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The relationship between transformational leadership, teachers' organizational commitment, and job satisfaction: An integrated investigation using meta-analysis and structural equation modeling

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Abstract

This study employs meta-analysis and structural equation modeling (SEM) to examine the relationships between transformational leadership, teachers' organizational commitment, and job satisfaction. Meta-analysis shows significantly positive effects of transformational leadership on job satisfaction (effect size = 0.65) and teachers' organizational commitment (effect size = 0.579), with a significant correlation between teachers' organizational commitment and job satisfaction (effect size =0.681). SEM analysis further indicates direct effects of transformational leadership on teachers' job satisfaction (0.365) and organizational commitment (0.646), as well as a direct effect of teachers' organizational commitment on job satisfaction (0.548). Crucially important is that teachers' organizational commitment serves as a mediator between transformational leadership and job satisfaction, with the estimated mediation effect of 0.354. These findings highlight the importance of enhanced transformational leadership to fostering teachers' organizational commitment and job satisfaction. Future research may deepen into the dimensions and interactions of these variables by adopting a multimethod research design.

Introduction

In recent years, with the acceleration of globalization and technological innovation, school education faces unprecedented challenges and opportunities. To keep pace with the impact of education for sustainable development, transformational leadership has been widely recognized as a vital means to adapt to environmental changes so as to enhance the quality of education. As implementers of school education, teachers' job satisfaction affects the quality and effectiveness of education and teaching. Investigating the impact of transformational leadership

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styles on teachers' job satisfaction bears significances in theoretical and practical implications for school development, teacher well-being and work efficiency, which in turn would lead to the improvement of educational quality.

In the field of organizational behavior, transformational leadership has been widely regarded as a leadership style that promotes innovation and organizational change, and significantly impacts employees' job satisfaction (Bass & Avolio, 1994). Job satisfaction, as a key indicator measuring employees' emotional reactions and attitudes towards their jobs, has profound effects on organizational performance, employee retention, and team collaboration (Judge et al., 2001). Although existing research generally supports the positive impact of transformational leadership on university teachers' job satisfaction, there is still considerable disagreement within the academic community regarding the consistency of its efficacy and the precise mechanisms behind practices of transformational leadership. This divergence stems not only from differences in research methods and sample selection but also from the cultural diversity of research contexts.

Given the limitations present in individual studies, such as sample size, research design differences, and the influence of cultural backgrounds, a comprehensive understanding of the relationship between transformational leadership and teachers' job satisfaction remains elusive. To overcome these limitations, this study employs a systematic integration of existing research through meta-analysis and structural equation modeling path analysis. It aims to evaluate the overall impact of transformational leadership on teachers' job satisfaction comprehensively. By doing so, it seeks to elucidate the extent of its influence and delineate the specific mechanisms through which it operates. The proposed approach provides a theoretical basis and practical guidance for implementing transformational leadership strategies in school education and offers new perspectives and ideas for future research directions.

Literature Review

The theory of transformational leadership was first introduced in 1978, where a distinction was made between transactional and transformational leadership (Burns, 1978). The latter approach highlights the collaborative pursuit of values and goals between leaders and followers, aiming to inspire and elevate the motivations of followers and guide them towards achieving superior performance. This theory was further expanded in 1985, identifying four components of transformational leadership: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration, each of which has the potential to affect employees' intrinsic motivation (Bass, 1985).

The concept of job satisfaction has its roots in the pioneering work of psychologist in the 1950s (Herzberg, 1959). Job satisfaction is defined as "a person's positive emotional response to their job" (Locke, 1976). Specifically, in the field of organizational behavior, job satisfaction is considered a vital indicator of employee feedback regarding their work environment, conditions, and job characteristics.

Organizational commitment was conceptualized as a work-related attitude, characterized as the extent to which an employee aligns with the goals of an organization and desires to remain a part of it (Robbins & Judge, 2016). A three-component model of organizational commitment, including Affective Commitment, Continuance Commitment, and Normative Commitment, was further introduced, marking a pivotal milestone in the exploration of organizational commitment and profoundly enriching the understanding of the concept (Meyer & Allen, 1991).

In the field of education research, Zhang et al. (2022) conducted a detailed analysis of China's education system, revealing a notable positive link between transformational leadership and teachers' Job Satisfaction. This study underscores the critical role of transformational leadership, illustrating how it substantially elevates teachers' job satisfaction through promoting positive identification with their professional environment and responsibilities (Zhang et al., 2022).

Nonetheless, some studies have reported the minimal significance or complexity of the connection between transformational leadership and job satisfaction. One instance is Thien's investigation (2019) into the relationship among distributive leadership functions, readiness for change, and teachers' affective commitment to change. This study found that when transformational leadership acts as a mediating variable, its direct impact on teachers' job satisfaction is complex. Employing Partial Least Squares analysis, this study also revealed that the link between leadership style and job satisfaction is influenced by multiple factors, including organizational readiness for change and the distribution of leadership functions (Thien, 2019). In view of the above discussions, the impact of transformational leadership on job satisfaction may not be linear. Instead. it is affected by a combination of factors such as organizational environment, cultural background, and individual differences. Building upon this foundation, the present study proposes:

H1: Transformational leadership has a significantly positive effect on Teachers' job satisfaction.

Research by Ramalho Luz et al. (2018) highlights the importance of high employee commitment levels in minimizing turnover consequences, suggesting that organizational commitment is positively correlated with the desire to stay within the organization. A recent study by Ji et al. (2022) further supports the notion that affective commitment acts as a mediator in the relationship between transformational leadership and job satisfaction. This research underscores the substantial impact that principals' transformational leadership can wield over teachers' job satisfaction, primarily by fostering of affective commitment. Similarly, Liu (2015) pointed out in a study in Kaohsiung that principals' transformational leadership behavior could enhance teachers' organizational commitment by improving their job satisfaction and sense of identification with the organization (Liu, 2015).

Drawing from the aforementioned findings, the present study suggests that organizational commitment significantly influences the relationship between transformational leadership and job satisfaction. Therefore, the hypotheses are as follows:

H2: A significantly positive relationship exists between transformational leadership and teachers' organizational commitment.

H3: A significantly positive relationship exists between teachers' organizational commitment and job satisfaction.

H4: Teachers' organizational commitment mediates the relationship between transformational leadership and job satisfaction.

Methodology

Research Approach

In the initial phase, the present undertaking primarily utilized the meta-analysis method to conduct a comprehensive and systematic quantitative analysis of correlational results concerning the relationship between transformational leadership and job satisfaction. Building upon results of the meta-analysis, the study further employed Structural Equation Modeling (SEM) to analyze the relationships among transformational leadership, Teachers' Organizational Commitment, and Job Satisfaction through path analysis, which allows for detecting the direct impacts of transformational leadership on teachers' organizational commitment and Job Satisfaction, and estimating the strength and mechanism of Teachers' Organizational Commitment as a mediating variable.

Sample Collection

Theoretically, a meta-analysis should include all accessible published and unpublished research findings, covering four main types of literature: books, journals, dissertations, and unpublished manuscripts. However, studies by Rosenthal (1992) have found no evidence suggesting that some sources are more prone to bias than others among the four main types of literature sources in meta-analysis. This study, therefore, used journals and dissertations as sources of literature, with corrections made for potential sampling biases encountered during the research process.

The search spans from January 2001 to December 2023, employing Chinese and English keywords 'Transformational Leadership', 'Job Satisfaction', 'Organizational Commitment' etc., as preliminary search parameters. Searches were conducted in both Chinese and English databases, including CNKI, WANFANG DATA, Airiti Library, Web of Science, Elsevier Science, EBSCO, Springer Link, PsycINFO (for psychology), and ERIC (for education), eliminating duplicates and samples that do not match the research theme and objectives. Additionally, to avoid omissions, a citation tracing technique was applied to the preliminarily extracted literature by revisiting literature reviews and references of related publications to further track potential literature.

Inclusion Criteria

To ensure the meta-analysis's metric needs were met and heterogeneity among studies were reduced, this study established a set of strict selection criteria prior to collecting literature, aiming to filter studies that meet the research requirements. These criteria include:

Language Limitation: Given the researchers' proficiency in both Chinese and English, which minimizes language interpretation errors, this paper exclusively collected research literature written in these languages. Each selected document must clearly indicate the author(s), publication year, and document type.

Type of Study: The selected studies must be confined to the educational field, specifically quantitative research related to the relationship between transformational leadership style, teachers' job satisfaction, and organizational commitment, and utilize survey methods. Qualitative studies were excluded in the sample for analysis.

Effect Size Requirements: The literature must provide explicit correlation coefficients (*r*-values), sample sizes, and Cronbach's alpha values for the variables. Studies presenting canonical correlation, multiple regression analysis, structural equation modeling, or other quantitative analyses without reporting these numerical values were excluded.

Recency Priority: If there existed multiple pieces of literature on the same research subject, the most recent study results were prioritized for analysis. For studies with duplicate content, the literature offering more comprehensive data are selected for the meta-analysis.

Data Coding

During the data coding phase, this study initially involved a consultation among the three authors to determine the coding contents, which included basic information about the study (such as author names, publication dates), sample sizes, variable correlation values (effect sizes), types of articles (journal articles, dissertations), and Cronbach's alpha values. Subsequently, the first and third authors independently completed the preliminary coding using Excel software. After the content coding was finished, the second author mediated a joint review of the coding results by all three authors, discussing any discrepancies until consensus was reached. This process was adopted to ensure that coding consistency exceeded 90 percent. Then, the study utilized CMA 3.0 (Comprehensive Meta-Analysis 3.0) software to analyze the selected literature, calculate composite effect sizes, and test for heterogeneity and publication bias among the research samples.

Data Processing

CMA 3.0 was employed as a statistical analysis software to input the necessary data for analysis, including the names of the researchers, correlation coefficients, and sample sizes. Given that the data from an ample of studies reported correlation coefficients *(r)*, this research followed the method proposed by Schmidt and Hunter (2015), using the R-to-Fisher's Z transformation steps while adjusting the correlation coefficients, using the number of samples as the weight (Schmidt & Hunter, 2015). This approach is based on the assumption that the larger the sample size, the higher the accuracy of the study; therefore, a higher weight should be assigned.

To convert correlation values to Fisher's z, the formula for Fisher's z transformation in relation to correlation *(r)* was used:

$$z = 0.5 \cdot ln\left(\frac{1+r}{1-r}\right)$$

Where *ln* represents the natural logarithm. The Fisher's z transformation is commonly used to improve the normality of correlation coefficients when performing statistical analyses.

The inverse operation of Fisher's Z transformation is used to convert Z scores back to Pearson correlation coefficients (*r*). The formula is as follows:

$$r = \frac{e^{2z}-1}{e^{2z}+1}$$

Yes, *e* is the base of the natural logarithm. This formula was used to convert Fisher's Z scores back into the original correlation coefficients.

For calculating the 95 percent confidence interval of the original correlation coefficients from the Fisher's Z score, the formula was as shown below:

$$Lower = \bar{E}S - Z_{(1-a)} \times SE_{\bar{E}S}$$

$$Upper = \bar{E}S + Z_{(1-a)} \times SE_{\bar{E}S}$$

Results and Discussion

Coding Results

After collecting samples and screening literature based on the aforementioned inclusion criteria, a total of 34 articles met the conditions and were subjected to further data coding. Studies examining the relationship between transformational leadership and teachers' job satisfaction (hereinafter referred to as AB) included 12 articles for analysis, with correlation coefficients ranging from 0.351 to 0.88 and a total sample size of 6,692 individuals. Table 1 summarizes the main literature samples included in this group.

Thirteen studies explored the relationship between transformational leadership and teachers' organizational commitment (hereinafter referred to as AC). The correlation coefficients ranged from 0.306 to 0.828, and the total sample size was 9,194 individuals. The details of these studies are presented in Table 2.

Eleven studies focused on the relationship between teachers' organizational commitment and job satisfaction (hereinafter referred to as CB). The correlation coefficients ranged from 0.213 to 0.98, with a total sample size of 4,346 individuals. The coding results for this set of studies are shown in Table 3.

Table 1 Summary of Literature Samples (Transformational Leadership*Teachers' Job Satisfaction)

Number	Researcher (Year)	Language	Form	r	Sample Size	TFL Cronbach's α	TJS Cronbach's α
AB01	LIANG, D. C. (2001)	Chinese	Master's Thesis	0.88	686	0.9889	0.9523
AB02	Tian, L. L. (2005)	Chinese	Master's Thesis	0.675	318	0.948	0.836
AB03	Zhou, C. B., and Fan, C. W. (2006)	Chinese	Journal Article	0.708	1120	0.9823	0.9615
AB04	Wang, L. L. (2009)	Chinese	Master's Thesis	0.575	415	0.819	0.894
AB05	LI,D.J. (2010)	Chinese	Master's Thesis	0.531	202	0.955	0.757
AB06	Zhang, X. X. (2012)	Chinese	Master's Thesis	0.351	316	0.881	0.828
AB07	Zhang, X. Z. (2012)	Chinese	Master's Thesis	0.463	465	0.985	0.935
AB08	ZHAO, Q. & XI, R. (2018)	Chinese	Journal Article	0.648	1040	0.97	0.87
AB09	JIA, J.W. (2020)	Chinese	Master's Thesis	0.577	1323	0.969	0.921
AB10	Thein, M. and Vinitwatanakhun (2021)	English	Journal Article	0.675	60	0.948	0.938
AB11	Ji, C., Feng, B., and Zhao, H. (2022)	Chinese	Journal Article	0.721	336	0.959	0.906
AB12	Panagopoulos et al. (2024)	English	Journal Article	0.737	411	0.903	0.93

Table 2 Summary of Literature Samples (Transformational Leadership*Teachers' Organizational Commitment)

Number	Researcher (Year)	Language	Form	r	Sample Size	TFL Cronbach's α	TOC Cronbach's α
AC01	Fun, C. (2005)	Chinese	Journal Article	0.7	1062	0.9435	0.9449
AC02	Tsai, C. (2005)	Chinese	Journal Article	0.624	897	0.9764	0.9026
AC03	Chin, J. M. and Wu, J. (2006)	Chinese	Journal Article	0.633	1035	0.9758	0.85
AC04	Cao, K.Y. (2007)	Chinese	Master's Thesis	0.575	402	0.92	0.91
AC05	Li, D. J. (2010)	Chinese	Master's Thesis	0.306	202	0.955	0.802
AC06	Khasawneh et al. (2012)	English	Journal Article	0.5	340	0.89	0.92
AC07	Tu, T. (2013)	Chinese	Journal Article	0.65	547	0.98	0.93
AC08	Feizi et al. (2014)	English	Journal Article	0.33	196	0.8	0.8
AC09	Xie, C. H. (2017)	Chinese	Journal Article	0.513	198	0.8023	0.8347
AC10	Li, L., Wang, J. P., and Li, X. Y. (2018)	Chinese	Journal Article	0.828	2196	0.971	0.906
AC11	Li, S. N. (2019)	Chinese	Master's Thesis	0.622	484	0.936	0.923
AC12	Han, X. M. (2020)	Chinese	Journal Article	0.488	650	0.943	0.754
AC13	Zhang, W. Y., and Mao, Y. Q. (2022)	Chinese	Journal Article	0.498	985	0.905	0.913

Table 3 Summary of Literature Samples (Teachers' Organizational Commitment*Teachers' Job Satisfaction)

Number	Researcher (Year)	Language	Form	r	Sample Size	TOC Cronbach's α	TJS Cronbach's α
CB01	Feather and Rauter (2004)	English	Journal Article	0.36	154	0.85	0.76
CB02	Li, L. (2007).	Chinese	Master's Thesis	0.817	398	0.857	0.924
CB03	LI,D.J. (2010)	Chinese	Master's Thesis	0.327	202	0.802	0.757
CB04	Peng, J. F. (2011)	Chinese	Master's Thesis	0.213	239	0.857	0.924
CB05	Anari. (2012)	English	Journal Article	0.497	84	0.71	0.75
CB06	Zhang, S, W. (2015)	Chinese	Master's Thesis	0.577	350	0.793	0.948
CB07	Mouloud et al. (2016)	English	Journal Article	0.98	100	0.989	0.99
CB08	Chen, X. Y., and Liu, X. (2021)	Chinese	Journal Article	0.42	1800	0.84	0.89
CB09	Luo, J. J. (2022).	Chinese	Master's Thesis	0.662	432	0.802	0.757
CB10	Cayupe et al. (2023)	English	Journal Article	0.68	300	0.98	0.88
CB11	Harb et al. (2023)	English	Journal Article	0.908	287	0.806	0.839

Note: Table 1, Table 2, Table 3

A = TFL = Transformational Leadership; B = TJS = Teachers' Job Satisfaction; C = TOC = Teachers' Organizational Commitment

AB05, AC05, and CB03 are from the same publication and have been individually accounted for in the studies of different variable relationships.

Heterogeneity Test Results

The heterogeneity of effect sizes was computed using the Cochrane Q test, p value testing, I^2 heterogeneity indicators, and tau-squared (tau²) values. The Q statistic (including p value testing) was primarily used to test for the presence of heterogeneity. The I^2 heterogeneity indicator reports values between 0 and 100 percent, with heterogeneity categorized as low (25%), moderate (50%), and high (75%). The tau² value indicates the degree of dispersion of effect sizes, with larger values indicating greater heterogeneity between groups.

According to the meta-analysis results (Table 4), the heterogeneity test results for the AB studies show significant heterogeneity across studies (Q = 391.583, p < .001), with a tau² value of 0.065 and an I-squared (I^2) value of 97.19 percent.

The AC studies' heterogeneity test results yielded a high heterogeneity across studies (Q = 570.187, p < .001), with a tau² value of 0.069 and an I^2 value of 97.9 percent.

Similarly, the CB studies' heterogeneity test results also indicated a high heterogeneity across studies (Q = 737.38, p < .001), with a tau² value of 0.215 and an I^2 value of 98.64 percent. Given that the I^2 values for all three relationships exceeded 75 percent, it suggested that nearly all variations are due to heterogeneity between studies rather than chance error. In cases of high heterogeneity, employing a random effects model is more appropriate than a fixed effects model. Consequently, subsequent research in the present study primarily utilized a random effects model to explore potential moderating variables, thereby enhancing our understanding the heterogeneity of effect sizes.

Publication Bias Test Results

Sharpe (1997) noted that some significant research papers might be excluded from analyses, making it impossible to compile a complete collection of similar studies—a situation that can lead to publication bias due to missing values. A funnel plot is a primarily visual tool used to assess publication bias. If the plot demonstrates symmetry around the central effect size, it indicates no publication bias. However, due to the potential subjectivity of this method, this paper employed Egger's linear regression test, the non-parametric rank correlation (Begg) test, and the fail-safe number to provide auxiliary validations.

From Table 5, it can be seen that the effect sizes for research items AB, AC, and CB are primarily concentrated at the top of the funnel plot and are symmetrically distributed around the mean effect size, indicating no issue with publication bias.

From Table 6, the actual test values indicate the following: Regarding the AB relationship based on the Egger regression test, the beta coefficient was -1.901; the standard error was 5.225; the corresponding t-value was -0.364, with 10 degrees of freedom. The p value of 0.724 indicated that there was not enough statistical evidence to support the presence of publication bias. In the Begg and Mazumdar rank correlation test, Kendall's S statistic (P-Q) was -8, the unadjusted Kendall's tau value was -0.121; the corresponding z-value was 0.549, and the two-tailed p value was .583, suggesting that there existed insufficient statistical evidence to support the presence of publication bias.

Table 4 Summary of Meta-Analysis Results (Including Heterogeneity Findings)

	Meta-Analysis Results							Heterogeneity Findings				
	Mode	Number Studies	Point estimate		95%CI	Z	P	Q	df (Q)	P	I^2(%)	tau2
AB	Fixed	12	0.664	0.650	0.677	65.232	0	391.583	11.000	0.000	97.191	0.065
	Random effects	12	0.650	0.556	0.728	10.261	0					
AC	Fixed	13	0.661	0.649	0.672	76.026	0	570.187	12.000	0.000	97.895	0.069
	Random effects	13	0.579	0.474	0.667	8.899	0					
CB	Fixed	11	0.594	0.574	0.613	44.876	0	737.380	10.000	0.000	98.644	0.215
	Random effects	11	0.681	0.504	0.803	5.884	0					

Table 5 Funnel Plot for AB, AC, and CB Studies

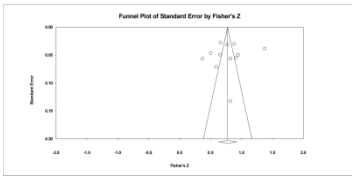
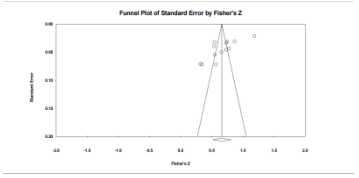
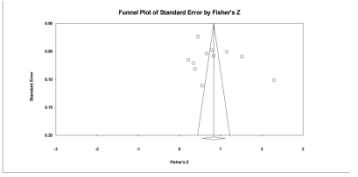
AB	AC	CB
		

Table 6 Publication Bias Test Results for AB, AC, and CB Studies

	Edger's linear regression test					the non-parametric rank correlation (Begg) test				Classic Fail-safe N					
	beta1	SE	t	df	p(2-tailed)	Kendall's score	tau	z	p (2-tailed)	z	p	Alpha	z for Alpha	k	Fail-safe N
AB	-1.901	5.225	-0.364	10	0.724	-8	-0.121	0.549	0.583	60.487	0	0.05	1.96	12	1418
AC	-14.646	3.725	3.932	11	0.002	-32	-0.410	1.952	0.051	65.03	0	0.05	1.96	13	4299
CB	7.998	5.705	1.402	9	0.195	7	0.128	0.545	0.586	45.424	0	0.05	1.96	11	5898

According to the findings by Rhoades and Eisenberger (2002) and Rosenthal (1979), the Fail-safe N should be five times the number of studies included in the analysis (k) plus 10, following the "5k + 10" rule (Rhoades & Eisenberger, 2002) (Rosenthal, 1991). In the classic fail-safe N test, the *Z* value for assessing publication bias was 60.48739, with a *p* value of 0, and a fail-safe number of 1418, demonstrating a minimal likelihood of publication bias, which allowed for the direct use of the calculated pool of effect size for further research.

With respect to the AC relationship, based on the Egger regression test, the beta value was -14.646; the standard error was 3.725, the *t*-value was -3.932, with 11 degrees of freedom, and the *p* value of .002. This result suggested the possibility of statistically significant publication bias. However, based on the Begg and Mazumdar rank correlation test, Kendall's S statistic (P-Q) was -32; the unadjusted tau value was -0.410, with a z-value of 1.952, and a *p* value of .051, indicating that the presence of publication bias was not present.

According to Rosenthal's "5k+10" rule, the classic fail-safe N analysis yielded a Z value of 65.03, with *p* value of .000, and a fail-safe number of 4,299, suggesting that at least 4,299 unpublished studies needed to raise the overall *p* value above .05. The above findings also indicated a strong resistance of the analysis results to unpublished studies and implied a minimal likelihood of publication bias. Considering the above results, the study concluded that there was no publication bias in the relationship between transformational leadership and organizational commitment, and the calculated pool of effect size can be used directly for further research.

For the CB relationship, the Egger regression test provided the beta value of 7.998, the standard error of 5.705, the t-value of 1.402, a *p* value of .195. In the Begg and Mazumdar rank correlation test, Kendall's S statistic (P-Q) was 7; the unadjusted tau value was 0.128, with a z-value of .545, and a *p* value of .586. In the classic fail-safe N test, the Z value for assessing publication bias was 45.424, with a *p* value of .000, and a fail-safe number of 5898. All three tests indicated no apparent publication bias, allowing for the direct use of the calculated pool of effect size for further research.

Path Analysis Results

To verify the relationship model among transformational leadership, teachers' organizational commitment and job satisfaction, a correlation matrix was established using the correlation coefficients between these variables. The weighted average values of random effects were utilized in the analysis. The correlation matrix is presented in Table 7.

Table 7 Meta-analysis Effect Value Correlation Matrix Based on Structural Equation Model

Variable	Cronbach's α	1-α	$\sqrt{\alpha}$	A	B	C
A	0.932	0.068	0.965	1		
B	0.876	0.124	0.936	0.65	1	
C	0.861	0.139	0.928	0.579	0.681	1

After the relevant matrices are established, the harmonic mean of the sample sizes for three research topics of transformational leadership, teachers' organizational commitment, and job satisfaction needed to be calculated. This harmonic mean would serve as the sample size for structural equation model validation analysis. The formula for calculating the harmonic mean is as follows:

$$H = \frac{1}{\frac{1}{m}\sum_{i=1}^{m}\frac{1}{n_i}}$$

According to the approach proposed by Viswesvaran and Ones (1995), the sample sizes for the three research topics are provided as follows: 6692, 9194, and 4346, respectively. Taking the harmonic mean of these three values yields 6,144, which served as the sample size for model validation analysis. Based on the principle of structural equation model reliability, the variance of measurement residuals was set to 1−α (where α represents the average reliability), and the non-standardized factor loadings are determined $\sqrt{\alpha}$. The sample size for the model, set at 6,144, was the harmonic mean of the sample sizes from each study. The model was then imported into AMOS 24.0 software for path analysis to validate

the conceptual model, as illustrated in Figure 1. Model estimation was conducted using the maximum likelihood method, resulting in both CFI and GFI values reaching 1.000. This demonstrated excellent model fit and reflected strong consistency between the observed data and the model expectations.

Direct effects

Direct effects, i.e., path coefficients, are shown in Table 8. The estimated impact of transformational leadership (A) on teachers' organizational commitment (C) was 0.646, with a standard error of 0.012 and a critical ratio (C.R.) of 55.510. The *p* value displayed as ***, indicated that this estimate was highly significant. Similarly, the impact of teachers' organizational commitment (C) on teachers' job satisfaction (B) was estimated at 0.548, with a standard error of 0.014 and a critical ratio of 39.660, which was highly significant. The direct impact of transformational leadership (A) on teachers' job satisfaction (B) is estimated at 0.365, with a standard error of 0.013 and a critical ratio of 27.476, and again highly significant.

Indirect Effects

In line with the research hypotheses, indirect effects here referred to the effect of the independent variable on the dependent variable through an intervening variable. Referring to the model displayed in Figure 4-1, transformational leadership (A) served as the independent variable, teachers' job satisfaction (B) as the dependent variable, and teachers' organizational commitment (C) as the mediating variable. This study employed the Monte Carlo Confidence Interval Method to estimate the mediating effect. This approach calculates the confidence interval for the product of coefficients a and b, based on their point estimates, which helps determine the significance of the mediating effect (Preacher & Selig, 2012).

The total effect of transformational leadership (A) on teachers' job satisfaction (B) was 0.719, which included both the direct effect (0.365) and the indirect effect through teachers' organizational commitment (C) (0.354). Teachers' organizational commitment (TOC) was strongly influenced by transformational leadership (A) (0.600), and similarly, teachers' job satisfaction (TJS) was influenced by both variables (A: 0.673, C: 0.513). Specific effect values are detailed in Table 9.

Table 8 Summary of Path Analysis Results

DV <--- IV	Estimate	*SE*	*CR*	*p*
C <--- A	0.646	0.012	55.510	<.001***
B <--- C	0.548	0.014	39.660	<.001***
B <--- A	0.365	0.013	27.476	<.001***

Note: ****P<.001*

Table 9 Direct, Indirect, and Total Effects Table

Path	Direct	Indirect	Total Effects Table	Standardized Direct Effects	Standardized Indirect Effects	Standardized Total
C <--- A	0.646	NA	0.646	0.646	NA	0.646
B <--- C	0.548	NA	0.548	0.548	NA	0.548
B <--- A	0.365	0.354	0.719	0.365	0.354	0.719
TOC <--- A	NA	0.6	0.6	NA	0.6	0.6
TJS <--- A	NA	0.673	0.673	NA	0.673	0.673
TJS <--- C	NA	0.513	0.513	NA	0.513	0.513

Note: *CR* stands for Critical Ratio. NA stands for Not Applicable, which means it is not applicable for fixed parameters or when the standard error and *CR* values for calculated indirect effects are not provided.

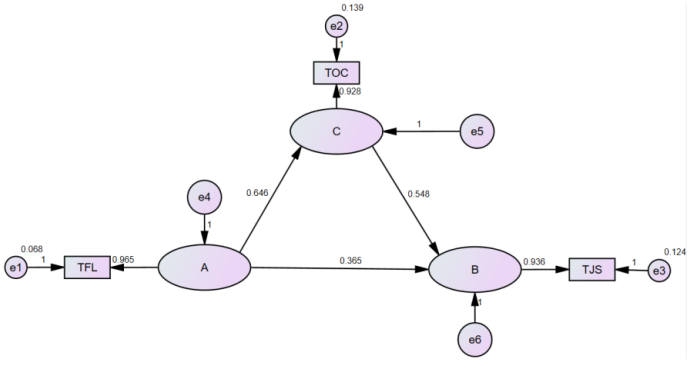


Figure 1 Path Analysis Diagram (Data computed by AMOS 24.0 software)

Conclusion and Recommendation

Positive Relationships Among Transformational Leadership, Teachers' Organizational Commitment, And Job Satisfaction

The results of the meta-analysis revealed that there existed a positive relationship between transformational leadership and teachers' job satisfaction. Utilizing a random-effects model, the overall correlation coefficient was calculated at 0.650, with a 95 percent confidence interval ranging from 0.556 to 0.728. The Z-value was 10.261, with a p value of .000. The meta-analysis results strongly demonstrated a significant positive correlation between transformational leadership and teachers' job satisfaction.

Similarly, the relationship between transformational leadership and teachers' organizational commitment was examined. The overall correlation coefficient, calculated by a random-effects model, was found to be 0.579, with a 95 percent confidence interval ranging from 0.474 to 0.667. The Z value was 8.899, with a p value of .000. These findings suggested that even after considering heterogeneity among studies, the positive correlation between transformational leadership and teachers' organizational commitment remains statistically significant.

Furthermore, the relationship between teachers' organizational commitment and job satisfaction was explored. Employing a random-effects model, the overall correlation coefficient was found to be 0.681, with a 95 percent confidence interval ranging from 0.504 to 0.803. The Z value was 5.884, with a p value of 0.000. The meta-analysis results clearly showed a significantly positive correlation between teachers' organizational commitment and job satisfaction.

Collectively, the interrelationships among the three variables in the educational domain exhibit moderate to high effects. The research findings support H1, H2, and H3, indicating that there were significantly positive correlations between transformational leadership and teachers' job satisfaction, and between transformational leadership and teachers' organizational commitment, and between teachers' organizational commitment and job satisfaction.

Teachers' organizational commitment Mediates the Relationship between Transformational Leadership and Job Satisfaction

The results of the structural equation model revealed that the direct effect estimate of transformational leadership on teachers' job satisfaction was 0.365 ($p <$ .001), demonstrating that transformational leadership directly and positively predicts job satisfaction in a significant manner. In addition, the direct effect of transformational leadership on teachers' Organizational Commitment was 0.646 ($p <$ .001), while the direct effect of teachers' organizational commitment on job satisfaction was 0.548 ($p <$ .001), implying that teachers' organizational commitment not only received a positive influence from transformational leadership but also directly and positively affected job satisfaction. Importantly, transformational leadership exerted a significantly indirect effect on job satisfaction through Teachers' organizational commitment, with an estimate of 0.354 ($p <$ 0.001), further enhancing job satisfaction. The total effect of these direct and indirect effects in the model was 0.719 ($p <$ .001), confirming that the mediating role of Teachers' organizational commitment was not only significant but also substantial. Based on the set findings, the research results supported H4: Teachers' organizational commitment mediates the relationship between transformational leadership and job satisfaction.

Given these findings, it becomes clear that school administrators must recognize the key role of transformational leadership in fostering teachers' job satisfaction. Transformational leadership positively affects not only teachers' job satisfaction directly but also through enhancing their organizational commitment. Therefore, school leaders should implement teacher-centered transformational leadership strategies that strengthen teachers' emotional identification with the organization and increase their organizational commitment. This, in turn, boosts teachers' motivation and job satisfaction. Moreover, by focusing on personalized care, motivation, and professional development support, school management can further align teachers with the school's goals and values, improving their performance and reducing turnover rates. Consequently, educational policymakers and administrators should view transformational leadership as a critical strategic tool for advancing school reform and teacher development, ultimately contributing to a more supportive and innovative school organizational culture.

Research Limitations and Recommendations for Future Research

The present study primarily extracted journal articles and dissertations as information sources, aiming to utilize the complete data for meta-analysis. Journal articles were selected for their rigorous peer-review process, ensuring the reliability of the information, while dissertations provided more detailed reports of data and results.

While the current study has provided insights into the overall positive correlations among the three variables, Future research may consider disaggregating transformational leadership, Teachers' organizational commitment, and job satisfaction into more detailed sub-dimensions.

After breaking down the variables into sub-dimensions, researchers should measure and analyze the correlation coefficients among these dimensions to further reveal the dynamic relationships within each dimension. This approach can help pinpoint which specific leadership behaviors are most effective in enhancing Teachers' organizational commitment and job satisfaction.

In terms of research methodology, future studies could consider the use of mixed research methods, such as combining quantitative and qualitative approaches, By adopting the above recommendations, future research can advance our understanding of the nuanced relationships among transformational leadership, Teachers' organizational commitment, and job satisfaction, leading to more effective strategies for enhancing teachers' well-being and organizational effectiveness in educational settings.

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