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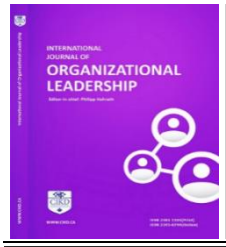

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Role of Green Transformational Leadership on Environmental Performance in Academia: A Mediated Moderation Model

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ABSTRACT

Scholars have acknowledged the importance of the organization's environmental performance; however, the factors contributing to improving ecological performance must be thoroughly investigated. Drawing on ability, motivation, opportunity theory, and social exchange theory to address this gap, this study investigated the impact of Green Transformational Leadership (GTL) on the environmental performance of green educational institutions in Pakistan. More so, the study empirically examined the mediation effect of green Organizational Citizenship Behavior (OCB) and the moderating effect of environmental concern on the environmental performance of educational institutions. The quantitative research design, cluster probability sampling technique, was used for selecting higher education institutions, and simple random probability sampling was used for selecting individuals. The data was collected through a structured questionnaire from teachers, staff, and heads of departments/sectional heads of 52 green higher educational institutions. Using SPSS and Smart PLS 4 software, the results suggest a direct association between green transformational leadership and green performance. Also, there is an indirect association between both variables when green OCB serves as a mediating variable. Further results show that environmental concern does not moderate the relationship between environmental performance and green OCB. Moreover, employees under GTL have sustainable behavior, which leads to higher environmental performance. This indicates that green transformational leadership, which promotes green OCB as well as green behavior, is a critical factor for firms in achieving environmental goals. The findings offer valuable lessons to institutions about how Academia should integrate green leadership and OCB into institutional policies to enhance environmental performance.

The role of green transformational leaders is interesting and has drawn interest among various researchers (Chen & Chang, 2013). Recent studies have emphasized the role of green transformational leadership in improving employee performance, productivity, and sustainability outcomes in the workplace (Al-Romeedy & El-Sisib, 2024; Lathabhavan & Kaur, 2023). Su and Hahn (2025) showed that green transformational leadership had a positive effect on employee green performance in organizations through mediating variables of moral reflectiveness and green crafting. This leadership model is one of the most applicable models to explain how organizations can reach sustainability goals and make employees eco-sensitive (Robertson & Barling, 2013).

Green Transformational Leadership is vital in all institutions (Buil et al., 2019), and it stresses the knowledge, forecasting, and modeling of individual and relational changing aspects of how people affect each other in pursuit of mutual goals (Buil et al., 2019; Leroy et al., 2018; Northouse, 2016). Babi et al. (2014), Crede et al. (2019), Guest and Teplitzky (2010), and Zhou et al. (2018) comprehend institutional management as a significant device for ecological management because climate change is the most challenging worldwide issue that human beings are experiencing today (Gilal et al., 2014; Kazdin, 2009; Stern, 2011). It becomes imperative to assess environmental sustainability in Pakistan. The need to examine environmental challenges in Pakistan requires urgency because Pakistan is facing unique trials in terms of environmental pollution. According to the 2024 Environmental Performance Index (EPI), Pakistan is placed in the 179th position out of 180 nations regarding ecological performance, only ahead of Vietnam, ((Environmental Performance Index, 2024). Environmental air contamination has increased considerably, with Pakistan ranking as the second most polluted country in the world (IQAir, 2024). Additionally, two of Pakistan's key cities (i.e., Lahore and Karachi) are among the world's most polluted cities (IQAir, 2024).

According to research studies, green OCB has a constructive impact on ecological outcomes in the sense that workers' pro-environmental conduct, such as waste lessening, assists an institution in achieving its environmental targets as well as enhancing environmental viability (Gilal et al., 2019; Luu, 2019a; Pham et al., 2020). Tentatively, green OCB gives a theoretical foundation for employees' mental course/authority in the direction of an organization's green efforts. Green organizational citizenship behavior is the "intentional conduct of an institution's employees aimed at enhancing the environment" (Daily et al., 2009). Boiral and Paillé (2012) furthered the meaning of green organizational citizenship behavior, expressing that it is optional and might not be acknowledged by the official reward structure. Still, it brings additional efficient ecological running by the institution". Recruits' readiness to engage in conduct and activities that go beyond their statement of work for the good of the environment is articulated by organizational citizenship behavior (Luu, 2019b). By minimizing an organization's plus individual resource intake, green organizational citizenship behavior adds to viability (Lamm et al., 2013; Nielsen et al., 2009). People who practice sustainability actions do tasks that include reusing office refuse, acting in opposition to factory effluents, and demonstrating a readiness to take up and become accustomed to weather change policies, among other things. Such people also participate in and execute extra roles of pro-environmental conduct in their educational institutions, for instance, reusing canisters and papers, preserving power, and properly getting rid of electronic refuse.

According to studies, employees who fear their environmental outcomes are more likely to engage in voluntary conduct plus green actions (Jackson & Seo, 2010; Pham, Tučkova, & Jabbour, 2019). Employees involved in green activities, such as green OCB, will develop into individuals who are extra zealous on environmental matters and go above and beyond their regular work duties (i.e., work-role description), ultimately adding to the institution's environmental performance. A starting point to address is the subject matter of leadership and sustainability. However, studies in the literature such as Robertson and Barling (2013), Chen and Chang (2013), Boiral and Paillé (2012), and Yusliza, Norazmi et al. (2020) provide insights about leadership, green transformational leadership, and environmental performance. Nonetheless, there are gaps in the literature on environmental performance and green transformational leadership style concerning academic institutions that adopt sustainability principles, particularly among higher education institutions' teachers, the Heads Of Departments (HODs), and heads of the institutions' sections.

This current study seeks to address such a prevailing gap. This is done by investigating whether green Organizational Citizenship Behavior (OCB) mediates the association between environmental performance and green transformational leadership. More so, this study was carried out of the interests evoked by studies such as Tosun et al. (2022) and Moin et al. (2021), which focused on the relationship between green transformational leadership and organizational environmental performance. As such, this study provides immense benefits to the field of academia on the subject matter of green transformational leadership and organizational environmental performance because it incorporates important higher education personnel such as teachers, HODs, and heads of the institutions' sections. These personnel are committed to current literature on green transformational leadership and organizational environmental performance, and they occupy critical positions and, therefore, play important roles in the creation and implementation of environmental policies across academic institutions. It is pertinent to note that this study is a response to the areas future research should explore, as requested by the study of Leal Filho et al. (2019), regarding the contributions of Higher Education Institutions (HEIs) towards greening practices. Therefore, this present research explores deeply how organizational leaders utilize their subordinates to develop green OCB toward achieving organizational sustainability.

Social Exchange Theory

The Social Exchange Theory (SET) by Blau (1964) is widely used to explain workplace social interactions, both formal and informal. Cook and Whitmeyer (1992) and Cross and Sproull (2004) demonstrated how SET helps in understanding interpersonal relationships, reinforced by earlier studies (Altman & Taylor, 1973; Taylor, 1968; Taylor & Altman, 1975). This study posits that such relationships thrive on mutual positive feelings, which green transformational leadership fosters through active listening, comprehension, and inspiration. Additionally, strong communication from transformational leaders enhances green OCB.

SET has also been used (Konovsky & Pugh, 1994; Taylor, 1968; Tekleab & Chiaburu, 2011) to examine personality traits in social exchange. This study supports this view, arguing that transformational leaders with suitable personality traits encourage green OCB, facilitating difficult tasks and reinforcing a healthy work environment (White & Lean, 2008). Employees assess workplace interactions based on costs and benefits and engagement with

transformational leaders is perceived as rewarding, leading to higher organizational environmental performance.

Further, SET explains social exchanges in situational contexts (Konovsky & Pugh, 1994; Taylor, 1968), highlighting how transformational leadership accelerates and enhances exchanges by fostering long-term relationships. Reciprocity, a key component (Gouldner, 1960), is shaped by both leaders and employees (Kozlowski & Doherty, 1989), with cooperation reinforcing employee-supervisor interactions for shared organizational goals.

This study extends SET by addressing overlooked dimensions. First, it applies Cole et al.'s (2002) framework to show how organizational relationships impact performance. Second, it explores how different social exchanges either strengthen or weaken workplace interactions. Third, it highlights the role of leadership and organizations in creating ideal conditions for social relationships. Green transformational leadership is emphasized as a key factor in providing such conditions.

A fourth dimension considers leadership's influence on employees and its impact on organizational performance (Cook & Whitmeyer, 1992). This study aligns with Konovsky and Pugh (1994) and Tekleab and Chiaburu (2011), asserting that employee contributions to sustainability stem from effective green transformational leadership. Prior research (Emerson, 1976; Rousseau, 1995) also suggests that social exchanges establish mutual obligations, reinforcing high-quality workplace relationships.

Finally, this study examines the latent superior behavior within SET—a commitment to reciprocity (Altman & Taylor, 1973). This behavior strengthens workplace relationships, transforming simple exchanges into high-quality interactions. By investigating these aspects, the study explores key leadership-subordinate dynamics, particularly their role in sustainability and green transformational leadership. Ultimately, it underscores the importance of understanding organizational sustainability processes and predictors within the employee-leadership framework.

Literature Review and Hypotheses Development

Developing a ground-breaking environment between diverse management forms, encouraging, exciting, and reassuring workers to have faith in a leader's understanding, which directly influences a company's invention and outcomes, is what transformational leadership entails (Boehm et al., 2015; Ng, 2017). Transformational governance proposes to stimulate supporters by focusing on a clear vision, providing discrete assistance, and empowering them. Faultless influence, academic motivation, inspiring motivation, and personal consideration are the four main characteristics of transformational leadership. According to Zhu et al. (2005), transformational leadership fosters advanced stimulus, sureness, unity, obligation, and achievement. Several surveys have demonstrated that the tactically focused facet of transformational leadership positively impacts employees' achievement (Carton et al., 2014; Naderi et al., 2019; Singh et al., 2020).

While the general effects of transformational leadership are well-documented, there is an increasing need for research into their applications in environmental sustainability, particularly in ways connected to the new paradigm of green transformational leadership. Green transformational leadership further focuses on environmental values, inspiring followers toward pro-environment behavior and aligning the organizational goals with sustainability

targets (Chen & Chang, 2013). Although the potential of green transformational leadership is present, empirical evidence of the same has seldom been explored, and if such studies can be located, they focus on the general impacts instead of mechanisms and outcomes in a multiplicity of organizational contexts.

Green transformational leaders significantly influence the green OCB of employees in the workplace, owing to several factors; effective communication is a factor responsible for the influence of green transformational leadership style on green OCB in the workplace, which brings about comprehension of information from the leader to subordinates and improved productivity (Robertson & Barling, 2013). Also, the trust and understanding created by the transformational leadership style is another factor that ensures that green transformational leaders influence green OCB in the workplace (Chen et al., 2014). Trust and understanding can help to overcome organizational crises between leadership and subordinates in the workplace, which helps to ensure that employees align with organizational goals and objectives (Graen & Uhl-Bien, 1995). As such, organizational employees are motivated to participate in official duties and extra official tasks. In addition, a green transformational leader encourages teamwork in the workplace, which fosters unity and commitment among organizational employees toward achieving organizational objectives and goals related to the environment (Ramus & Killmer, 2007). For instance, Robertson and Barling (2013) discovered that green transformational leadership positively predicts green OCB as the former bolsters employees' intrinsic motivation to undertake pro-environmental behaviors. Similarly, Chen et al. (2014) showed that trust in the leader is the mediator of the relationship between green transformational leadership and green OCB, emphasizing the importance of relational factors for the promotion of sustainability. Despite these insights, the literature on green transformational leadership and green OCB has some conflicting results. For instance, Nurfitriyana and Muafi (2023) did not find a significant positive association between green transformational leadership and OCB; however, Robertson and Barling (2013) found a significant positive relationship. Podsakoff et al. (2000) observed that organizational citizenship behavior is not dependent on leadership style. This discrepancy indicates that the effectiveness of green transformational leadership may vary depending on contextual factors, such as organizational culture, employee values, and type of industry. Furthermore, Maharani et al. (2013) suggest transformational leaders can stimulate employees to attain high levels of productivity and engagement, thus including green OCB. These contradictory results underscore a major gap in the literature: the need for a more nuanced understanding of the context within which green transformational leadership might or might not influence green OCB.

This study aims to address this gap by investigating the extent of green transformational leadership on green OCB in higher educational institutions in Pakistan. Unlike previous studies that mainly focus on corporate arenas, this study looks into how green transformational leadership can enhance green OCB among the teachers, staff, and department heads of educational institutions. This is particularly important because higher educational institutions are the shapers of values and behaviors in society, which includes, among other things, environmental sustainability. This study thus makes contributions to the literature by providing empirical evidence on the viability of green transformational leadership in non-corporate settings and raising insights on the mechanisms through which it propels green OCB.

Based on the above discussion, the following hypothesis is proposed:

H1: There is a relationship between green transformational leaders and green OCB among employees.

Mediating Role of Green OCB

Green OCB is a vital variable that determines a firm's environmental performance. Studies in literature have provided valid reasons for such assertion (Organ, 1997; Podsakoff et al., 2009; Yusliza, Amirudin et al., 2020). Roy et al. (2001) noted earlier that the concept of green OCB is a vital factor that determines the successful implementation of the environmental management systems of a firm, as well as the integration of environmental policies in the workplace. Already, Ramus and Killmer (2007) and Daily et al. (2009) reveal that green OCB is one of the vital predictor factors for achieving organizational greening. More so, Boiral and Paillé (2012) have identified significant dimensions of pro-environmental behavior in the workplace that encourage organizations' greening. They are eco-civic engagement, eco-initiatives, and eco-helping. Boiral et al. (2015) also showed a significant relationship between an organization's management involvement in green OCB practices and the firm's environmental management practices. More so, Paillé et al. (2014) investigated the pro-environmental behavior of employees in Chinese firms and found that green OCB has a positive significant effect on the environmental performance of the firms.

Although the positive effect of green OCB on environmental performance has been established, little research exists on how green OCB mediates between green transformational leadership and environmental performance. Green OCB has most often been defined as an outcome variable rather than a mediating mechanism (Boiral et al., 2015; Chan & Hsu, 2016). Understanding the mediating role of green OCB has important implications in terms of the way green transformational leadership is thought to be translated into improved environmental performance, which is a significant empty notch in the literature. In higher educational institutions, the present study intends to fill this void by proposing that green OCB mediates the relationship between green transformational leadership and environmental performance.

Based on the above discussion, the following hypothesis is proposed:

H2a: There is a relationship between green OCB and the environmental performance of higher educational institutions.
H2b: Green OCB mediates the relationship between green transformational leadership and the environmental performance of higher educational institutions.

Moderating Role of Environmental Concern

Temminck et al. (2015) note that the impact of employees' environmental concerns on green OCB determines the sustainability of an organization. Such green OCBs are distinguished by employees' voluntary engagement and their unrewarded actions about the environment, which go beyond their job descriptions (Daily et al., 2009). Such green OCB can occur by offering suggestions to reduce energy consumption or advising fellow employees on how to reduce their environmental pollution in the workplace. Research by Temminck et al. (2015) showed that environmental concerns increase green OCB in the workplace. Poortinga et al. (2004) noted the positive effects of environmental concerns on employees' green OCB encourage the need for environmentally friendly behavior in the workplace, such as recycling behavior and adopting

green electricity (Ozaki, 2011; Rowlands et al., 2003; Schultz & Oskamp, 1996). One would expect that the nexus between green OCB and environmental concerns holds both in domestic and industrial places, as such green OCB is borne out of voluntary actions. In other words, green OCB is borne out of voluntary decisions that benefit the environment in the long run.

This assertion is consistent with the study conducted by Steg and Vlek (2009), which shows that environmental concerns predict individual volition to alter and adopt behavioral intentions that are pro-environment. Even so, little is known about the moderating role that environmental concern plays within the relationship between green OCB and environmental performance. Most studies have mainly examined the direct effects of environmental concern on green OCB without considering the moderating effect it could have (Temminck et al., 2015). Therefore, this study attempts to fill the gap by explaining how environmental concern enhances the influence of green OCB on environmental performance, especially in the context of higher educational institutions where concern for the environment is getting the limelight.

Based on the above discussion, the following hypothesis is proposed:

H3: Environmental concern moderates the relationship between green OCB and the environmental performance of higher educational institutions.

Method

Population and Procedure

This study employed a sample of 538 teachers, HoDs, and staff members from 52 green and sustainable educational institutions in Pakistan, ranked by the University of Indonesia's Green Metric World University rankings. The sample size was determined using Krejcie and Morgan's (1970) method, which recommends 384 participants. To account for potential low response rates among educated participants in Pakistan, the study followed Dillman et al. (2014) suggestion and increased the sample size by 40%, reaching 538 respondents. Additionally, the G*Power formula suggested a minimum of 111 participants.

The dataset underwent several validity checks. Common method bias was assessed and found not to be a concern. Multi-collinearity was tested using the Variance Inflation Factor (VIF), with all values below 5 indicating no multi-collinearity (Hair et al., 2016). Non-response bias, a potential threat to result reliability, was mitigated using Lindner and Wingenbach's (2002) method, ensuring bias remained below 50%. Of the respondents, 79% completed the survey within eight days, while 21% were delayed due to dual roles as teachers and consultants. The high response accuracy minimized non-response bias.

Participants were assured confidentiality, and responses were used solely for academic research. The demographic analysis showed that 69% of respondents were male and 31% female. Regarding education, 46% held PhDs, 48% master's degrees, and 6% bachelor's degrees. Among the participants, 24% were staff members, 17% were HoDs, and 59% were teachers.

Measures of Constructs

One of the constructs of the data is green transformational leadership, which was measured using a 7-point Likert scale. This construction is drawn from the works of Chen and Chang (2013). Another construct is green OCB which is derived from the study of Boiral and Paillé

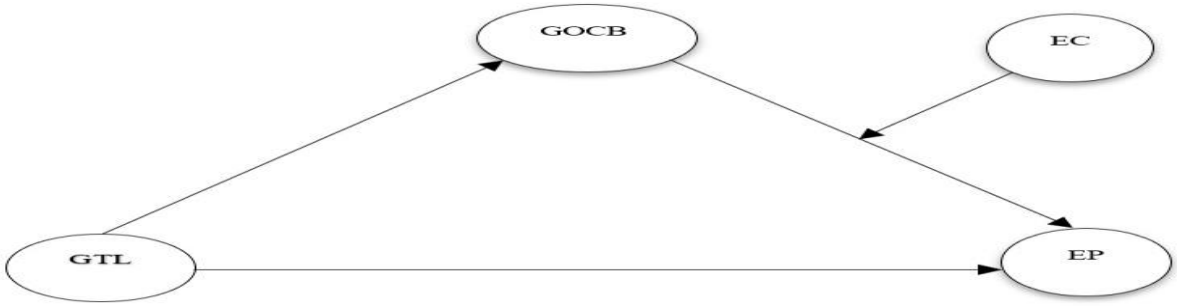
(2012). The green OCB construct is a 5-point Likert scale. A third construct is environmental concern which is a 5-point Likert scale item drawn from the study of Echegaray and Hansstein (2017). The fourth construct is environmental performance, which is a 5-point Likert scale item drawn from the study of Paillé et al. (2014).

Research Framework

As shown in Figure 1, the research framework studied the relationships between Green Transformational Leadership (GTL), Organizational Citizenship Behavior (OCB), Employee performance (EP), and Environmental Concern (EC). The model focuses on examining how green leadership affects environmental performance both directly and indirectly through citizenship behavior, and the environmental concern moderation factor.

Figure 1

Research Framework



Results

Analytical Procedures

To analyze the dataset, this study employed the partial least-squares Structural equation modeling (PLS-SEM) path method. The decision to use this technique is due to several reasons. First, it is frequently employed in the field of management to provide insights into the relationships between latent variables (Real et al., 2014). Moreover, the PLS-SEM is most relevant to analyzing the research objectives of this study by Hair et al. (2019). In addition, the PLS-SEM was used because it is the most advanced method used in academia when analyzing associations across variables (Hair et al., 2016). The Smart PLS 4 was utilized for the PLS-SEM based on the recommendations of Ringle et al. (2015). A two-step process was deployed in this study based on the recommendations of Ringle et al. (2015). The first process involves the estimation of the measurement model, while the second process requires the estimation of the structural model (Hair et al., 2016; Henseler et al., 2009).

Measurement Model Assessment

This study finds it necessary to assess the measurement model to ensure that the results obtained using the PLS-SEM are not spurious. As such, the method suggested by Henseler et al. (2009) and Hair et al. (2016) was utilized, which involves a reliability test of all constructs, as well as a test for internal consistency reliability, individual item reliability test, and discriminant and convergent validity tests.

Individual Item Reliability

Researchers Duarte and Raposo (2010) and Hair et al. (2016) stated that the reliability of individual constructions should be assessed by examining the outer loadings of each single measure of a construct. The standardized loadings express the strength of the relationship of each indicator to its associated construct. Normally, loadings above .60 are acceptable, whereas those exceeding .70 are preferred. Based on the results obtained in Table 1, all items loaded above .65, which suggests all items passed the individual item reliability test.

This study adopted the method recommended by Bagozzi and Yi (1988), which agrees with Hair et al. (2019) to test for internal consistency reliability. Composite Reliability (CR) is assessed as the internal consistency of each construct; it is quite like Cronbach's alpha but is deemed more robust in structural equation modeling. According to the criterion, a CR value greater than .70 is accepted, while one above .80 is acceptable for strong reliability. In Table 1, CR values vary from .79 to .96, confirming good to excellent reliability. Among these, Green Transformational Leadership has a higher reliability of .96, while Environmental Concern, with a lower reliability of .79, still remains acceptable. Also, this study deployed the recommendations by Fornell and Larcker (1981) to test the convergent validity of the dataset collected. This involves using the Average Variance Extracted (AVE) statistics. Based on the test, AVE values above .50 indicate that the items tested demonstrate convergent validity. Table 1 confirms that all constructs satisfy the AVE test; the values range from .56-.80. Green Transformational Leadership entails the highest AVE of .80, which qualifies it for strong convergent validity, whereas Environmental Concern entails a lower AVE of .56, yet admissible.

Table 1

Measurement Model

Construct and Indicators	Standardized loadings	CR(PC)	AVE
Environmental Concern		.79	.56
EC1	.86		
EC2	.65		
EC5	.72		
Environmental Performance		.89	.57
EP2	.71		
EP3	.75		
EP4	.72		
EP5	.73		
EP6	.80		
EP7	.81		
Green Transformational Leadership		0.962	.80
GTL1	.85		
GTL2	.91		
GTL3	.90		
GTL4	.92		
GTL5	.89		
GTL6	.89		
Green OCB		.87	.58
OCB3	.73		
OCB4	.80		
OCB5	.72		
OCB6	.79		
OCB7	.76		

More so, this study conducted discriminant validity using the recommendations of Henseler et al. (2015), which involves a test of the Hetrotrait-monotrait (HTMT) ratio. Values below .85

indicate the presence of discriminant validity. The results shown in Table 2 show the HTMT ratio, which implies that the dataset collected exhibits discriminant validity.

Table 2

Discriminant Validity (HTMT)

	Variable	1	2	3	4
1	Environmental Concern	**.75**			
2	Environmental Performance	.23	**.75**		
3	Transformational leadership	.17	.17	**.89**	
4	Green OCB	.39	.37	.40	**.76**

Structural Model

This study employed the procedure suggested by Chen (2019) regarding the analysis of the structural model. This involves controlling the demographic variables in the structural model because including them in the model would have a significant impact on the results obtained. As such, variables on education, gender, age, and participant's work experience were controlled for. This adopted bootstrapping of 5,000 to increase the validity of the structural equation coefficients. The results obtained from the boost rapping are presented in Table 3. Based on the structural model estimated, it was found that green transformational leadership impacts positively on green OCB (β = .28, t = 5.05, p = .05). This agrees with the first research hypothesis. Organizational Citizenship Behavior (OCB) has a positive path coefficient (β = .29, t = 4.62, p = .06), indicating that the EP is enhanced by OCB. Even though the p-value of .06 is slightly above .05, which should be the threshold, it is still within the 10% significance level, and the T value of 4.62 is extremely supportive of the relationship. Therefore, the hypothesis is supported: OCB is positively related to an organization's environmental performance. This agrees with the second research hypothesis and aligns with Paillé et al. (2014). Based on further structural equation coefficients, GTL has a positive association with environmental performance (β = .12, t = 3.27, p = .03). Moreover, structural model coefficients obtained show that environmental concern does not moderate the relationship between environmental performance and green OCB (β = -.004, t = .06, p = .06). This disagrees with the third research hypothesis, which assumes that environmental concern moderates the relationship between sustainability and green OCB.

Furthermore, Figure 2 indicates the strength of the moderating impact of Environmental Concern (EC) on the relationship between Organizational Citizenship Behavior (OCB) and Environmental Performance (EP). The lines here indicate low (red for -1 SD), mean (in blue), and high (green for +1 SD) levels of EC. A significant effect of moderation is shown when these lines have very different slopes, indicating the change in the strength of the OCB-EP relationship across varying levels of EC.

EC virtually explains little of the relationship between OCB and EP; the lines in the graph are quite close to parallel. This small space between these two lines even tends to underscore more that variation in EC does not bring to bear any value to changing the effects of OCB on EP. If EC is a strong modifier, then the differences in EP will go through all these lines or cross them depending on whatever affects EC levels (its strength or weakening against OCB).

The visual results are in line with the statistical results of the non-significance of the interaction terms (β = -.004; p = .06, t = .06). In other words, while OCB does positively affect

EP, variations in EC do not affect the OCB-EP relationship; therefore, the figure does not support the hypothesis that EC moderates the OCB-EP relationship.

Table 3

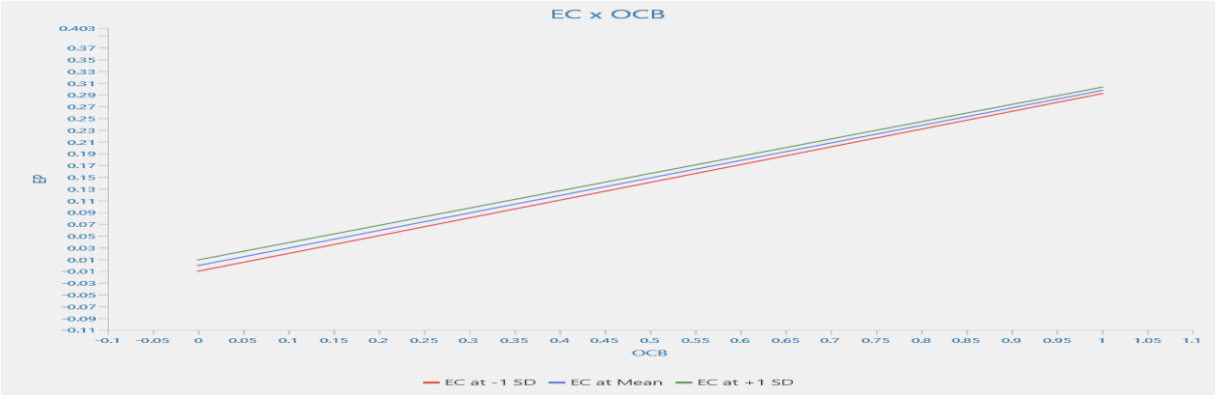
Path Coefficients

Hypotheses	Relationships	Beta	p	t	Findings
H1	GTL -> OCB	.28	.05	5.05**	Supported
H2a	OCB -> EP	.29	.06	4.62***	Supported
H2b	GTL -> EP	.12	.03	3.271**	Supported
H3	EC x OCB -> EP	-.04	.06	0.065	Not Supported

Note. Level of significance: ***$p < 0.01$; **$p < 0.05$ *$p < .10$

Figure 2

Moderating Effects



This study conducted a test of the predictive relevance of the PLS results using a cross-validated statistic, otherwise known as Q^2. According to Hair et al. (2016), this statistic is often used to assess an estimated PLS model by determining the variables from omitted cases. Henseler et al. (2009) mention that when Q^2 is greater than 0, this implies the presence of predictive significance. The results obtained from the PLS model estimated in Table 4 report a Q^2 value of .30. This implies that the PLS model estimated in this study exhibits predictive relevance.

Table 4

PLS Predict

Total	Q^2	R^2	RMSE	MAE
EP	.20	.23	.90	.70
OCB	.30	.23	.83	.63

The results in Table 4 show that the model can explain 23.8% of the environmental performance variance and 23.9% of the variance in green OCB. These values suggest that even though green transformational leadership, along with the other predictors embedded in the model, accounts for quite a sizable number of differences in environmental performance and OCB, many different variables that have not so far been identified might also be in active service. Although moderate, these R-square values help emphasize the importance of leadership in engendering voluntary pro-environmental behaviors of employees and, hence, of generalized sustainability outcomes in the organization.

The model fit indices associated with Table 5 shed some more light on the adequacy of the structural model. SRMR amounts to .07 for the saturated model and .09 for the estimated model. In general, any such value below .08 indicates a well-fitted model; therefore, the somewhat higher estimated model value indicates the model is only reasonably acceptable, that is, it needs some improvement. Other similar information is provided by unweighted least squares discrepancy (d_ULS), at 1.63 and 2.58 for saturated and estimated models, along with geodesic discrepancies (d_G) equal to .72 and .85, correspondingly. The lower the discrepancy values, the better the fit. Thus, this increase in the estimated model over the saturated model indicates some amount of misfit

In general, results indicated a meaningful relationship between green transformational leadership, green OCB, and environmental performance, substantiating the need for leadership in sustainability-related initiatives. However, the model fit results imply the inclusion of some other variables to do justice to the complexity of how organizations in different parts of the world perform environmentally. Future studies may incorporate those other relevant constructs, such as regulatory pressures, employee engagement or industry-specific sustainability practices, to enrich the model and enhance explanatory power and model fit.

Table 5
Model Fit

	Saturated model	Estimated model
SRMR	0.07	0.09
d_ULS	1.63	2.58
d_G	0.72	0.85

Discussion

From the results of the transformational leadership PLS-SEM model, there is evidence that there is a direct association between green transformational leadership and green performance. Also, an indirect association occurs between both variables when green OCB serves as a mediating variable. This shows a strong relationship between environmental performance and green transformational leadership, which does not require a moderating variable. Further results from this study show that employees under the leadership of a green transformational leader have sustainable behavior, which leads to higher environmental performance. This shows that green transformational leadership is a critical factor for firms to achieve environmental goals, which promotes green OCB as well as green behavior. Hence, organizational green goals require green transformational leadership (Awan et al., 2023).

Further results reveal that green OCB influences organizational environmental performance; this agrees with the findings of AlSuwaidi et al. (2021). This further coincides with the theoretical framework of Social Identity Theory, stating that employees who identify with the green values of their organization are more likely to engage in behavior in support of environmental sustainability (Abbas & Tufail, 2024; Liu & Qi, 2022). Further results also show that green OCB mediates the association between organizations' environmental performance and green transformational leadership. This result agrees with Tosun et al. (2022). This demonstrates the importance of green citizenship behavior for organizations that seek to achieve sustainability goals. As such, employees are required as much as transformational leaders to achieve organizational environmental goals and objectives (Farooq & Yusliza, 2023).

The results of this study conform to the Resource-Based View (RBV) theory that provides insight into how the dimensions of organizational resources- such as leadership styles and employee behaviors- would be of importance for competitive advantage and the attainment of sustainability goals. Additional studies have reinforced this perspective by highlighting green transformational leadership and green OCB as determinants of enhancing environmental performance.

For instance, Priyadarshini et al. (2023) discovered that green transformational leadership increases green empowerment in employees, which, in turn, leads to increased organizational environmental citizenship behavior and enhanced environmental performance. Similarly, Zahid et al. (2023) demonstrated that green transformational leadership positively influences environmental performance through the mediating roles of green human resource management practices and employee creativity.

These findings concurred with the Green Transformational Leadership theoretical perspective, as leaders motivating staff to adopt environmental sustainability-enhancing behavior are usually susceptible catalysts of increased green performance in organizations. The empirical evidence offered in these studies accentuates the centerpiece role green OCB plays in the relationship of the sub-optimal leadership with its environmental commitment. Barring a few empirical studies such as Moin et al. (2021), Tosun et al. (2022), and Awan et al. (2023), there are scarce empirical studies on the topic. This shows that there is a need for more studies on how green transformational leadership impacts organizations' environmental performance. Responding to such a call, this study demonstrates that there is an association between green transformational leadership and organizations' environmental performance which is mediated by green OCB. This contributes significantly to the body of literature on organizations' environmental performance.

Research hypotheses were developed to provide theoretical and empirical insights based on the literature. These theoretical perspectives motivate this study to assert that green transformational leadership influences the green OCB of Pakistan's employees of higher educational institutions. One research Hypothesis was specified to analyze this assertion based on a PLS path estimation. The Hypothesis concerns the relationship between green transformational leadership and green OCB. It thus states that there is a relationship between green transformational leadership with a small effect size (f^2 = .10) and the green OCB of teachers, staff members, and heads of departments of higher educational institutions. As revealed from the PLS results, the Hypothesis holds, implying that when higher educational institutions have green transformational leadership, it impacts the green OCB of the employees of the higher educational institutions in Pakistan.

This finding gains the support of studies in the literature. For instance, developing a ground-breaking environment between diverse management forms, encouraging, exciting, and reassuring employees to have faith in a leader's understanding, which directly influences an organization's invention and outcomes, is what transformational leadership entails (Boehm et al., 2015; Ng, 2017). Crucke et al. (2022) emphasize that environmentally specific transformational leadership is positively related to employees' green advocacy, with leadership integrity acting as a significant moderator. An earlier study by Robertson and Barling (2013) revealed a significant positive relationship between green OCB and green transformational leadership in the workplace; this implies that if higher green transformational leadership

policies are adopted in the workplace, it will increase green organizational citizenship behavior among employees. However, Podsakoff et al. (2000) found that organizational citizenship behavior among employees is independent of transformational leadership. This difference can be explained by the fact that leadership effectiveness is specific to the context, as highlighted by Al-Romeedy and El-Sisi (2024), who emphasized that the impact of green transformational leadership varies across organizational and cultural settings. However, Maharani et al. (2013) disputed the findings from Podsakoff et al. (2000) stating that transformational leaders aim to motivate employee potential to achieve a higher level of productivity. This is highlighted in the results of this study, which show that green transformational leadership has a positive relationship with the green OCB of the employees of higher educational institutions in Pakistan. This result is consistent with the findings that green transformational leadership has a significant positive association with green OCB.

Theoretical Implications

This study contributes to the rising need for green transformational leadership, particularly across educational institutions. Some studies in the literature find the importance of green transformational leadership as well (Pham, Hoang, & Phan, 2019; Saeed et al., 2019; Yong et al., 2019). However, specific contributions of this study to the literature focus on how green transformational leadership and green OCB are key to the attainment of environmental goals across higher education institutions. Therefore, findings from this study contribute to the literature on green transformational leadership and green OCB regarding their importance in helping to achieve environmental goals across higher education institutions. In addition, findings from this study contribute to the less explored research on green transformational leadership and environmental performance across higher education institutions (Aboramadan et al., 2020). Further research on this aspect of environment would deepen the comprehension of how green transformational leadership interacts with staff's green workplace conduct, though academic scholars are beginning to conduct managerial research on the industrial advantages of sustainability, while a few studies have inquired about employees' green OCB (Ren et al., 2018). Finally, this study contributes to the topic of green transformational leadership literature by revealing green OCB and environmental concerns as mediators and moderators for achieving higher environmental performance. Therefore, organizational employees are becoming knowledgeable about the importance of sustainability.

Practical Implications

It is essential to emphasize that an organization that requires green OCB and green transformational leadership (GTL) could not achieve environmental performance. As such, green OCB is a vital factor for validating the effectiveness of GTL (Farooq & Yusliza, 2023). It is necessary to stress that the association between GTL and Green OCB is hinged on legal policies an organization adopts in the environment; therefore, firms that adopt green policies create an environment for GTL to promote green OCB. The association between GTL and Green OCB offers important insights to green-focused organizations. First, the relationship demonstrates the importance of greening as a mechanism for reducing costs. This is because green practices like recycling, reuse, and energy saving exert long-term reduction of costs; however, firms that adopt sustainability policies experience increased business costs during the

short and immediate period (Rim & Kim, 2016). Another implication of the GTL and Green OCB relationship is that it grants firms, as well as employees and leaders, the ability to recognize the relevance of sustainability towards adopting necessary activities that would promote and sustain environmental performance, which transcends goodwill and higher revenue from customers. Recent studies in literature such as Dangelico (2015), Wei et al. (2022), Hayat and Afshari (2022), and González-De-la-Rosa et al. (2023) affirm that numerous human societies and countries are increasingly becoming sympathetic to the environment. Therefore, firms and businesses must be key to these sympathetic concerns of societies and adopt greening in their operations.

In addition, this study shows that green transformational leadership and green OCB promote environmental performance. This occurs as green transformational leadership motivates the emergence of green OCB to help green organizations achieve higher environmental performance. This emphasizes the importance of both green transformational leadership and green OCB for countries and organizations that seek to achieve higher environmental performance. Specific to the context of this study, this finding is relevant to stakeholders of the environment in Pakistan, such as the governing bodies and the management of Pakistani Universities, and thus appeals to them to adopt policies that promote sustainability in their institution of learning (Leal Filho et al., 2015). A study by Mullen (2016) earlier appealed that faculty and departmental meetings, peer mentoring workgroups, and various workshops and symposia should be used to educate and propagate news on sustainability across universities.

Furthermore, the results from this study show that sustainable behavior such as green OCB and green transformational leadership, can be used to prove environmental performance.

Limitations and Future Directions

The author of this study recognizes that some limitations could impair the quality and relevance of this study. One of the shortcomings may relate to the choice of moderating variables. So far, this study relies on sound theoretical perspectives that justify the use of green OCB and environmental concern as mediating and moderating factors in the relationship between environmental performance and green transformational leadership across higher schools of learning. Other variables may exist that can be used as mediating and moderating variables, which future empirical studies can employ to expand robust insights on this topic. More so, this study may experience limitations with the choice of green OCB and environmental concern as mediating and moderating variables. Future academic research may use various mediating and moderating mechanics to further explore this relationship. For instance, factors that influence green efforts or green performance of teachers, staff members, and heads of departments/sectional heads in higher educational institutions can be deployed by future research.

Conclusion

This study adds to existing knowledge by emphasizing the importance of green transformational leadership and green Organizational Citizenship Behavior (OCB) in improving environmental performance in academic institutions. It validates direct and mediating relationships, expanding the literature on sustainability in higher education. The findings show that leaders who

demonstrate environmentally responsible behaviors motivate employees to participate in discretionary green practices, resulting in better institutional environmental performance.

One significant contribution of this study is its empirical evidence supporting the mediating role of green OCB. This suggests that creating a culture of voluntary pro-environmental behaviors among employees is critical for translating leadership efforts into tangible sustainability outcomes. This insight enhances previous research by highlighting the significance of employee-driven environmental initiatives alongside top-down leadership strategies.

Additionally, the study challenges the common belief that environmental concern alone leads to improved environmental performance. The lack of support for the moderating role of environmental concern indicates that while individual awareness and attitudes toward sustainability are important, they may not necessarily strengthen the relationship between green OCB and environmental performance. This finding emphasizes the need for structured institutional policies and leadership-driven initiatives instead of relying solely on employees' environmental consciousness.

Overall, this study broadens the understanding of sustainability management in academic institutions by demonstrating that effective leadership and voluntary environmental behaviors have a greater impact on driving institutional environmental performance than simply caring about the environment.

Declarations

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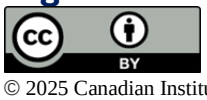

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