Investigating the Mediating Effect of Green Work Engagement on the Relationship between Green Human Resource Management and Employee Green Work Behavior: A Study of Chinese Higher Education Industry

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Abstract

This research explores the relationship between green human resource management (GHRM) practices and employees' green workplace behaviors in higher education institutions (HEIs), focusing on the mediating role of green work engagement (GWE). As global sustainability becomes increasingly important, HEIs are integrating eco-friendly strategies into their operations. The study emphasizes HRM's role in embedding sustainability through green recruitment, training, incentives, and evaluations. While GHRM has been widely studied in manufacturing and service sectors, its application in HEIs, particularly in China, remains underexplored. This research addresses that gap by examining how GHRM influences employees' in-role and extra-role green behaviors, and how GWE mediates this relationship. It also evaluates how HEIs can enhance environmental sustainability through effective HRM strategies. Grounded in social exchange theory (SET), and supported by the job demands-resources (JDR) model and the broaden-and-build theory (BBT), the study develops a comprehensive research model. Data were collected from 400 academic and administrative staff across four universities in Shenyang, China, via self-administered questionnaires. Findings confirm that GHRM positively impacts both types of green behavior and that GWE plays a significant mediating role. These results align with previous research suggesting that employees reciprocate green initiatives with stronger engagement and environmental commitment. The study recommends integrating GHRM into core HR policies at Chinese HEIs, forming sustainability teams, and encouraging green engagement through incentives and collaboration. Future research should expand to different regions and sectors, adopt longitudinal methods, and explore mediators like green organizational support, climate, and leadership.

Keywords: Green Human Resource Management; Green Work Behavior; Green Work Engagement; Mediating Effect

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Introduction

In response to the mounting environmental concerns including climate change, resource depletion, and environmental degradation, together with the growing emphasis on sustainability, organizations worldwide are transforming their corporate practices and shifting their strategies toward more eco-friendly agendas. As organizations strive to incorporate sustainability into their core operations, the role of human resource management (HRM) becomes increasingly crucial and its practices must progress to integrate green management ideologies, ensuring that fundamental HRM functions such as recruitment, training, appraising, and employee engagement align with environmental sustainability objectives (Zhang et al., 2024). By embedding sustainability into HRM frameworks, organizations can foster a culture highlighting eco-conscious behaviors, strengthening their extensive environmental commitments (Adu et al., 2024). HRM has been recognized as a crucial element in nurturing sustainability-oriented behaviors, outlooks, and attentiveness among workforces because its policies and practices directly shape employees' attitudes, awareness, and motivations regarding sustainability (Adu et al., 2024). When HRM incorporates green initiatives, it may inspire not only employees at individual level but also organizational norms and values at corporate level, implanting sustainability within institute's structure. As a result, HRM functions as an indispensable mechanism for organizations to develop and embed environmentally friendly policies effectively (Freire & Pieta, 2022). By aligning HRM strategies with green philosophies, businesses can cultivate workforce that are both environmentally responsible and enthusiastically engaged in sustainability initiatives, ultimately improving the organization's environmental performance and competitive advantage (Zhang et al., 2024). Employee green behaviors is defined as actions that support environmental management practices within workplace, which are integral to the successful execution of green initiatives (Dumont et al., 2017). As past researches highlighted that engaging employees in green practices is critical for achieving superior environmental performance and attaining competitive advantage (Chen & Wu, 2022). Green human resource management (GHRM) has emerged as a strategic approach to enhance employees' environmental consciousness and green behaviors. GHRM integrates several HR functionalities including green staffing, green learning, green incentives, and green evaluation, which all aimed at underpinning environmental sustainability (Ercantan & Eyupoglu, 2022). Furthermore, the notion of green work engagement (GWE) can be defined as the psychological state in which employees display a high degree of devotion, vigor, and absorption in performing environmentally sustainable tasks. And early studies (Wang et al., 2025) also advocated that GWE can be substantial in explaining how GHRM practices translate into actual green behaviors at the workplace, due to that GHRM practices only instill a sense of environmental accountability in employees, but does not guarantee that realization of sustainable workplace behaviors, which allows GWE to serve as the mechanism transforming HR interventions into intrinsic motivation that foster commitment to initiatives. This research sets itself apart from prevailing literature in the development of an integrative framework that simultaneously evaluate both in-role and extra-role green behaviors as discrete yet interconnected aftermaths of GHRM, a disparity that has received inadequate attention in prior academic researches (Islam et al., 2021). Additionally, this study introduces the interplay of GHRM and GWE under the theoretic triangulation of Social Exchange Theory (SET), Job Demands-Resources (JDR) model, and Broaden-and-Build Theory (BBT), providing a renewed perspective to translate the motivational mechanisms fostering green behaviors, which offers a theoretic contribution that were not fully explored by other researchers (Dumont et al., 2017; Fawehinmi et al., 2020).

Higher education institutions (HEIs) play critical role in environmental sustainability, not only by means of education and research but also by motivating green management behaviors within their operational structures. Being regarding as the centers for knowledge diffusion and concept innovation, HEIs are exclusively positioned to address environmental and challenges by setting an illustration in sustainability endeavors (Oliveira & Proença, 2025). To cultivate a green workplace environment, HEIs must embrace the viewpoint of "Act Green," endorsing sustainability in both academic and administrative settings (Gilal et al., 2019). Faculty, researchers, and administration team are all central stakeholders in these endeavors, and their daily workplace behaviors can significantly influence the outcomes of green activities (Lashari et al., 2022). Despite the increasing attention GHRM has received across various industrial contexts, studies regarding its application in higher education industry remains scarce (Fawehinmi et al., 2020). A comprehensive literature review conducted by Oliveira and Proença (2025) underscored this paucity, thus suggesting further exploration of GHRM within diverse service settings. Among the limited researches conducted in HEIs, Fawehinmi et al. (2022) advocated that GHRM practices can indirectly augment the green behaviors of academic staff via the effects of employees' environmental knowledge. Similarly, Gilal et al. (2019) demonstrated that embedding employees' green behaviors into HEIs' management frameworks may positively influence economic and ecological performance in addition to cultivating employee commitment (Fawehinmi et al., 2020).

Under Chinese context, the study of GHRM and green employee behaviors in the higher education sector is both timely and pertinent due to various key factors including China's sustainability objectives, its education sector's fast expansion, and the growing role of universities in fostering environmental accountability. Since China articulated its ambitious environmental objectives such as realizing carbon neutrality by 2060, its 14th Five-Year Plan (2021–2025) has underlined the significance of green development and sustainable practices across various sectors including education (Ba & Cao, 2023). This state schema also requires the incorporation of GHRM practices to encourage pro-environmental behaviors among employees. And the existing researches that highlighted the positive influence of GHRM on environmental performance in China's manufacturing industry similarly suggested the potential benefits for the education sector (Ba & Cao, 2023). Chinese higher education institutions has been serving as incubators for future leaders and professionals by embedding GHRM practices in universities, which can instill environmental values in their faculty and employees (Mou et al., 2024). This, in turn, will influence their students and the broader community, as suggested by a study conducted on private Chinese universities claiming that GHRM practices positively affect environmental performance through green behavior, which underlining Chinese educational institutions' significant role in motivating sustainability (Mou et al., 2024). In contrast to prior studies that focusing on general organizational context or isolated HR practices, this research distinctively contextualizes the GHRM framework within Chinese HEIs while specifically aligning with China's carbon neutrality commitment and imminent government policy, thereby providing both empirical novelty and practical relevance. Moreover, early researches (e.g., Fawehinmi et al., 2020) have predominantly investigated GHRM in Western or generic service settings, while this study extends understanding within the unique socio-cultural and policy-driven landscape of Chinese higher education system, which remains under-explored. Therefore, to address the mentioned research gap, the present research intends to propose a comprehensive framework examining the impacts of GHRM practices on both in-role and extra-role green behaviors in HEIs. And this research will also introduce GWE as a mediator variable linking HEIs' GHRM practices with employees' green workplace behaviors under Chinese cultural context. By differentiating green behaviors into

in-role and extra-role categories, the originality of this research lies in extending beyond simplistic evaluation of overall green behavior to capturing the nuanced expressions of sustainable practices of academic staff, which can enrich the existing theoretical understanding of how GHRM impacts discreet types of behavior that are both formal (in-role) and discretionary (extra-role) under Chinese HEI contexts.

The research objectives of this study are, firstly, to examine the relationship between GHRM practices and employees' green workplace behaviors from both in-role and extra-role perspectives within higher education institutions; secondly, to investigate the mediator role of GWE in the relationship between GHRM practices and employees' green workplace behaviors; thirdly, to contribute to the developing body of literature on GHRM by exploring its influence in the under-researched higher education sector; fourthly, to provide a culturally grounded extension to present theories by taxing the applicability of SET, JDR, and BBT in the distinctively cultural environment of Chinese HEI so as to enrich their explanatory power in non-Western settings. The contributions of this research are, first, it is grounded on the social exchange theory (SET) and develops a framework that explores the impact of GHRM on employees' green behaviors in Chinese cultural context. Second, by integrating insights from both the job demands-resources model and broaden & build theory (BBT), this research introduces GWE as a key mediator variable, explaining the mechanism through which GHRM augments green workplace behaviors. Third, this study contributes to the growing body of literature on GHRM by addressing its underexplored implications in the HEIs sector, offering theoretical advancements and practical recommendations for HEIs to develop environmental sustainability.

Literature Review

GHRM & Green Work Behavior

As an emerging critical concept in corporate sustainability, the concept of GHRM practices refers to, as described by various scholars (Dumont et al., 2017), the practices that comprise of green employing and recruiting people with green consciousness and understanding; green development of workers' green abilities and aptitudes; green performance evaluation with recognized green criteria; and green incentives to offer rewards for the successful implementation of green goals required by organization. Employee green behavior encompasses an employee's environmentally responsible actions in workplace, which can be categorized into compulsory in-role actions and discretionary extra-role actions. In-role green actions refers to environmentally sustainable job-specific responsibilities that are formally incorporated into an employee's job accountabilities and performance evaluations such as minimizing waste and energy consumption, and adhering to green policies (Tirno et al., 2023). Conversely, extra-role green actions represents discretionary pro-environmental actions that extend beyond formally expected job obligations and are not explicitly evaluated in performance appraisals such as partaking in environmental campaigns and mentoring colleagues on sustainable practices (Jiang et al., 2022). In HEI context, fostering both in-role and extra-role green behaviors among faculty and administrative staff is critical for institutional sustainability efforts. Faculty members engaging in in-role green behaviors incorporate sustainability principles into teaching and research, while extra-role behaviors involve voluntary participation in campus-wide environmental initiatives (Ercantan & Eyupoglu, 2022)

The supporting theoretical framework for the relationship between GHRM and green work behavior can be attributed to the SET that emphasizing on the principle of reciprocity,

which suggests that employees develop reciprocal relationships with their organizations based on perceived support and investment in their well-being (Blau, 1964). SET postulates that employees answer to organizational investments in GHRM such as green recruitment, training, and incentive systems by responding with behaviors that align with the organization's sustainability values (Nabi et al., 2023). GHRM practices signifies organization's pledge to employee well-being and ecofriendly goals and triggers a sense of obligation among employees to engage in both in-role and extra-role green behaviors as a form of social interchange. And when organizations demonstrate a strong managerial pledge to environmental sustainability by means of clear green objectives, pro-environmental developmental programs, green performance evaluations, and environmentally focused incentive systems, it will foster a sense of obligation and motivate workforce individuals to reciprocate by engaging in both task-related and voluntary pro-environmental behaviors (Nabi et al., 2023). Thus, SET provides the theoretical grounding for the direct effects of GHRM on GWB. Early conducted pragmatic studies have found that positive relationship exists between GHRM and various dimensions of green workplace behavior including individual employee's green task performance, empowerment, work creating, and environment friendly workplace citizenship behavior in various industries such as retail, healthcare, and automotive (Dumont et al., 2017; Wu et al., 2024). Therefore, this study posits the following hypothesis:

H1: GHRM positively influences employees' in-role Green Work Behavior at HEI.

In HEI context, studies also found evidence suggesting that GHRM activities such as green staffing and developing can encourage academic employees to incorporate sustainability principles into their teaching, thereby amplifying the impact of environmental management beyond institutional boundaries (Gilal et al., 2019). Also, green performance evaluations and incentives were found reinforce positive environmental actions, thus motivating faculty and staff to participate in eco-friendly initiatives on campus (Bui et al., 2024). Therefore, this research postulate following hypothesis:

H2: GHRM positively influences employees' extra-role Green Work Behavior at HEI.

GHRM & GWE

Work engagement is conceptualized as the extent to which employees are cognitively, emotionally, and physically invested in their work (Haque et al., 2024), and GWE is defined as the level of energy employees devote to environmentally sustainable tasks, disposition to exercise effort in green initiatives, and degree of immersion in green work-related activities (Haque et al., 2024). Empirical research has identified several influencing factors of work engagement, including work features, management, and HRM practices (Aboramadan et al., 2022). Traditional HRM literature has examined the influence of HR practices and systems on work engagement, for example, Arnold et al. (2018) suggested a framework incorporating administrative, task-related, inspirational, and individual elements that contribute to enhanced work engagement. Furthermore, previous researches (Aboramadan et al., 2022) have demonstrated a positive association between organizational resources and employee's work engagement. The theoretical support for the relationship between GHRM and GWE can be explained by JDR framework, where in the context of green HRM, practices like green development and performance incentives serve as job resources that support employees' ability to reach environmental goals. According to the JDR model, such resources augment motivational developments, leading to amplified engagement with environmental responsibilities (Haque et al., 2024; Gomes et al., 2023). Thus, GHRM increases GWE and in

turn improves both in-role and extra-role green behaviors. The JDR model justifies the mediation pathways proposed in this study. As supported by Susanto (2023) that resources embedded in organizations and work including HRM practices, can galvanize an inspiring mechanism that augments work engagement. From this view, GHRM such as green recruiting, training, and incentives can function as job resources, which are crucial stimulating elements that motivate employees' engagement with green work initiatives. Resources such as GHRM can fulfill intrinsic and extrinsic needs by facilitating workers' growth and supporting career goals, which foster their commitment to job and organizations (Gomes et al., 2023).

Several researches across industries found that GHRM can positively influences employees' green outlooks, conducts, and engagement levels. For instance, Ibe et al. (2024) found that GHRM practices significantly enhance GWE in education sector. Similarly, Yadate (2025) concluded that employees in education industry who received green training and incentives displayed higher levels of GWE, meaning that GHRM serves as a powerful driver of engagement in environmentally friendly job behaviors. In higher education, research on GHRM and GWE remains inadequate but growing, for instance, one study conducted by Veerasamy et al. (2019) found that GHRM practices in universities significantly enhance GWE by enhancing employees' environmental knowledge and mindfulness. Likewise, Yang et al. (2024) underlined that GHRM encourages academic staff to incorporate sustainability into their research, thereby fostering greater engagement in green job-related tasks. Therefore, following two hypotheses are postulated in this research:

H3: GHRM positively influences employees' GWE at HEI.

GWE & Green Work Behavior

The relationship between GWE & green work behavior in this study can be justified by the theoretical rational using BBT theory proposed by Fredrickson (2001). The BBT postulates that the positive emotions individuals experienced can broaden their thought-action repertoire, resulting in the development of enduring personal resources, such as flexibility, knowledge and creativity, when in contrast to the negative emotions that tend to narrow focus and create immediate survival-oriented reactions. Positive emotions expand cognitive and behavioral flexibility, encouraging creativity, problem-solving, long-term commitment and well-being (Fredrickson, 2001). In the context of Green Work Engagement (GWE), the BBT suggests that individual employees who experience positive emotions related to sustainability such as pride in contributing to environmental initiatives or a sense of contentment from green practices are more likely to engage in pro-environmental behaviors. These positive emotions broaden their awareness and motivation to partake in green activities and such recurrent engagement in sustainable practices can foster a long-term commitment to environmental objectives (Chatelain et al., 2018). As GWE boosts employees' internal motivation to engage in sustainable practices and pledge to environmental initiatives, employees also facilitate coworkers in comprehending and adopting green behaviors, which through this process, employees contribute not only to organizational sustainability but also to broader community environmental endeavors (Marini et al., 2023).

It is evident in early studies that employees who experience higher degree of engagement tend to cultivate stronger and more constructive relationships with their organizations, which subsequently leads to favorable job-related outcomes such as adhering to waste reduction guidelines, following energy-saving procedures, and complying with eco-friendly work guidelines (Yong et al., 2020). Also, some research suggests that employees with high GWE display stronger adherence to green job responsibilities, for instance, Haque et al.

(2024) concluded that employees who were deeply engaged in sustainability initiatives were more likely to conform to workplace environmental guidelines and perform their green job duties effectively. Similarly, Yong et al. (2020) further found that GWE augments employees' intrinsic motivation to align their daily tasks with eco-friendly standards, ensuring consistent in-role green behavior. Moreover, engagement can encourages a sense of psychosomatic expansion that allows employees to not only excel in their prescribed job duties but also vigorously play a part in discretionary activities that range beyond their core responsibilities (Amah, 2020). Prior research (Aboramadan et al., 2022; Chen et al., 2020) has consistently validated that work engagement may play a crucial role in predicting employees' extra-role behaviors such as suggesting innovative green ideas to management, inspiring colleagues to adopt sustainable practices and other related organizational citizenship behaviors. For instance, Amah (2020) concluded that actively engaged employees were more proactive in sharing green ideas and participating in volitional sustainability initiatives, and Chen et al. (2022) also underlined that employees with high GWE were more likely to endorse environmental awareness among coworkers, thus fostering a culture of sustainability within organizations. In the context of HEI, Fawehinmi et al. (2020) found that academic staff who were highly engaged in green initiatives took extra intentional steps to incorporate sustainability into teaching and research, consequently enhancing organization's overall environmental performance. Therefore, this research posit following hypothesis:

> **H4a:** GWE positively influences employees' in-role Green Work Behavior at HEI.
> **H4b:** GWE positively influences employees' extra-role Green Work Behavior at HEI.

The Mediating Role of GWE

As GWE is defined as a psychological state in which employees display high degree of devotion, energy, and immersion in performing environmentally sustainable errands, the JDR model suggests that GHRM practices being as organizational resources can enhance employee engagement by offering meaningful work and indispensable support (Haque et al., 2024). Subsequently, when employees experience high GWE, they are more likely to embed sustainability into their job accountabilities and willingly endorse pro-environmental undertakings (Albrecht et al., 2023). It is evident in prior studies across various industries that researchers have underlined the mediating role of GWE in transforming organizational sustainability initiatives into employee behaviors. In hospitality industry, Abualigah et al. (2023) advocated that GHRM policies resulted in amplified engagement, which leading to greater demonstration of both in-role and extra-role green behaviors. Likewise, in information technology sector, Ojo et al. (2022) confirmed that GHRM augmented employees' green engagement that drove them more devoted to embracing eco-friendly workplace practices. In the context of HEI, the relationship between GHRM and green behaviors is also likely to be mediated by GWE, as education institutes frequently depend on faculty and staff engagement to promote sustainability practices (Purnomo et al., 2024). When education institutes implement GHRM such as sustainability oriented training and performance rewards, employees are more likely to feel invigorated and dedicated to environmental objectives, thus augmenting their in-role and extra-role green behaviors (Aboramadan, 2022). Therefore, following two hypotheses are postulated in this research:

> **H5a:** GWE mediates the relationship between GHRM and employees' in-role green behavior.
> **H5b:** GWE mediates the relationship between GHRM and employees' extra-role green behavior.

By combining SET, JDR, and BBT, this research conceptualizes a unified theoretic framework in which GHRM functions as an organizational antecedent based on SET and JDR, GWE as a motivational mediator based on JDR, and green work behaviors as attitudinal and behavioral consequences based on BBT. The integrative use of these frameworks allows for inclusive explanation of organizational resource allocation and individual psychological engagement and behavior, thus strengthening the conceptual integrity and robustness of the proposed research model. Based on the aforementioned empirical evidences in existing literature, the proposed research framework that contains all hypotheses can be seen in Figure 1.
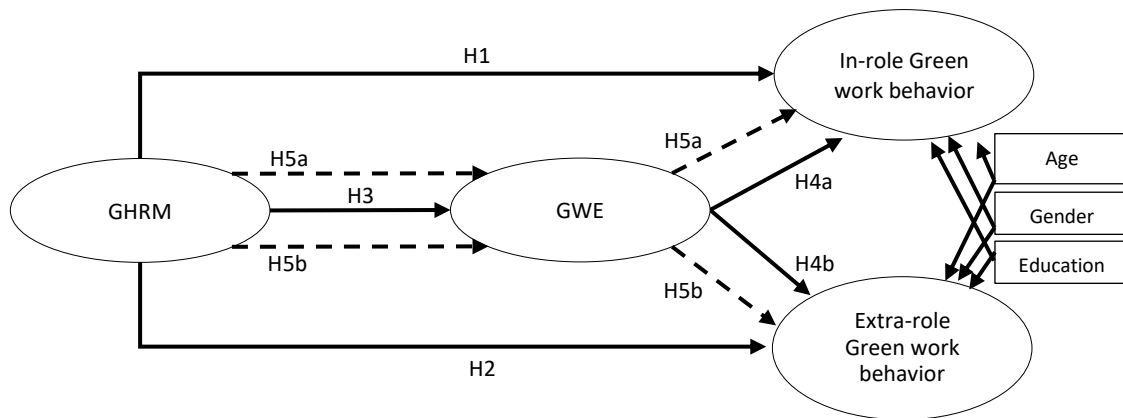
Figure 1: Proposed Green Work Behavior Framework
Source: Authors' own creation

Research Methodology

Data for this study were collected from employees working at four selected Chinese universities and colleges in the largest city (Shenyang) in northeastern region, encompassing both academic faculty and administration staff. Shenyang city was selected as the sampling frame for this study because it is one of the largest and most industrialized cities in China. It has historically been a manufacturing and heavy industry hub, which has led to significant environmental degradation, air pollution, and high carbon emissions (Ren et al., 2020). Shenyang was also listed among China's cities with serious air quality concerns, where PM2.5 levels exceeding national standards in past years (CEIC, 2023). So, Shenyang has been a target city for Chinese government's various green initiative, which mandates organizations and education institutes to incorporate sustainability into HRM operations, and employee behaviors (The Education Department of Liaoning Province, 2024). Moreover, Shenyang as the largest educational hub in northeastern China, is also home to several prominent universities that are actively working toward sustainability. The city currently has more than 40 universities and colleges enrolling over 700,000 students and employing tens of thousands of academic and administrative staff (ZZKLDZ, 2025). Thus, because of their size, academic diversity, and varying levels of sustainability implementation, universities in Shenyang may provide a representative sample for studying GHRM and green behaviors in higher education. To collect the required minimum sample size of 400 (Yamane, 1973), 600 questionnaires were distributed to four universities. After conducting a pilot study of 200 collected questionnaires, test results of the proposed measurement scales' reliability and validity were satisfactory indicating that a larger scale survey was appropriate. After obtaining permissions from universities' management to carry out the proposed study, online self-administered questionnaires links

were circulated by recruited surveyors via email or WeChat application among academic faculty and administration staff who were also informed regarding the research objectives. The questionnaire was designed by MS Form with cover letters explaining research purpose and privacy rights of respondents' personal information. Data collection process took estimate three weeks in April, 2025 and yielded 400 effective response.

The scale measurements and items in this research were adopted from early studies, which includes the GHRM scale proposed by Dumont et al. (2017) consisting of six-item, and the GWE scale developed by Schaufeli et al. (2006) including six-items. The employee's green work behavior scale was proposed by Bissing-Olson et al. (2013) including three in-role green behavior items and three extra-role green behavior items. All measurement items were evaluated on a 7-point Likert scale to assess respondents' level of agreement ranking from 1 (strongly disagree) to 7 (strongly agree). The survey questionnaire was initially translated into Chinese language then back-translated into English by bilingual specialists to ratify the accuracy of the translated texts. The statistical analysis process began with assessing the data normality, validity, reliability measurement and common method bias evaluation, followed by assessing multicollinearity concern, structural equation modeling (SEM), path analysis, and mediation effect investigations using SPSS and AMOS statistical programs. The control variables that could influence green work behavior are respondents' age, gender, education, for example, Pham et al. (2024) found that age affected employee engaging in sustainability efforts in higher education settings. Moreover, (Altassan & Ahmad, 2024) suggested that female were likely to engage in workplace sustainability programs than their male counterparts, which was in line with similar research (Islam et al., 2023) claiming that female employees were more inclined to contribute in organization's sustainability programs such as recycling and energy conservation. Fawehinmi et al. (2020) advocated that individuals with higher degree of educations (e.g., Master's or Ph.D. holders) may be better equipped to comprehend complex environmental policies, integrate sustainability into their work routines, engage in research and promotion related to sustainability, which influence their green work behaviors.

Research Findings

The demographic profile of sampled participants' is shown in Table 1, it showed that most of participants were male (53.5%), aged between 27 and 58 (77.8%). It also showed that majority respondents in this research had doctoral degree (44.3%). The statistical tests began with normality, validity, reliability, common method bias evaluation, followed by multicollinearity test, structural equation modeling (SEM), path analysis, mediation and moderation testing by SPSS and AMOS programs.

Normality test result showed that skewness and kurtosis values were between 0.763 to -1.050 and -1.980 and 1.033, respectively, which were both in acceptable ranges (Hair et al., 2019), signifying that sampled data had normal distribution. The convergent validity test began with assessing scale items' factor loadings that were below the threshold values was deleted, followed by computing the composite reliability and AVE values, which all exceeded the respective threshold levels (see Table 2). Also, the calculated heterotrait-monotrait ratios was below ideal threshold level of 0.85 (Henseler et al., 2015) signifying that scale's discriminant validity was acceptable. Scale's reliability was tested by Cronbach's alpha coefficients which showing that all results exceeded the acceptable level of 0.6 (Henseler et al., 2015), indicating measurement scale's reliability was established. Multicollinearity concern was tested by variance inflation factor (VIF) values for all independent factors including GHRM (1.161) and

GWE (1.161), which were both under minimum threshold value of 3.3 (Petter et al., 2007) meaning that proposed research framework did not show multicollinearity issue. The common method bias (CMB) test was evaluated by Harman's one-factor method, as the largest loading of a single factor was 40.7 percent (less than 50%) indicating that CMB concern did not present.

Table 1: Sample Respondents' Profile

Variable	Category	Frequency	Percent
Gender			
	Female	186	46.5
	Male	214	53.5
Age			
	18-26	62	15.5
	27-42	144	36
	43-58	167	41.8
	59 or above	27	6.8
Education Level			
	Below Bachelor	8	2.0
	Bachelor	46	11.5
	Master	156	39.0
	Doctoral	177	44.3
	Above Doctoral	13	3.3

Source: Authors' own creation

Table 2: Discriminant Validity Testing

	CR	AVE	GWE	GHRM	In-role	Extra-role	Reliability
GWE	0.864	0.522	0.722				0.900
GHRM	0.908	0.631	0.403	0.795			0.872
In-role	0.896	0.742	0.628	0.405	0.861		0.887
Extra-role	0.863	0.678	0.593	0.409	0.525	0.823	0.859

Source: Authors' own creation

Table 3: HTMT Ratio

HTMT RATIO	GWE	Extra-role	In-role	GHRM
GWE				
Extra-role	0.52098			
In-role	0.56553	0.37243		
GHRM	0.38369	0.37331	0.38508	

Source: Authors' own creation

The SEM test results from Table 4 indicated that the fit indices values of the proposed research framework including chi-square to degrees of freedom ratio, goodness-of-fit Index (GFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA) were all within the ideal ranges signifying that research model had good model fit (Kline, 2011). Results from Table 4 also presented that both GHRM and GWE had significant effects on employees' green behaviors, and among control variables, only gender showed significant influence while education level and age factors did not show significant impacts on employees' green behaviors, therefore, Hypothesis 1-4 were all supported (see Figure 2).
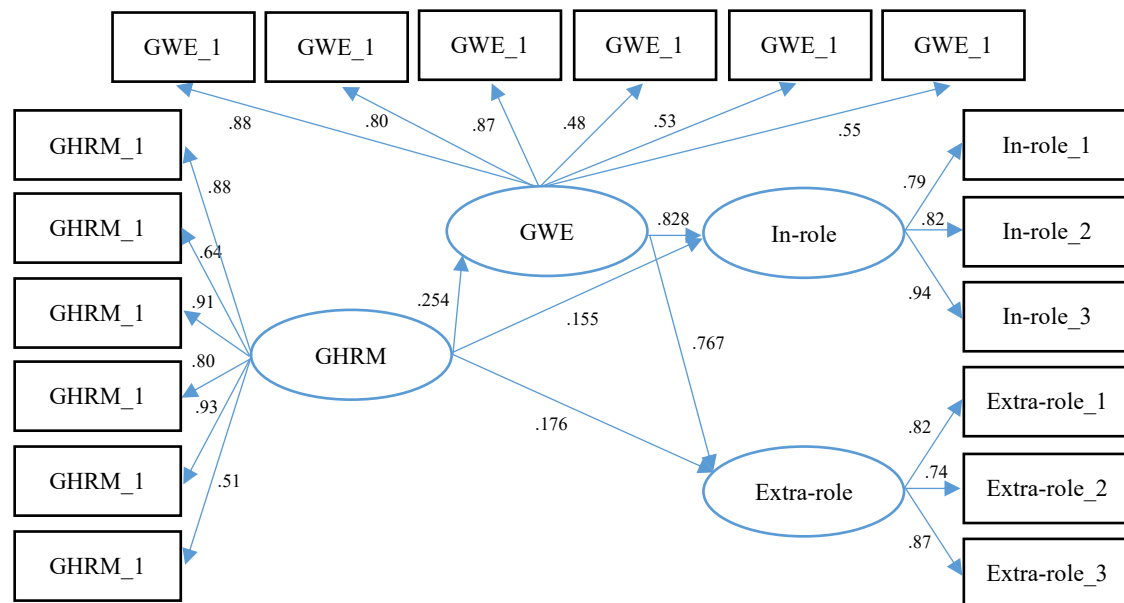
Figure 2: Adjusted Research Framework
Source: Authors' own creation

Table 4: Regression Weight Estimate

			Estimate	S.E.	C.R.	P
GWE	←	**GHRM**	.254	.038	6.758	***
In-role	←	**GWE**	.828	.105	7.855	***
Extra-role	←	**GWE**	.767	.105	7.272	***
In-role	←	**GHRM**	.155	.048	3.240	.001
Extra-role	←	**GHRM**	.176	.052	3.415	***
Extra-role	←	**Education Level**	.116	.067	1.731	.083
Extra-role	←	**Gender**	.380	.109	3.504	***
Extra-role	←	**Age**	-.050	.065	-.776	.438
In-role	←	**Education Level**	-.011	.062	-.183	.855
In-role	←	**Gender**	.248	.100	2.469	.014
In-role	←	**Age**	-.036	.060	-.591	.554

Notes: Model fit indices: $\chi2$ = 3.5.82 (P < 0.00), df = 174, $\chi2$/df = 1.758, CFI = .973, GFI = .933, NFI = .940, TLI =. 967, RMSEA = .044, *** = .001 significance level
Source: Authors' own creation

Table 5 showed that the GWE exhibited higher impacts on employees' green behaviors than GHRM although all direct effects were significant. And Table 5 also indicated that GHRM indirect effects on green behaviors were significant higher than its direct effects, meaning that GWE exerted partial mediation effect on the path relationship between GHRM and employees' green behaviors. Thus, Hypothesis 5a and 5b were both supported.

Table 5: Mediating Effect of CPT

Relationship	Estimate	Bootstrapping		2 Tailed Significance
		Bias-corrected 95% CI		
Direct Effects		LB	UB	
GHRM - GWE	.254	.159	.363	.001
GHRM - Extra-role	.176	.074	.282	.003
GHRM - In- role	.155	.045	.264	.008
GWE - Extra-role	.767	.576	1.012	.001
GWE - In- role	.828	.619	1.072	.001
Indirect Effects				
GHRM - Extra-role	.194	.134	.273	.000
GHRM - In- role	.210	.145	.293	.001

Source: Authors' own creation

Discussion

The research investigated the association between GHRM and various employee green behaviors, specifically in-role green behavior and extra-role green behavior, with a particular focus on the mediation role of GWE. The findings indicate that GHRM was significantly related to both in-role and extra-role green behaviors, which aligns with the study conducted by Dumont et al. (2017) advocating that positive relationships existed between GHRM and employees' green behaviors. Such findings also support the application of SET theory in predicting that employees reciprocate their organization's green management initiatives by engaging in both job-related and volitional green behaviors (Islam et al., 2021). Moreover, the results of this study confirmed the positive correlation between GHRM and GWE, supporting the JDR framework, which underscores the role of workplace resources in enhancing employee motivation and engagement. This finding was consistent with similar recent studies, for instance, research conducted by Haque et al. (2024) also suggested that exposure to GHRM practices results in higher levels of work engagement among employees, which was supported by Baykal and Bayraktar (2022) who demonstrated that green competency-building practices are significantly associated with augmented GWE, with green knowledge sharing serving as a mediating factor.

The research further confirmed that GWE positively influences employees' in-role green behavior, extra-role green behavior. This indicated that employee that exhibits higher levels of GWE are more likely to build strong, trust-based relationships with their organizations, eventually fostering positive green behaviors. This result was in congruent with early studies, for example, one research carried out by Ababneh (2021) advocated that employee engagement partially influenced the relationship between GHRM practices and employees' green engagement that resulted in increased environmentally friendly actions at workplace. Likewise, Kim et al. (2023) suggested in their research that organizational leadership and GHRM enhances employee engagement, thereby strengthening their commitment to both obligatory and voluntary environmental activities. Furthermore, this research confirmed GWE's a significant mediator role in the relationships between GHRM and employees' green behaviors. It designated that the impact of GHRM on green workplace behaviors is not solely direct but can occur through an intermediary process, as suggested by Kania (2024). Putri et al. (2023) also explored the effects of GHRM practices on GWE and that found GHRM practices significantly augmented GWE, suggesting that the importance of

intermediary processes in the relationship between GHRM and green workplace behaviors. Other empirical research similarly provided evidence supporting GWE's significant mediating effects, for instance, Aboramadan (2022) found that GHRM can influence both green behavior and work engagement, suggesting that the impact of GHRM on green behavior operates through an intermediary engagement process.

Theoretical Contributions

This research contributes to the broader body of GHRM literature and, more specifically, to the study of green management within higher education context. While GHRM research continues to progress, scholars emphasize the need for further exploration, particularly in higher education sector (Miah et al., 2024). In response, this research put forward and empirically investigated a conceptualized framework explaining the link between GHRM and its outcomes. By empirically validating a dual-role model of utilizing GWE as both a predictor and mediator factor, this study advances HRM theory by indicating how GWE within institutions can both directly and indirectly foster green behaviors among employees. And it is a novel study to incorporate GWE as both predictor variable and mediator variable in examining various green behaviors, comparing with other mediating factors including green psychosomatic environment, green knowledge, green passion, green empowerment, green investment, and green design that were employed in prior studies (Miah et al., 2024). Additionally, majority early researches have focused solely on either obligatory job-related or volitional green behaviors, whereas integrating both employees' participation and citizenship behavior toward the environment had not previously been considered as potential GHRM practices outcome simultaneously (Saad et al., 2024). This integration of in-role and extra-role behaviors provides fresh theoretical insight into how GHRM can nurture a holistic culture of sustainability rather than isolated conducts. It also supports the extension of other HRM theories such as Role Theory, by signifying that employees may change roles due to organizational support systems such as GHRM and GWE. Moreover, the unique context of Chinese HEI offers distinctive institutional conditions, which may vary meaningfully from outcomes in Western organizational settings. Therefore, the contextual relevance enriches the explanatory power of the proposed research model within higher education while also providing comparative understanding for future researches.

Managerial Implications

From a managerial perspective, higher education institutions are encouraged to adopt green initiatives and develop strategic plans that position their employees as environmental advocates. To enhance environmental sustainability, these institutions must implement effective GHRM practices that promote workplace green behaviors, which contributes to both internal sustainability culture and broader community's benefits. Employees who are invigorated and empowered to adopt sustainable practices at work are more likely to integrate those behaviors into their homes and communities, thus impacting sustainability awareness and action in society at large. This ripple impact augments the institution's societal influences by nurturing a culture of environmental responsibility beyond organizational borders. By integrating sustainable green practices, higher education institutions can support employees in addressing environmental challenges, thus improving both organizational and societal green performance, which relates to the degree that institutions contribute to wider sustainability targets such as minimizing carbon releases and fostering resource saving. These contributions align well with international initiatives such as the United Nations' Sustainable Development Goals. HR professionals in higher education settings need to prioritize GHRM initiatives alongside other HRM strategies, such as performance-oriented work systems and commitment-

oriented HRM approaches. Effective GHRM strategies should encompass transparent green staffing policies, comprehensive green growth programs, systematic green performance appraisals, and well-structured green incentive and remuneration systems. By implanting such initiatives, HEIs not only achieve their organizational goals but also champion as role models for sustainability in society, producing graduates and communities that are more acclimated to sustainability. Therefore, findings from this study contributes both socially managerially by exhibiting how GHRM interventions can produce wider environmental impacts at institutional and social level.

Conclusion

Recommendation

Grounded on the research findings of this study, several recommendations can be proposed for both academic and managerial contexts so as to improve the effectiveness of GHRM in nurturing employees' green behaviors. Firstly, higher education institutions should incorporate GHRM practices into their core HRM policies to stimulate both in-role and extra-role green behaviors among employees. For instance, Chinese Universities should establish dedicated sustainability teams to superintend the development and execution of green initiatives. Chinese Universities can prioritize recruiting employees with pro-environmental principles and aptitudes to align with organizational sustainability objectives, or conduct frequent teaching programs for enhancing employees' green knowledge and abilities that equip them to participate in green practices both within and beyond their job accountabilities. Chinese universities should also implement green performance gauges into employee appraisals and offer both financial and non-financial stimulus such as added leave days, or proficiency development opportunities for sustainable behaviors including encouraging paper recycling and energy conservation. Secondly, as GWE has been identified as a critical mediator between GHRM and green behaviors, Chinese universities should emphasize on nurturing an educational environment that motivates employee engagement in sustainability efforts. This can be accomplished by building collaborative spaces for green innovation, acknowledging employee-led sustainability developments, and boosting partaking decision-making in environmental policies, which can reinforce GWE. Additionally, cooperation among different universities and relevant stakeholders such as government agencies, industries, and international establishments should be encouraged to assist knowledge exchange on the best green initiatives. Organizing both domestic and international conferences, establishing research coalitions, and engaging in community-based environmental projects can also augment cross-sectional learning and engagement, which leads to green behaviors. Moreover, some behavioral nudges can be applied by Chinese universities to subtly engage employees in sustainable practices, such as placing reminders to decrease paper usage, utilize waste separation bins, and adopt digital platforms to reduce printing, which may all considerably improve GWE and diminish the environmental footprint of Chinese higher education institutions. Thirdly, it is recommended for Chinese universities to establish mechanisms that can continuously measuring the efficacy of their GHRM initiatives such as conducting regular environmental inspections, gathering feedback from employees on sustainability policies, and benchmarking against worldwide best green practices, which can further facilitate Chinese higher education institutions to refine their tactics and realize long-term green objectives.

Limitations and Directions of Future Research

Despite the significant insights offered by this study, it also has a few limitations that need to be addressed. First, this research's findings was based on self-reported data from employees, which may introduce response biases to the analysis results. Second, the data utilized in this study was collected from employees in a limited number of higher education institutions in a single first-tier Chinese city (Shenyang city). Third, this research is a cross-sectional study that confines causal implications between the predictor variables and response variables. Fourth, this research examined solely on one mediating factor (GWE) between the relationships between GHRM and employees' various green behaviors. Fifth, research findings from this study was limited to Chinese higher education institutions, which confines its generalization to other industrial sectors under other cultural contexts. Last, the research did not include departmental-level control variables, such as the type of faculty or job function, which may meaningfully impact employees' engagement in green behaviors. Different departments may have different access to resources, environmental initiatives, and sustainability awareness, which could influence how GHRM practices are perceived and enacted.

Therefore, the above addressed research limitations also present opportunities for future research. First, to overcome the self-reported data bias, future research should consider adopting several data sources such as interviews or objective observational measures so as to corroborate employees' described green behaviors and enhance the findings' reliability. Second, to strengthen the external validity of the research findings, future studies should broaden research sample to contain higher education institutions from various geographical regions and different economic tiers within China. Comparative researches across several countries or cultural backgrounds could also offer profounder insights into how national and organizational cultures impact the effectiveness of GHRM practices. Third, future studies can also consider longitudinal research design in order to monitor variations in employee green behaviors over time and confirm reliable causal inferences regarding the effects of GHRM and GWE. Fourth, future research should explore other mediating mechanisms such as green psychosomatic environment, green organizational support, or green transformational leadership to offer more comprehensive understanding of the pathways through which GHRM affects employee behaviors. Moreover, investigating moderating factors such as employees' environmental awareness and organization's dynamic green capability could provide insights into the marginal circumstances of GHRM efficacy. Fifth, future research should consider exploring whether comparable relationships hold in various sectors such as manufacturing, healthcare, or government agencies. Exploring industry-specific challenges and prospects for applying GHRM practices will contribute to a more nuanced understanding of GHRM across different institutional settings. Lastly, future research should address the present study's absence of multilevel analysis. Given that the study investigates organizational-level constructs and their impacts on individual-level outcomes employee green behaviors, applying appropriate multilevel modeling techniques such as hierarchical linear modeling or multilevel structural equation modeling is applicable to account for the nested data structure such as employees within departments or institutions, which can eliminate biased parameter estimates and unravel both within-group and between-group effects and yield more accurate and generalizable research findings.

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