

SEARCH FOR EMPOWERMENT STRATEGIES: AN EXAMPLE OF FACTORIAL EXTRACTION

DIAN-FU CHANG^{1,*}, SHENG-NAN CHEN² AND HUNG-JEN WENG³

¹Graduate Institution of Educational Policy and Leadership

³Doctoral Program of Educational Leadership and Technology Management
Tamkang University

No. 151, Yingzhuan Rd., Tamsui Dist., New Taipei City 25137, Taiwan

*Corresponding author: 140626@mail.tku.edu.tw; andyw921@yahoo.com

²Municipal Youn-Fu Elementary School

No. 66, Yuan-Fu St., San-Chun Dist., New Taipei City 24156, Taiwan

shinnerchen@gmail.com

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ABSTRACT. *This study explores the theoretical concepts in previous literature to determine what kind of empowerment strategies fit current education setting. The target group has been selected for the case to reflect the issue in elementary schools in Taiwan. 453 teachers have been selected as voluntary basis to participate in the study. Factor analysis has been conducted to tackle the issues for better solutions. Following the solution algorithm, this study selected 20 indicators related to empowerment from previous literature. After verification by factor analysis, 18 indicators fit in our model and have been classified by four domains. Based on the analysis, this study suggests “participating in decision making”, “lift professional status and impact”, “promote self-efficacy”, and “lift professional autonomy” are workable strategies for school leaders to empower their teachers. Finally, the study suggests the factorial model can be applied to solving similar issue in other settings.*

Keywords: Empowerment, Education leadership, Education management, Factor analysis, Exploratory factor analysis, Confirmatory factor analysis

1. **Introduction.** Numerous studies have presented theoretical models without careful consideration of the relationships between dimensions and the higher-order construct of empowerment [1-3]. Empirical studies can yield very different results, however, depending on the conceptualization of a construct [4-6]. Peterson argued that superordinate models of empowerment have been misspecified and research that tests alternative models at different levels of analysis is needed to advance theory, research, and practice in this area [7]. As Perkins and Zimmerman’s argument, these include a wide diversity of settings, fairly representative of empowerment interventions, and, at the same time, improve clarity of definitions and measurement, which has been a problem in much empowerment research and intervention [8]. In education settings, the elementary schools have been reported experiencing more serious in their empowerment issues [9]. Engaging in theoretical understanding of empowerment, Avidov-Ungar et al. also pointed out that it affects the career characteristics of the teacher, ranging from limited impact of the leadership position to a powerful effect on the organizational culture. Evaluating teachers’ empowerment patterns and accordingly assisting their development toward change are practical way to enhancing empowerment [10].

Based on above discussions, this study argues the different relationships between dimensions and the higher-order construct of empowerment might exist in various settings. This study assumes empowerment might demonstrate a comparable pattern in similar

settings. However, this assumption is insufficient validation by previous studies. Therefore, this study displays the attempt to address the issue systematically in empowerment theory by using factor analysis. Factor analysis is a powerful statistical technique widely used in psychology and the social sciences. This technique simplifies the field by indicating what the important variables are [11]. There are two main types of analyses based on the common factor model: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) [11-13]. EFA and CFA both aim to reproduce the observed relationships among a group of indicators with a smaller set of latent variables/indicators. Typically, EFA aims to explore the field, to discover the main constructs or dimensions. CFA is used to test hypothesis based on previous studies or relevant theory [11].

In this study, factorial extraction has been conducted to integrate a set of indicators to address the concept engagement. It is tendency to conduct EFA. First, this study addresses the related studies in this filed to analyze the notions of empowerment in education settings; second, this study will present a logic of sampling for EFA; third, the factorial extraction method conducted in this study will be addressed; fourth, the result of study will be displayed in Section 4; finally, based on findings, this study makes conclusions and provides suggestions for the field.

2. Construction of Theoretical Concepts and Algorithm of Solution. Based on previous theoretical empowerment, we found the concepts covered 20 related indicators [14-18]. Table 1 displays the 20 indicators extracted from previous research literature.

TABLE 1. The conceptual indicators for empowerment

1. Participate in decision making and implement school plan	11. I can set my teaching schedule in school
2. With responsible for conducting school development plan	12. I can select teaching materials according to the goal
3. Be consulted the main affairs in school	13. I can decide the assignment and evaluation method
4. Engage in new faculty selection	14. I can set counsel guideline or discipline regulations
5. Participate in school-based curriculum and teaching	15. The administrative staff do not intervene my classroom management
6. I can integrate students' need and design teaching	16. My performance has been recognized by colleagues
7. I can assist student learning and enhance their capabilities	17. I have been treated with respect and fairness
8. I feel have great responsibility for student learning	18. I have been respected by students, parents, and community
9. I have professional knowledge in my teaching	19. Discussing in the meeting, I felt comfortable and supportive
10. I can get student's better performance even they are lack of motivation	20. I can impact the other teachers and students

This study offers a hybrid approach based on previous theoretical concepts of empowerment. The step-by-step computation has been presented as follows:

Step 1: Synthesize the theoretical indicators for empowerment in school level;

Step 2: Select target group to verify the structure of empowerment;

Step 3: Decide the fittest samples according to reliable confident level;

Step 4: Design the statistical process by using SPSS (statistical package for social science);

Step 5: Set the selection criteria for analysis which include extraction, rotation, and factor loadings;

Step 6: Rename the factors and make conclusions.

3. Sampling and Data Transformation. We estimated the samples from target group in terms of 16,201 elementary school teachers in New Taipei City [19] with 95% confident level and possible error control under .05. According to the sampling formula proposed by Dillman [20], the satisfied samples for study are 375. The fittest estimated samples based on the target population in New Taipei City are as follows:

$$n = \frac{N}{N \left(\frac{2d}{z_{\alpha/2}} \right)^2 + 1} = \frac{16201}{16201 \times \left(\frac{2 \times 0.05}{1.96} \right)^2 + 1} \approx 375$$

N: 16201 elementary school teachers; *n*: fittest samples; *d*: error of tolerance.

According to the educational statistical data in New Taipei City in 2015 [19], the school scale has been considered and the samples were classified by following the rules: under 12 classes (14 schools), 12-30 classes (7 schools), 31-60 classes (10 schools), and over 61 classes (10 schools). In order to maintain 80 percent return rate, we invited 490 teachers in elementary schools to fill the questionnaires designed for tackle the issues. The distributions of 490 samples have been presented in Table 2.

TABLE 2. Elementary schools and samples distribution in New Taipei City

School scale (classes)	Under 12	13~30	31~60	Over 61	Total
Number of schools (%)	68 (33%)	36 (17%)	51 (25%)	50 (25%)	205 (100%)
Target schools (25%)	14	7	10	10	41
Number of teachers (%)	1,246 (8%)	1,910 (12%)	4,984 (30%)	8,061 (50%)	16,201 (100%)
Samples	70	70	150	200	490
Average samples in each school	5	10	15	20	—

Finally, we successfully collected 453 questionnaires, among which teachers are from 41 elementary schools in New Taipei City (Taiwan). It represents 92.4% of return rate, higher than that we expected. In this case, male teachers are 165 (36.4%), and female teachers are 288 (63.6%). We code the data as SPSS formats to further transform. The SPSS program language for factor analysis has been presented as follows:

FACTOR

/VARIABLES B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 B17 B18

/MISSING LISTWISE

/ANALYSIS B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 B17 B18

/PRINT INITIAL KMO EXTRACTION ROTATION

/FORMAT BLANK(.50)

/PLOT EIGEN

/CRITERIA FACTORS(4) ITERATE(25)

/EXTRACTION ML

/CRITERIA ITERATE(25)

/ROTATION VARIMAX.

EFA is primarily used for data reduction or structure detection. In this study, the purpose of structure detection is to examine the latent relationships among the indicators. The following steps are used to conduct the factor analysis:

- Running the analysis
- KMO and Bartlett’s test

- Total variance explained
- Scree plot
- Justify the factor loadings
- Factor matrix and rotated factor matrix
- Summary

4. **Results.** The EFA shows two tests that indicate the suitability of your data for structure detection. First, the Kaiser-Meyer-Olkin measure of sampling adequacy is .926 that indicates the proportion of variance in the variables that are caused by underlying factors (If the value is less than 0.50, the results of the analysis probably will not be very useful). Second, Bartlett's test of sphericity tests the hypothesis that the correlation matrix is an identity matrix, which indicates that the variables are unrelated and therefore unsuitable for structure detection (Bartlett = 5185.03, $df = 153$, $p = .000$). Small p values (less than 0.05) of the significance level indicate that the analysis is useful with the data.

4.1. **Explanation of variances.** The left section of Table 3 shows the variance explained by the initial solution in principal component analysis according to SPSS. Only four factors in the initial solution have eigenvalues greater than 1. Totally, they account for almost 71% of the variability in the original variables. This suggests that four latent influences are associated with empowerment, but there remains room for some of unexplained variation. The second section of Table 3 displays the variance explained by the extracted factors before rotation. The cumulative variability explained by four factors in the extracted solution is about 71%. The right section of Table 3 demonstrates the variance explained by the extracted factors after rotation. The rotated factor model makes some adjustments to factor 1, factor 2, factor 3, and factor 4 with their rotation sums of squared loadings changed. In this study, factor loadings are correlations of the indicators with the factors. It is used to regard factor loadings are high if they are greater than 0.6 (the positive or negative sign is irrelevant) and moderately high if they are above 0.3. Other loadings can be ignored [11].

4.2. **Strategies selection (criteria).** In the beginning, there are twenty indicators which refer to the concepts of empowerment in previous literature. While the factor analysis indicates 18 indicators work well in the proposed model. Basically, the selection criteria can follow the rule: Eigenvalue > 1 . The scree plot confirms the choice of four components. The scree plot has demonstrated in Figure 1. The rotated factor matrix describes the specific rotation applied to our factor solution. This matrix is used to compute the rotated factor matrix from the original factor matrix, see Table 4.

4.3. **Selecting the sum of square loadings.** The variances of extracted for four factors are 44.06%, 14.36%, 6.66%, and 5.96% respectively. After rotation by Varimax, the four factors' variances display 21.00%, 19.24%, 17.96%, and 12.85%. This study renames the four factors as "Participating in decision making" (1-5 indicators), "Lift professional status and impact" (16-20 indicators), "Promote self-efficacy" (11-14 indicators), and "Lift professional autonomy" (6, 7, 8 and 10 indicators).

5. **Conclusions.** For the purpose to verify the better empowerment strategies for elementary school teachers. This study begins with the literature review to tackle the concepts existing in previous studies. Twenty indicators related to empowerment have been selected from the literature. Then, we design a study to develop a questionnaire to collect the school teachers' perspectives on the empowerment related indicators. By using the EFA and structure detection, this study examined the latent relationships among the indicators. Four factors containing 18 indicators have been selected. Finally, this study

TABLE 3. Total variances explained by initial eigenvalues, extracted factors and rotated factors

Factors	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulated %	Total	% of variance	Cumulated %	Total	% of variance	Cumulated %
1	7.931	44.061	44.061	7.931	44.061	44.061	3.780	21.002	21.002
2	2.585	14.363	58.424	2.585	14.363	58.424	3.463	19.236	40.238
3	1.199	6.663	65.087	1.199	6.663	65.087	3.233	17.963	58.202
4	1.073	5.962	71.049	1.073	5.962	71.049	2.312	12.847	71.049
5	.686	3.812	74.861						
6	.556	3.091	77.952						
7	.546	3.032	80.985						
8	.502	2.788	83.772						
9	.422	2.343	86.115						
10	.375	2.082	88.197						
11	.349	1.937	90.135						
12	.341	1.893	92.028						
13	.300	1.666	93.694						
14	.286	1.592	95.285						
15	.249	1.382	96.668						
16	.225	1.251	97.919						
17	.195	1.081	98.999						
18	.180	1.001	100.000						

Note. Extraction: Varimax; The indicator number 9 and 15 in Table 1 will be deleted for their loading reason.

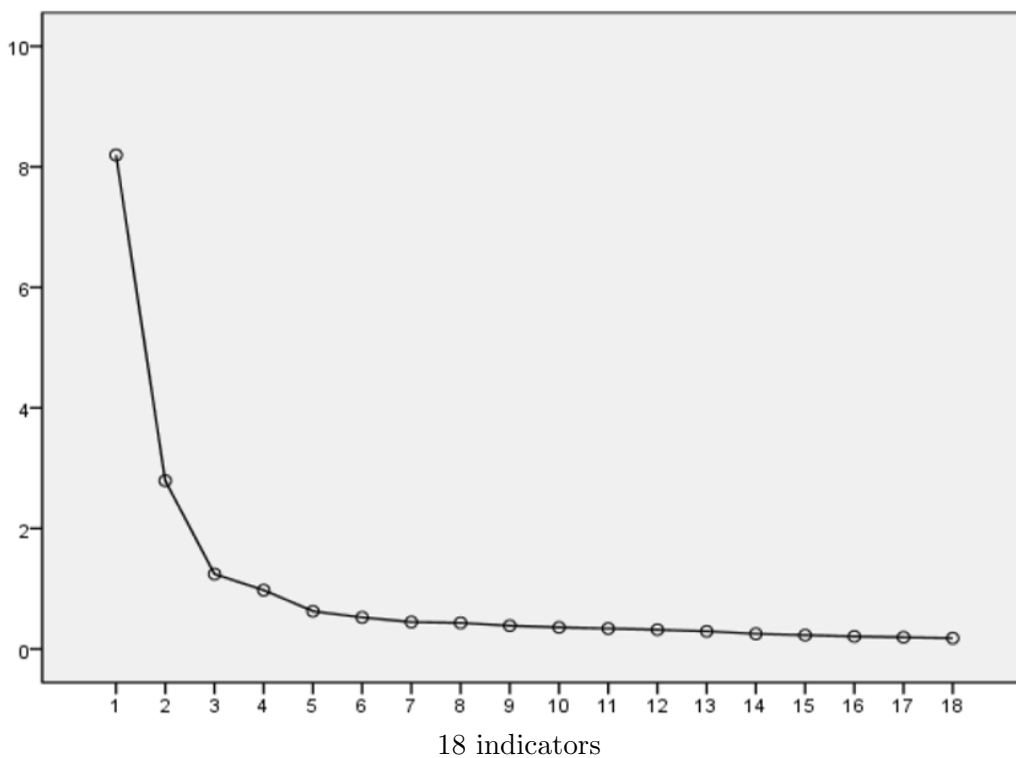


FIGURE 1. The scree plot for factor selection determined by eigenvalues

TABLE 4. Rotated factor matrix

Indicators	Factor			
	1	2	3	4
1	.841			
2	.832			
3	.849			
4	.762			
5	.785			
6				.785
7				.568
8				.737
10				.614
11			.785	
12			.784	
13			.809	
14			.791	
16		.751		
17		.772		
18		.740		
19		.783		
20		.644		

Note. Extraction: Varimax; Rotated method: Kaiser orthogonal Varimax

suggests “participating in decision making”, “lift professional status and impact”, “promote self-efficacy”, and “lift professional autonomy” are workable strategies for school leaders to empower their teachers for better performance.

The relationships between dimensions and the higher-order construct of empowerment are complicated and exist in various patterns in different settings. Even though the process of factor analysis is not so easy to solve the issue, this study provides an example of a specific education setting by way of algorithm solution and step-by-step to follow. The study suggests the factorial model can be applied to other settings to demonstrate the factor structure with similar issues.

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