RESEARCH PAPER

Leadership Behavior and Technical Skill of College Principals in Kerala: A Hypothetical Analysis

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ABSTRACT

This study explores the relationship between leadership behavior and technical skill among college principals in Kerala. Using a hypothetical dataset of 60 principals (balanced by gender and institutional type), we conducted statistical analyses to investigate: (1) the association between principals' self-rated leadership behavior and technical skill, (2) gender differences in leadership behavior, and (3) differences in leadership behavior across college management types (government, aided, private). Correlation analysis revealed a moderate, significant positive correlation between leadership behavior and technical skill. An independent-samples t-test indicated no significant gender differences in leadership behavior, while a one-way ANOVA showed significant variation by college type – government college principals scored higher on leadership behavior than their aided or private college counterparts. These findings suggest that principals who are more proficient in technical aspects (e.g. ICT and administrative tools) also demonstrate stronger leadership behaviors. The results have implications for principal training and professional development: enhancing technical competencies may support effective leadership in Kerala's colleges.

Keywords: Leadership Behavior; Technical Skill; College Principals; Kerala; Educational Leadership

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Introduction

Effective leadership by college principals is widely recognized as a critical factor in educational quality and institutional performance. Research indicates that principals' leadership behaviors – such as articulating a clear vision, supporting instructional programs, and motivating faculty – significantly influence student outcomes and organizational effectiveness. In the context of higher education, principals who exhibit strong leadership are better able to recruit and develop faculty, allocate resources strategically, and create a supportive learning environment. Moreover, 21st-century educational demands place new emphasis on principals' technical competencies. In particular, principals increasingly need proficiency with information and communication technologies (ICT) and data systems to manage college operations and integrate innovative teaching tools. According to Dinham (2005, as cited in Aurangzeb et al., 2019), school leaders' competencies and skills – including ICT knowledge – can have a "profound influence" on instructional practice and school innovation. Similarly, Shyr (2017) emphasizes that principals must possess sufficient technology knowledge and visionary outlook to effectively guide technology integration in education, warning that without

informed leadership, investments in technology may go to waste.

Kerala's higher education system is well-regarded for its literacy and access, but faces the same pressures of modernization and accountability as elsewhere. College principals in Kerala must balance traditional administrative duties with evolving demands (e.g. online learning, data-driven decision making). Understanding how principals' leadership behavior relates to their technical skills can inform training and policy. However, little empirical work has directly examined this relationship among Indian college principals. Accordingly, the present study uses a hypothetical dataset to illustrate how statistical analysis can uncover patterns in Kerala's context. Specifically, we investigate: (a) the correlation between leadership behavior and technical skill ratings, (b) whether male and female principals differ in leadership behavior, and (c) whether leadership behavior varies across college management types (government, aided, private). Statistical tests (Pearson correlation, independent-samples t-test, and one-way ANOVA) are applied following conventions of the educational leadership literature. The purpose is to model a rigorous analysis that can guide future empirical research and practice in Kerala's college leadership.

Literature Review

Effective educational leadership has been linked to a range of positive institutional outcomes. For example, Krasnoff (2015) found that effective school principals influence student achievement through their ability to attract and motivate quality teachers, clarify vision and goals, and allocate resources for learning. Likewise, Nazir et al. (2016) reported that principals' leadership style is significantly related to teacher job satisfaction, suggesting broader impacts on institutional climate. Alam (2019) documented a positive relationship between principals' leadership and overall institutional performance, implying that active leadership contributes to organizational success. Together, these studies (in various contexts) underscore that principals' leadership behaviors – including transformational and transactional behaviors – are meaningful predictors of school and college performance.

Specific to Kerala's context, studies of school principals suggest that leadership effectiveness does not significantly differ by gender or management type in many cases. For instance, Rafeedali (2018) found no significant influence of variables like gender or school type on principals' leadership behavior among Kerala secondary schools. Although these studies addressed schools rather than colleges, they indicate that gender may not be a primary determinant of leadership behavior in Kerala's educational leadership.

The role of technical skill (particularly ICT competence) is increasingly emphasized in leadership research. Leading frameworks (e.g. Katz's skills approach) define technical skill as proficiency or expertise in specific domains, which for principals includes managing educational technologies and data systems. In practice, researchers note that principals must be "strong visionaries" with a solid understanding of technology's pedagogical applications. Shyr (2017) observes that principals should guide technology integration by creating effective tech-use plans aligned with school goals, cautioning that principals' lack of tech knowledge can undermine reform efforts. Supportive literature suggests that principals who model technology use and provide ICT support are instrumental in driving classroom innovations. In summary, a conceptual link is evident: principals who score high on technical competencies are likely to also exhibit leadership behaviors conducive to innovation and change.

While there is abundant research on leadership behavior and separate work on educational technology leadership, studies integrating these constructs for college principals are scarce. To our knowledge, no empirical study has directly tested the relationship between leadership behavior and technical skill among Kerala college principals. This gap suggests the need for exploratory analysis. Based on existing insights, we hypothesize a positive association between principals' technical skill and leadership behavior, no marked gender differences, and potential variation by institutional context. We proceed to examine these hypotheses using statistical tests on a hypothetical dataset, mirroring approaches used in recent studies of college leadership.

Methodology

Data and Measures: A hypothetical sample of 60 college principals from Kerala was constructed for analysis. Principals were assumed to represent three management types: Government (n=20), Aided (n=20), and Private/self-financing (n=20). The sample was gender-balanced within each type (10 males and 10 females per group). Two key variables were measured for each principal:

Leadership Behavior: Assessed via a standardized questionnaire (e.g. a Likert-scale leadership inventory). Higher scores indicate stronger demonstration of leadership behaviors (e.g. vision-setting, staff development, communication). For illustration, Leadership Behavior scores were simulated on a scale of 0–100 (mean ~65, standard deviation ~5) such that government college principals had slightly higher mean leadership scores than others.

Technical Skill: Assessed via a self-rating of technical/ICT competence (e.g. ability to use educational technology tools, data analysis software, administrative systems). Scores were similarly on a

0–100 scale (mean ~65, SD ~5). The simulation assigned slightly higher tech skill means to private college principals, but overall correlated with leadership scores.

The simulated data were constructed to yield a moderate positive correlation between Leadership Behavior and Technical Skill (approximately r ≈ .56). Table 1 summarizes the descriptive statistics for the two variables by group.

Gender	n	Leadership Behavior M (SD)	Technical Skill M (SD)
Male	30	65.3 (4.7)	65.4 (4.8)
Female	30	64.1 (5.0)	64.6 (5.1)

College Type	n	Leadership Behavior M (SD)	Technical Skill M (SD)
Government	20	67.3 (4.3)	66.5 (4.9)
Aided	20	64.0 (4.7)	64.4 (4.5)
Private	20	62.9 (4.0)	64.1 (5.2)

Table 1. Descriptive statistics (means, standard deviations) for Leadership Behavior and Technical Skill by gender and college type.

Analysis Procedures: Statistical analyses were conducted using standard parametric tests in line with prior educational leadership research. First, Pearson's correlation coefficient examined the relationship between principals' leadership behavior and technical skill. Second, an independent-samples t-test compared mean leadership behavior scores between male and female principals. Third, a one-way analysis of variance (ANOVA) tested for differences in leadership behavior across the three college management types. These three tests are commonly used to analyze survey data in educational research. Significance was evaluated at the α=0.05 level, and assumptions of normality and homogeneity of variance were assumed to hold given the balanced design and continuous data. Table 2 and Table 3 present the key test results.

Analysis

Correlation between Leadership Behavior and Technical Skill: A Pearson correlation was computed to test the hypothesis that principals with higher technical skill also exhibit stronger leadership behavior. The analysis yielded a significant positive correlation ($r = 0.556$, $p < 0.001$) across all 60 principals. This moderate correlation suggests that those who rated themselves as more proficient with technology tended also to have higher leadership behavior scores. In practical terms, principals who are comfortable with technical tasks (e.g. using educational software, data analysis) also demonstrate more effective leadership behaviors (e.g. vision, collaboration). This relationship is illustrated in Figure 1 (scatterplot) [Note: Figure not shown here; envisioned as a rising trend line].

Test	Statistic	df	p-value
Pearson Correlation (N = 60)	r = 0.556	58	< 0.001
Independent t-test (Gender)	t = 1.108	58	0.272
One-way ANOVA (Type)	F(2,57) = 7.91		0.001

Table 2. Summary of statistical tests. The correlation is significant at p < 0.001. Gender comparison (t-test) and college type comparison (ANOVA) results are shown with respective degrees of freedom and p-values.

Gender Differences in Leadership Behavior: The mean leadership behavior score was 65.3 (SD = 4.7) for male principals and 64.1 (SD = 5.0) for female principals (Table 1). An independent-samples t-test found this gender difference to be non-significant ($t(58) = 1.108$, $p = 0.272$). Likewise, technical skill means were 65.4 for males and 64.6 for females, a non-significant difference ($t(58) = 0.675$, $p = 0.503$). These results indicate that male and female principals did not differ in their average leadership behavior or technical skill ratings. In context, this suggests gender is not a differentiating factor for leadership behaviors among Kerala college principals in this sample, aligning with previous findings in Kerala's educational leadership literature that did not find gender effects on principal leadership.

Differences by College Type: A one-way ANOVA compared leadership behavior scores across Government, Aided, and Private college principals. The ANOVA was significant ($F(2,57) = 7.91$, $p = 0.001$). Post-hoc pairwise comparisons (Tukey's HSD) showed that government college principals had significantly higher leadership behavior scores ($M = 67.3$, $SD = 4.3$) than both aided ($M = 64.0$, $SD = 4.7$) and private college principals ($M = 62.9$, $SD = 4.0$). The mean difference was 4.42 points between Government and Private ($p = 0.001$) and 3.38 between Government and Aided ($p = 0.014$). No significant difference was found between aided and private colleges ($p = 0.644$). These findings imply that principals in Government colleges report stronger leadership behaviors than their counterparts in other college types. The technical skill means by type were 66.5 (Govt), 64.4 (Aided), and 64.1 (Private), but we did not test this formally; it suggests that government principals also rated themselves somewhat higher in technical skill. Overall, college

management context appears to be associated with leadership behavior, with government-sector principals showing notably higher leadership scores in this hypothetical sample.

Discussion

The analyses reveal several key patterns. First, the positive correlation between leadership behavior and technical skill suggests that these attributes go hand-in-hand for college principals. Principals who are technically proficient (for example, adept with ICT, data management, or administrative software) also tend to exhibit stronger leadership behaviors. This aligns with theoretical expectations: as Shyr (2017) argues, principals need "sufficient knowledge of technology" and visionary competence to effectively guide educational innovation. In other words, a principal's technical skill complements their leadership, enabling them to implement digital tools, communicate vision using data, and support teachers in modernizing instruction. Aurangzeb et al. (2019) similarly note that effective principals should have ICT awareness and dispositions to succeed in the 21st-century school environment. Thus, our finding underscores a synergy between technical and interpersonal competencies, reinforcing the idea that leadership development should integrate technical training.

Second, the lack of gender differences in leadership behavior suggests that, at least in Kerala's college context, male and female principals display comparable leadership qualities. This finding is consistent with some studies in Kerala's education sector (e.g. studies of school principals) that report no significant gender disparity in leadership effectiveness. It implies that both male and female principals are likely to receive similar preparation and face similar expectations in Kerala's collegiate system. For policy, this suggests that leadership training need not be gender-targeted; rather, programs can be uniformly designed since both genders can benefit equally.

Third, the ANOVA result indicates that institutional context matters: government college principals scored higher on leadership behavior than aided or private college principals. This may reflect several factors. Government colleges in Kerala often have longer-established administrative structures and may provide more leadership training for principals. It is possible that state-run institutions prioritize principal appointments and leadership roles, leading to higher reported leadership behaviors. Alternatively, principals in private colleges (which can be more career-oriented or commercially managed) might emphasize technical competence differently. Regardless, this difference suggests that sectoral policies affect principal leadership. Educational authorities might investigate whether private college principals require additional leadership support or whether expectations differ by sector. Notably, similar patterns have been observed in other contexts: effective leadership may vary by type of institution and resourcing.

In summary, our hypothetical analysis suggests that leadership behavior and technical skill are positively related attributes of college principals. Principals who score high in one tend to score high in the other, highlighting the integrated nature of modern educational leadership. No evidence emerged for gender gaps, but institution type had an effect, with government college principals leading in leadership behavior. These conclusions are drawn with the understanding that our data are simulated; however, they provide a plausible picture consistent with educational leadership theory.

Findings and Implications

Finding 1: Leadership and Technical Skill are Positively Related. The moderate positive correlation ($r \approx 0.56$) indicates that principals who rate themselves high on technical skills tend to also exhibit stronger leadership behaviors. Implication: Leadership development programs should integrate technical training (e.g. ICT management, data analysis) with leadership training. Enhancing principals' technical competencies may reinforce their overall leadership effectiveness. Education authorities in Kerala could include modules on technology leadership and data-driven decision-making in principal preparation courses.

Finding 2: No Gender Difference in Leadership Behavior. The analysis showed no significant difference between male and female principals in mean leadership behavior or technical skill. Implication: This suggests gender equity in principal leadership roles in Kerala. Professional development and recruitment can continue without needing gender-specific modifications. Instead, policymakers can focus on universal leadership competencies, knowing that female and male principals perform similarly in leadership aspects.

Finding 3: Government College Principals Show Higher Leadership Scores. Principals in government colleges reported higher leadership behavior than those in aided or private colleges. Implication: There may be differential emphasis on leadership development across sectors. The government and education boards might explore whether aided/private college principals need additional support or training to reach the same leadership potential. For example, tailored leadership workshops for private college principals could help close this gap. Conversely, the finding could reflect structural advantages (e.g. professional development opportunities) that government institutions already provide. Ensuring consistent leadership standards across all college types may improve system-wide outcomes.

Overall, these findings highlight the need for capacity-building in both leadership behavior and technical skill among college principals. Emphasizing technological proficiency alongside soft leadership skills can create more effective administrators. Kerala's higher education policymakers and college management should note the interplay of these competencies when designing in-service training. By leveraging principals' technical skills in concert with leadership development, colleges can better meet modern educational challenges.

Conclusion

This hypothetical study demonstrates how statistical analysis can yield insights into college principals' leadership behavior and technical skill in Kerala. The significant positive association between these variables suggests that technical competence enhances, or at least accompanies, effective leadership. The absence of gender differences is encouraging for equity, while the variation by college type points to context-specific factors influencing leadership. Although based on simulated data, the patterns align with literature emphasizing the principal's dual roles as instructional leader and technology manager.

In practical terms, education stakeholders in Kerala should foster both strong leadership practices and technical training for principals. Leadership training programs could incorporate ICT leadership modules, ensuring that principals are well-equipped to handle digital transformation in higher education. Future research should collect real data from Kerala college principals to validate these findings. Longitudinal studies could also examine how improvements in technical skill (e.g. through training) affect leadership outcomes over time. By focusing on these competencies together, Kerala's colleges may enhance institutional leadership and, ultimately, student learning outcomes.

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