficacy, the latent variable,e is measured by nine indicators (GC1 to GC9), all of which demonstrate strong and statistically significant factor loadings ($p < 0.001$). All indicators have significant loadings with Est./S.E. values well above the threshold for statistical significance (typically Est./S.E. > 2.0), confirming that the indicators are reliable measures of the latent variable. It is still above the threshold of 0.50, which is typically considered acceptable in many research contexts [32].

The range of estimates (0.65 to 0.78) indicates that the indicators generally exhibit strong correlations with Group Competencies, but there may be slight variation in their contributions to the overall construct. Indicators such as GC1, GC2, GC5, GC6, GC7, GC8, and GC9 contribute more strongly, while GC3 and GC4 contribute less, though still significantly. In short, the teacher collective efficacy (TCE**)** latent variable is well-represented by its nine indicators, all of which show strong and statistically significant loadings. The strongest indicators include GC6 and GC4, while GC8 and GC9 show slightly weaker loadings but are still statistically significant and acceptable. These findings suggest that the teacher collective efficacy construct is reliably measured by its indicators, with minor variations in the strength of individual indicators.

Table 5 Model Fit Evaluation

Items	Estimate				
	Factor loading	Residual variances	CR	AVE	Square Root of AVE
GC1	0.72	0.64			
GC2	0.73	0.59			
GC3	0.65	0.64			
GC4	0.69	0.56			
GC5	0.75	0.59			
GC6	0.71	0.55			
GC7	0.76	0.61			
GC8	0.78	0.69			
GC9	0.73	0.69	0.85	0.53	0.73

4.1.5. Assessing Construct Validity and Model Fit for TCE

Construct validity consists of convergent validity and discriminant validity. The researchers conducted a confirmatory factor analysis (CFA) to evaluate the convergent validity, discriminant validity, and model fit of teacher collective efficacy. Convergent validity consists of average variance extracted (AVE) and composite reliability with the cutoff values of 0.53 and 0.85, respectively.

The CFA results also revealed that the measurement model fits the empirical data very well ($x^2/df = 3.01$, $p < 0.0001$, CFI = 0.97, TLI = 0.96, SRMR = 0.028, and RMSEA = 0.057). This is expected in models with large sample sizes and does not undermine the overall fit. The RMSEA value (90% CI: 0.042–0.073) was close to the ideal range, and both CFI (0.97) and TLI (0.96) exceeded the recommended threshold, indicating strong model performance. The SRMR (0.028) further supported the adequacy of the model. The CFA results indicated an accepted model fit.

4.2. Discussion

After doing an exploratory factor analysis (EFA), it was found that collective teacher efficacy (TCE) is better understood as a single concept than as two separate ones: task analysis and group competence. Initially, two factors emerged from the analysis; however, upon further inspection, it became apparent that the task analysis component accounted for a relatively small portion of the variance, explaining only 12.81% of it. On the other hand, the group competence factor was much more prominent, accounting for 42.77% of the variance.

Items 7, 8, 9, and 12, which belonged to the test task analysis, had higher scores on the group competence component than on the intended factor, task analysis component. This suggests that these items did not sufficiently capture the task analysis dimension. In particular, item 12 had a factor loading on group competence that was very low (0.29), which meant it wasn't a good way to measure the construct. Following the established rules for factor analysis [32], [40], [41], items that had loadings lower than 0.40 were eliminated. This served to bolster the conclusion that the task analysis factor was both underrepresented and redundant.

Furthermore, the reverse-coded task analysis items may have introduced response bias, further undermining the measure's clarity. It was determined by the oblimin rotation that there is a very strong correlation (0.96) between the two factors, which lends credence to the choice to combine them into a single factor. Previous research [43], [45] says that factors that are strongly correlated (above 0.85) should be combined into a single construct. This high correlation suggests that the task analysis and group competence components were not sufficiently different to warrant being separate factors. This is in line with the findings of the previous research.

Findings from the Confirmatory Factor Analysis (CFA) back up both the construct validity and model fit of the TCE model. This is strong evidence to back up these claims. All nine of the indicators that make up the TCE latent variable (GC1 to GC9) have significant factor loadings between 0.65 and 0.78, which means they can all accurately show the TCE latent variable. Even though there is some variance in the strength of these loadings, all of the indicators are statistically significant and meet the frequently accepted criterion of 0.50 [32]. This demonstrates that they are reliable in terms of measuring the TCE construct. Indicators such as GC1, GC2, GC5, GC6, GC7, GC8, and GC9 have substantially higher loadings, while GC3 and GC4 contribute marginally less, despite the fact that their contributions are still significant.

In addition, the results of the CFA indicate that the TCE construct has a high degree of convergent validity. The values of the Composite Reliability (CR) for each indicator are greater than 0.85, which indicates that there is a high level of internal consistency. Furthermore, the values of the Average Variance Extracted (AVE) are higher than the essential threshold of 0.53 for the majority of the indicators. This demonstrates that the indicators sufficiently describe the construct and that the model captures the fundamental aspects of teacher collective efficacy.

Considering the model fit, the CFA results indicate a perfect match between the measurement model and the data. Because the χ^2/df value of 3.01 is within a range that is considered to be acceptable, and because the CFI (0.97) and TLI (0.96) values are higher than the recommended threshold of 0.90, it may be concluded that the model provides an effective explanation for the data. For example, the SRMR value of 0.028 is quite low, which provides more evidence that the model is adequate. On the other hand, the RMSEA value of 0.057 is inside the optimal range, which provides additional confirmation that the model has a high performance.

Overall, these results show that the TCE construct, measured by its nine indicators, is a valid and accurate way to find out how effective teachers are as a group. The notion that the TCE scale successfully reflects the characteristics of teachers' collective views about their power to impact student learning outcomes is supported by the fact that the factor loadings are considerable, the convergent validity is strong, and the model fit is excellent.

The current study found that the scale of TCE is a single construct rather than two separate factors, aligning with the work of Goddard [11] and Skaalvik and Skaalvik [16], who claimed group competence as the central component. The high correlation between the task analysis and group competence factors of the present study is 0.96, which is consistent with Goddard et al. [46], who recommended combining strongly correlated factors. This is also consistent with Gibson and Dembo [8]**,** who found that personal teaching efficacy and teaching efficacy, key factors, finally loaded on a single factor. The Confirmatory Factor Analysis (CFA) findings support the construct validity of the TCE model, which matches results from Goddard et al. [10]. The Composite Reliability

(CR) and Average Variance Extracted (AVE) values in the current study also confirm the reliability of the measure, consistent with Goddard [7].

The current findings, however, stand in contrast to those of Goddard et al. [9], who identified three factors within the TCE scale: positive group competence, positive task analysis, and negative task analysis. A total of 12 items were identified for the TCE scale, including 6 items for the group competence factor, 3 for positive task analysis, and 3 for negative task analysis. Likewise, the current research differs from previous studies by Goddard et al. [10] as well as Goddard [7], which also identified three factors and 12 items for the TCE scale, consistent with the findings of Goddard et al. [9].

The current findings generally support the notion of group competence as the primary factor in TCE, thereby confirming the validity of a unified construct. The findings, however, call for further study investigating task analysis as an independent factor and bring to light new inquiries regarding methodological concerns like response bias. The results infer that TCE is most appropriately viewed as a single, dependable component, but further study, particularly in cross-cultural contexts, is necessary.

The validation of the Teacher Collective Efficacy (TCE) scales in the context of this study gives valuable and refined instruments in the Cambodian context. The findings offer how important it is for teachers to work together and play leadership roles in order to improve student academic achievement. The study provides a more practical and focused method for assessing and enhancing teacher collective efficacy in schools by merging task analysis and group competence into one construct.

Due to the small number of secondary resource schools in Cambodia that were sampled, the study's limitations include a potential restriction of the findings' generalizability. Moreover, the research did not include factors like teacher characteristics or educational policies, which might also affect collective efficacy. To achieve a more comprehensive understanding, future studies should consider these aspects.

To enhance the generalizability of the findings, future studies should broaden the sample of secondary resource schools from various provinces in Cambodia. Longitudinal research on the validation of teacher collective efficacy scales is suggested. Additionally, examining the relationship between collective efficacy and particular educational outcomes would offer valuable insights to provide more insights beyond the TCE scale. Furthermore, conducting comparative studies of various types of schools in Cambodia would assist in pinpointing general factors that affect teacher collective efficacy.

5. CONCLUSION

The first objective of the study is to validate the TCE scale, and exploratory factor analysis (EFA) is used; the present study achieved successful validation of the Teacher Collective Efficacy (TCE) scale in the context of Cambodia. The analysis showed that TCE ought to be viewed as a single construct that merges group competence and task analysis, rather than as two distinct factors. The two factors were identified at first; the task analysis component elucidated only a minor fraction of the variance, in contrast to group competence, which explained the bulk of it. Considering these results, it was determined that the task analysis element was both underrepresented and redundant. Consequently, the decision was made to combine it with group competence into a single construct. Removing items with poor loadings, especially those reverse-coded for task analysis, enhanced the scale's clarity and validity. For the assessment of collective teacher efficacy in Cambodia, the revised TCE scale is more reliable and suitable for the context. This polished model can assist educational leaders in comprehending and improving collective efficacy in schools.

The second aim of the present study is to assess the convergent and discriminant validity of the Teacher Collective Efficacy (TCE) scale via Confirmatory Factor Analysis (CFA), which yielded strong results. The CFA results confirmed that each of the nine indicators of the TCE latent variable (GC1 to GC9) demonstrated strong and statistically significant factor loadings, ranging from 0.65 to 0.78. This indicates that the indicators strongly represent the construct of teacher collective efficacy despite minor differences in their contributions to the overall model. Moreover, the findings from the CFA confirmed that the TCE scale demonstrates strong convergent validity, as indicated by composite reliability (CR) values above 0.85 and average variance extracted (AVE) values surpassing 0.53. The model satisfies the criteria, as evidenced by the χ^2/df ratio, CFI, TLI, and SRMR, which all suggest a good fit with the data. Furthermore, the RMSEA value indicated that the model was robust. The results confirm that the revised TCE scale can be considered reliable and valid for evaluating teacher collective efficacy in Cambodia. This scale provides a clear-cut means of assessing teacher collective efficacy, and the findings reveal that it can serve as a useful resource for educational leaders seeking to improve collective efficacy within Cambodian schools. Further studies could investigate the use of this scale in various educational settings to strengthen verification of its generalizability.

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