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The Multilevel Chain Mediating Mechanism of College Faculty's Felt Responsibility on Students' Engagement in Green Building Learning

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Abstract: The limitations surrounding the education and teaching of green building courses in higher education institutions are becoming increasingly evident. The roles of instructors, the learning environments of green building-related courses, and the impact of student engagement in these courses are attracting significant academic interest. This study delves into the cross-level mediating roles of the green building learning climate and helping behaviors, exploring the link between instructors' sense of responsibility and student engagement. It employs a multi-layer structural equation model for statistical analysis, utilizing paired survey data from 543 students and 51 instructors of green building courses, based on social cognitive theory. This paper incorporates the educational psychology concepts of "climate" and "mutual aid" with the green building learning climate and mutual aid behaviors. It provides a theoretical analysis of how instructors' sense of responsibility in colleges influences students' learning of green building knowledge and skills. By merging the ideas of "climate" and "mutual aid", this study aims to theoretically examine the impact of instructors' responsibility on student engagement with green building concepts. This approach seeks to offer new theoretical insights for pedagogical studies in green building courses.

Keywords: green building; learning engagement; felt responsibility; pedagogical research

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1. Introduction

Since the dawn of the 21st century, a growing awareness among nations globally has emerged regarding the critical importance of enhancing the quality of higher education. University educators, as the primary drivers of students' academic experiences, play a crucial role in fostering comprehensive human capital development and nurturing a new generation of skilled talents [1,2]. Contemporary architectural educators in Chinese universities operate within a traditional tri-level administrative hierarchy: "university-college-department". This structure primarily focuses on fulfilling teaching obligations and adopts a unidirectional approach to imparting knowledge, tailored to the specific requirements of various disciplines. The prevailing ethos is to teach for the sake of teaching, or merely to fulfill teaching hour quotas. Consequently, fostering student innovation and managing the educational process are not considered primary responsibilities of these educators. The development of students' comprehensive abilities is often viewed as a secondary function, only addressed after regular teaching tasks are completed. Consequently, university classrooms, particularly in emerging disciplines like green building,

have evolved into passive, task-focused environments, akin to "graduate production workshops". This approach has revealed several deficiencies in the educational processes and teaching practices of these innovative fields [3], such as the principles of green building, and the technical and practical knowledge, which the existing teaching system has not been completely covered. Moreover, students find it difficult to learn from the current, more diffuse curriculum system. For example, the principles, as well as technical and practical knowledge of green building, have not been fully covered by the existing teaching system, and it is difficult for students to deeply understand the connotation of green building and effectively master the green building evaluation technology and innovative design methods from the current curriculum system [4], as well as other constraints and difficulties.

Green building education, evolving from conventional architectural pedagogy, aligns with architectural student development programs, emphasizing practical, hands-on learning through project-based and engineering-centric approaches [5]. This approach necessitates the completion of time-sensitive tasks. However, a lack of a focused curriculum often leaves students reliant on extensive instructor guidance to master complex concepts. The course content, predominantly theoretical, frequently remains detached from practical real-world applications. This disconnect is compounded by the delayed integration of internships and practical social experiences, leading to a discrepancy between academic learning and the professional skills required. Educators, constrained by pedagogical limitations, struggle to impart practical insights. This restricts students' exposure to real-world scenarios and experiential learning, which are essential for the effective assimilation and application of knowledge in the green building sector [6].

In practice, various factors, such as economic and geographic constraints, limit students' opportunities for field trips or participation in green building projects. This limitation adversely affects their motivation and learning outcomes. Consequently, the challenge of effectively engaging students in green building studies, ensuring they acquire both theoretical knowledge and practical skills, has emerged as a critical issue in this field. In response to these problems, some scholars in the current academic world have started from the student's perspective and carried out in-depth explorations on learning methods of green building [7], educational model [8], curriculum design [9], practical application [10], etc., achieving relatively fruitful results. And the perspectives of teaching academic competence [11], teachers' norms [12], and teachers' morality [13] have been the usual entry points for academia to address issues related to student learning statuses, attitudes, learning effects, etc., making student learning attitudes and outcomes paramount within the academic sphere. However, a review of the existing literature reveals a notable gap in research concerning the nuanced relationship between the teaching responsibilities of green building lecturers and student learning engagement. A thorough examination of university students' engagement in green building-related knowledge and skills is vital. Such a study not only aids students in comprehensively understanding and applying principles of environmental, social, and economic sustainability in building design, construction, and operation but also enhances their learning effectiveness and overall development. This approach offers a holistic view of the green building learning process, elucidating the link between teaching methods and student outcomes. It highlights student engagement, attitudes, academic performance, and achievements, allowing for comparisons across various levels of engagement. Furthermore, considering that most college students live away from their parents and have limited social interactions, the influence of teachers and peers becomes a critical factor in their learning engagement. In our study, we observed that green building education courses in Chinese universities are predominantly offered as electives or online modules. This format often leads to issues such as diminished attention, suboptimal learning outcomes, and indiscriminate course selection by students [14]. The casual nature of these courses tends to lessen both student engagement and teacher responsibility. In an environment where the value of the classroom experience is already underappreciated, commitment to learning from students and a sense of responsibility among teachers naturally wane. Consequently, it is crucial to examine the involvement of university students

in green building education and the commitment of educators from the perspectives of educational professionals and their peers. This approach is vital for gaining a thorough understanding of the dynamics influencing the efficacy of green building education in China's higher education institutions.

As China increasingly prioritizes environmental protection at the macro level, and as awareness of energy conservation and carbon reduction permeates public consciousness, knowledge and technologies related to green building are continuously evolving. To stay abreast of these changes, college students must invest considerably in independent research. Additionally, they require innovative guidance from their teachers throughout their academic journey to effectively grasp and adapt to these evolving concepts [15]. Because the process of teaching green building-related knowledge is a "bilateral" process, which requires the active guidance of teachers and the cooperation of students, the responsible attitude of green building lecturers becomes a crucial factor affecting students' learning outcomes [16]. Teachers possessing a strong sense of responsibility extend beyond imparting course-specific knowledge; they focus on nurturing college students' critical thinking, independent exploration, team communication, cooperation, and practical application skills. Such educators act as guides, helpers, and facilitators for students, and as architects of the educational environment. They prioritize students' practical application abilities, shifting from a teaching-centric to a learning-centric approach. These teachers are pivotal in bridging the gap between student learning and university teaching, forming a unique connection that enhances both aspects [17]. This is a unique link between student learning and university teaching, one where students can be deeply inspired by their interest in learning, fully engage them in green building learning, and ultimately enable them to effectively master core green building skills.

Social cognitive theory, an evolution of learning theory, emerged as a distinct research area in the 1970s and 1980s and swiftly became a significant field within psychology in the 1990s. Albert Bandura, leveraging his extensive psychological expertise, approached human functioning as a focal point. He integrated this with pre-existing social learning theories to propose a model where human functioning is influenced by a dynamic interplay among individual factors, environmental elements, and behavior [18]. According to social cognitive theory [19], the learning process, particularly in the context of green building knowledge, is influenced by multiple factors. First, the learning outcomes of students are shaped by teachers' personal preferences, attitudes, wills, emotions, and other individual cognitive and qualitative elements. Second, in the interaction between students' individual green building behaviors and learning environments, the ambiance of the learning environment significantly affects students' learning behaviors. Third, while the learning outcomes are impacted by environmental factors, individual students possess the agency to shape a conducive learning environment tailored to their needs. This adaptive capacity hinges on the student's cognitive understanding and proactive engagement in the learning process. This framework underscores the importance of considering both internal and external factors in educational settings, particularly in specialized areas like green building education.

This research transcends the traditional "teacher–student" dichotomy in higher education research perspectives. Drawing from social cognitive theory, it analyzes how the characteristic of felt responsibility among university instructors can enhance student engagement in green building learning. This study delves into this role process in-depth, elucidating the pathways through which student-level helping behaviors and teacher-level green building learning climate influence the relationship between instructors' felt responsibility and students' engagement in green building learning. These mechanisms are integrated into a comprehensive cross-level research framework. Through in-depth investigation and addressing related questions, this research aims to improve the effectiveness of green building courses for college students and offer valuable insights for the development of green building teaching theories.

2. Literature Review and Research Hypotheses

2.1. Green Building Teachers' Felt Responsibility and Students' Green Building Learning Engagement

Learning engagement is defined as the positive learning behaviors exhibited by students in specific educational contexts. It encompasses their effort to maintain these behaviors persistently and their dedication to learning. This engagement involves overcoming challenges and reaping the rewards of their endeavors, leading to positive internal emotional states [20]. Reflecting on the research concerning learning engagement, early scholars have predominantly based their studies on the "time on task theory". This theory posits a significant positive correlation between the amount of time students dedicate to learning and their academic achievements; essentially, the more time spent learning, the greater the learning outcomes. In the 1960s, scholars introduced the "Quality of Effort Theory", suggesting that students' learning engagement depends not only on the time invested in learning but also on the intensity of effort they exert [21]. In the 1990s, scholars conducted more in-depth research on learning engagement, such as Astin's study [22], which was based on the "engagement theory" and explored the psychological and behavioral aspects of learning time engagement and effort. Marks [23] and other scholars believe that learning engagement includes the operational experiences of students, highlighting that learning engagement involves the emotional and psychological engagement of students. Simply put, emotional engagement refers to the expression of emotions, while psychological engagement refers to mental activities and mental feelings [24,25]. In recent years, Cornell et al. [26] noted that the degree of each learner's engagement in learning activities is related to their own objective situations, needs, engagements, and gains, while the degree of student engagement is closely related to school conditions and teachers' personal teaching styles. Researchers contend that the key elements influencing students' learning engagement encompass not only personal factors but also external environmental aspects, such as the learning environment and teaching methods employed by instructors. They assert that these external environmental factors are equally pivotal in shaping students' learning engagement. Schaufeli et al. [27] focused on student learning engagement based on work engagement research. They believe that this state is also reflected in the learning process of students, as a psychological state in which an individual engages in learning or works with a positive and enthusiastic mindset, is attracted to the work or learning task, and is willing to actively work hard [28]. Therefore, some scholars believe that learning engagement involves a continuous and stable combination of positive cognition, behavior, and heightened emotions and feelings in the learning process [29,30]. Schaufeli et al. [31] also explored the connotation of learning engagement in depth, and classified it into the three dimensions: dedication, concentration, and vitality. Dedication refers to student satisfaction and pleasure in learning, as well as pride and meaning in learning. In the context of learning engagement, "Dedication" pertains to the learners' enjoyment, satisfaction, and sense of achievement in their educational pursuits. "Concentration" reflects the depth of their focus and immersion in learning activities. "Vitality" relates to the student's time and energy commitment, coupled with their resilience and motivation to navigate academic challenges. Qiao Xiaolong, a notable Chinese scholar, offers a nuanced perspective by bifurcating learning engagement into emotional and behavioral dimensions. According to Qiao, this encompasses the intensity of students' behavioral involvement in learning scenarios and the quality of their emotional experiences during these engagements, highlighting a dual focus on action and affect in the learning process [32].

In summary, according to international scholars, engagement in green building learning is a multifaceted construct involving both behavioral and emotional inputs. This concept encompasses the cognitive, behavioral, and affective contributions of students in the learning process, which are interdependent, mutually influential, and equally crucial. A comprehensive understanding of student engagement in green building learning requires an assessment across cognitive, behavioral, and affective dimensions. It is important to recognize that this form of engagement is the outcome of interactions between the learner

and the learning environment, contributing to academic achievement. The 'subject' aspect involves the time and energy students actively dedicate to educational activities. The 'object' aspect encompasses the organizational and managerial roles of teachers, including teaching leadership, the creation of a conducive learning climate, and the facilitation of student participation in various learning practices. Therefore, college students' engagement in green building learning can be defined as the investment of time, energy, resources, and emotional and cognitive efforts in learning and practicing within the realm of green building, reflecting a deep level of individual engagement.

In every profession, practitioners must adhere to established professional standards, abide by specific ethical codes, and accept responsibilities pertinent to their roles. Within the educational sphere, a concept termed "teacher felt responsibility" emerges, originating from a profound comprehension of the educator's role. This sense of duty is inherent in teachers who deeply understand their students' expectations and the interplay between education and society. Consequently, professionals experience varying degrees of responsibility throughout their careers, with this phenomenon being particularly pronounced and distinctive in education. Scholars have varied in their definitions of teacher's felt responsibility. For example, Yuan [33] suggests that a teacher's felt responsibility refers to the duties and responsibilities that an educator should undertake in the process of education, including guiding, evaluating, and caring for students. The teacher's felt responsibility reflects the educator's sense of responsibility to students and society in the educational practice. Dao [34] believes that teachers' felt responsibility refers to the teachers' in-depth understanding and subjective awareness of their educational duties based on their firm beliefs and concepts about education. In terms of measuring teachers' felt responsibility, Lauermann [35] points out that there are three ways to measure teachers' felt responsibility, namely, teachers' sense of professional responsibility as a stable personality trait, teachers' sense of professional responsibility as the appearance of contextualized action representations, and teachers' sense of professional responsibility as a component of the subject's social role. In the specialized domain of green building education, the notion of teachers' felt responsibility acquires distinct meaning. Building on the previous discussion, this responsibility in green building education encompasses a range of aspects. It includes the obligation of educators to instill environmental consciousness in students, balance the theoretical and practical facets of green building, and foster a learning environment conducive to this field. Such responsibility requires college educators to acknowledge their professional duty as an essential societal role, which involves not just teaching technical knowledge and skills in building technology but also emphasizing innovative educational strategies and methodological applications. The ultimate goal is to nurture students' capacities for independent and critical thinking. Social cognitive theory elucidates the process of generating meaning and behavior in the relationship between the individual and the environment and emphasizes that behavior and environment are interdependent and mutually determined [36]. Within this framework, the felt responsibility of green building teachers, recognized as an environmental factor, is interdependent with and mutually influences student learning behaviors. This positive environmental influence will likely invigorate student engagement in learning activities. Crucially, the felt responsibility of green building teachers can provide constructive learning guidance, ignite students' intrinsic motivation, and enhance their willingness to participate actively in learning. Furthermore, social cognitive theory posits that students' academic achievements are shaped by the interaction between the individual and the environment. Consequently, under the tutelage of teachers with a strong sense of felt responsibility, students are more inclined to see themselves as active learners rather than passive recipients of information, thereby fostering increased engagement in acquiring green building knowledge and skills. Based on this, this paper proposes the following hypotheses:

Hypothesis 1 (H1). *Felt responsibility of college faculty has a positive effect on college students' engagement in green building learning.*

2.2. Mediating Role of Helping Behavior

Helping behavior has its origins in altruism and refers to the behavior of an individual who provides help to others without compensation in a given situation [37]. This behavior may be selfless or based on some expectation of reward. While previous scholars have focused on helping behavior at the giver level, this study focuses more on the effects of helping behavior on the recipient. In general, helping behavior can be divided into explanatory helping behavior and informational helping behavior [38]. Bargh et al. found that these two types of helping behaviors will have different effects on recipients [39].

In educational settings, perceptions of a teacher's felt responsibility are closely linked to factors such as commitment, positive attitudes toward teaching, teachers' confidence in their impact, students' academic achievements, interactive behaviors, and overall learning status. This sense of responsibility represents a stable psychological tendency, highlighting teachers' capacity to harmonize external professional expectations with their internal motivations and needs.

From the basic starting point of social cognitive theory, human activities are determined by the interaction of three factors: individual behavior, individual cognition/other individual characteristics, and the external environment in which the individual is located; people's beliefs and motives tend to dominate and guide their behaviors in a powerful way. Therefore, based on social cognitive theory, we believe that college teachers' felt responsibility influences their teaching behaviors in the teaching process, and that this sense of responsibility motivates college teachers to create good learning environments for students, better respond to students' needs, and guide the development of cooperative and mutual support behaviors among students. Specifically, driven by felt responsibility, college teachers' facilitation of students' helping behaviors can be categorized into the following areas: First, support for students' helping behaviors [40]. Teachers' felt responsibility often motivates them to focus on students' comprehensive development, encompassing academic performance, mental health, and social needs. The perception of their responsibility to provide support and guidance to students ensuring each one progresses, motivates teachers to guide students in providing academic support and encouragement to one another. Second, providing feedback and guidance on helping behaviors among students [41]: Teachers in higher education see themselves as responsible for ensuring that students are clear about their learning goals, and fostering mutual support among students to help them overcome difficulties. This felt responsibility perception contributes to a positive teacher–student relationship and helps to increase the motivation of students to cooperate with and help each other. Third, creating a supportive learning environment: Teachers believe that they have a responsibility to provide conditions that are conducive to students' mutual supportive learning, including a positive classroom climate and opportunities to encourage students to actively participate in collaborative discussions. Such supportive aids can encourage students to be more proactive in seeking help and participating in learning [42].

Green building is a discipline that encompasses the principles of environmentally friendly, sustainable, and high-performing building design and construction, and aims to develop students' knowledge and skills in adopting environmentally friendly and sustainable practices in the construction field. Students enrolled in green building courses often face numerous challenges. While some of these can be overcome through individual efforts, others require external assistance. In this context, teachers are a pivotal source of support within the university's support network, significantly impacting students' learning experiences and outcomes. Strati [43] found that students' perceived teacher support is closely related to their level of learning engagement; meanwhile, Sawka [44] believes that teachers' positive attitudes, academic expectations, and motivational behaviors toward students can effectively increase students' learning engagement, especially teachers' emotional support, which is more effective than other aspects of support, and is also more effective than other aspects of support. The positive predictive effect of emotional support is stronger than that of other types of support. Social cognitive theory suggests that students' social behaviors can be formed or changed by observing and learning from model behaviors,

and that student behaviors depend on the teachers' model behaviors and the learning climate [45]. Therefore, we hypothesize that the helping behaviors of college teachers can, to some extent, help students construct green building knowledge, develop related skills, and promote students' overall development in academic and social domains by providing cognitive support, affective support (respect, understanding, and encouragement, etc., from green building teachers), and social support (unpaid tutoring or helping behaviors, etc., from green building teachers) [46,47], which will ensure that students are fully engaged in their green building studies. Based on this, this paper proposes the following hypotheses:

Hypothesis 2 (H2). *Helping behavior mediates the relationship between college faculty's felt responsibility and college students' engagement in green building learning.*

In practice, universities place significant emphasis on fostering a campus atmosphere that resonates with the concept of harmony between humans and nature. This is evident in the design of many university libraries, where the architecture not only serves an academic purpose but also aligns with environmental aesthetics. Prominent examples include the Library of the University of Oxford in the United Kingdom, Heidelberg University Library in Germany, and Stanford University Library in the United States. These institutions have seamlessly integrated their library buildings into the natural environment, a design choice that subtly cultivates and reinforces student awareness and appreciation for green initiatives. This architectural approach reflects a broader educational philosophy, one that extends beyond traditional learning spaces and seeks to imbue students with a deeper, more intrinsic understanding of sustainable and environmentally conscious living.

2.3. Mediating Role of Green Building Learning Climate

The learning climate (within the educational realm) is a multifaceted concept. It is perceived as an intricate, dynamic system encompassing cognitive, affective, social, and physical components. These elements interact to form the totality of a learner's experience within a specific educational setting [48]. The first researcher to link the concept of climate to schools was Halpin, while Way et al. were the first to take the novel step of measuring climate as an environmental variable from an educational and pedagogical perspective [49].

Green building, as an emerging discipline, emphasizes innovation, multidisciplinary cooperation, and practical participation as its main themes. The course content focuses on the sustainability and eco-friendliness of building design, construction, and operation [50]. However, taking the interdisciplinarity of green building-related knowledge points as an example, the knowledge systems and ways of thinking of the various disciplines within the green building curriculum are different, which will likely lead to learning and communication difficulties for students. Therefore, for students studying green building-related courses, the classroom learning climate will have an important impact on students' learning effectiveness. The green building learning climate is mainly composed of two aspects: (1) The control of the classroom learning climate for students with teachers as the main body [51]. A positive learning climate in green building education, characterized by rigorous pedagogical approaches, effective classroom instruction, and responsible teaching ethos, enhances student engagement. The attention green building educators give to student needs, their teaching methodologies and strategies, and the fostering of open and effective communication and a safe learning environment act as external stimuli. These factors ignite and amplify students' intrinsic motivation to learn. (2) Students themselves as the main body of the learning climate control [52], through the green building learning attitudes and behaviors fostered by different learning climates. Specifically, students generally perceive that there is an atmosphere within the group that encourages individuals to continuously learn new knowledge about green building and encourages the continuous improvement of self-worth through knowledge-sharing.

In the learning context of green building courses, learning is the primary task of students, and the learning climate is considered an important influence on students' knowledge of green building [53]. Social cognitive theory suggests that individual behavior and cognition are always influenced by the surrounding environment. The young college students in this study, who have not yet entered society, are mainly influenced by their families and schools. Regarding the direct contact with college students, the teaching staff is one of the significant factors in the school dimension. Teachers' sense of responsibility for teaching reflects their professional cognition, emotions, and beliefs, and is a prerequisite for realizing their professional purposes, so teachers' sense of responsibility makes them more student-centered, more focused on the positive cultivation of students, and more attentive to the creation of the teaching environment. Therefore, teacher factors, such as teacher engagement, teacher expectations, and teacher attitudes, become important components of the green building learning climate. It can be seen that teachers' own moral attributes will have a significant impact on the learning climate [54,55]. At the same time, the shaping of a moral sense or sense of responsibility is closely related to the perception of the environment, the smoothness of communication within the classroom, and the ideal perception of the teacher–student relationship, which will subconsciously affect the sense of responsibility in the classroom, and as the teacher–student relationship strengthens, the teacher's sense of responsibility will gradually increase [56]. Therefore, in an actual green building course, the stronger the teacher's felt responsibility perception, the more likely it will directly affect the students' learning climate.

Social cognitive theory states that students' behaviors will change due to various environmental factors around them, and that controlling and changing environmental factors can effectively improve the effectiveness of students' learning behaviors and stimulate cooperative and supportive behaviors [57]. The link between team or group climate and cooperative behavior has garnered attention in the academic world. For example, Ho [58] said that when there is a high psychological climate of cooperation in an organization, the members of the organization will have a high degree of harmonious passion, which leads to further interpersonal helping behavior. In addition, Byoung et al. [59] showed that when there is a high degree of fairness in the team climate, the members of the team believe that their own helping behaviors will be praised and rewarded by the recipients; this is a very important factor in the development of cooperative behavior in an organization. When the team has a high level of fairness, internal members believe that their helping behavior will be praised and rewarded by the recipients, and they tend to help other members of the team in this case. Learning climate is one of the most important factors determining students' learning status. In the green building classroom, the influence of the overall learning climate of the classroom is indispensable to establishing trust, respect, and cooperation between teachers and students and between students and students, and in cultivating students' helping behaviors. When students perceive a good learning climate in a green building course, they will show positive emotions and pay more attention to the needs of their classmates around them, which in turn affects the helping behavior in a green building course [60].

To summarize, the teachers' own sense of responsibility is an important factor affecting the green building learning climate, and a positive green building learning climate motivates students to offer help within the course. Social cognitive theory points out that three factors (individual, behavior, and the environment) can interact with and influence each other. Specifically, teachers in green building courses who feel responsibility may attach more importance to the development and growth of students and actively solve teaching problems, e.g., by providing opportunities for students to participate in green building-specific project practices and foster active student learning. And in this case, students are drawn by the high moral standards of the teacher to create a good green building learning climate. Under the influence of the positive learning climate, some students will be driven to help their neighboring classmates and then generate helping behavior. Therefore, we believe that teachers translate their moral perceptions into their impact on the

green building student climate, and the positive learning climate fosters helping behaviors among students in the green building course. Based on this, the following hypotheses are proposed in this paper:

Hypothesis 3 (H3). *The green building learning climate mediates the relationship between teachers' felt responsibility perceptions and helping behaviors in higher education.*

Based on this, this paper proposes a cross-layer chain mediation model, as shown in Figure 1, where college teachers' felt responsibility knowledge will positively influence college students' engagement in green building learning through a green building learning climate and inter-student helping behavior. When the level of college teachers' felt responsibility knowledge is higher, the positive influence on the green building learning climate will increase, and the helping behavior among students will be more effective in transmitting the positive influence of college teachers' felt responsibility knowledge on engagement in green building learning. In summary, this paper proposes the following hypotheses:

Hypothesis 4 (H4). *College faculty's felt responsibility indirectly (and in an orderly manner) influences college students' engagement in green building learning through the green building learning climate and helping behaviors.*

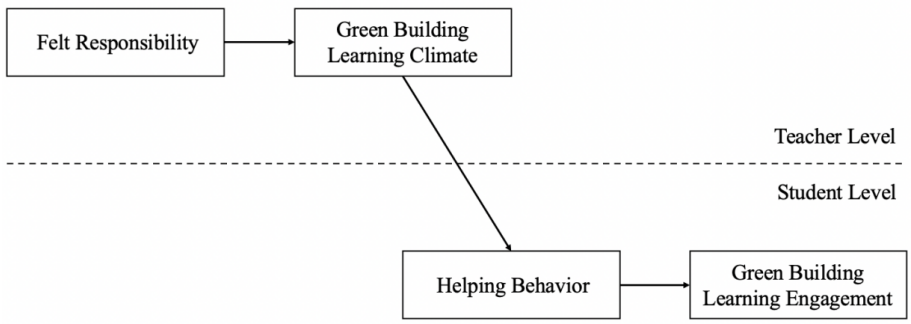

Figure 1. Theoretical research model.

3. Study Design

3.1. Data Collection

This study consisted of green building course instructors and their students at several universities in central and eastern China, with no fewer than 10 students per class (832 students in total) selected as the study population. A paired method was used to collect data at the instructor and student levels. The universities selected for this study are all public comprehensive universities in China, and the green building-related courses are taught by traditional lecturers, who use slides to assist in explaining green building-related knowledge during lectures. The content of the lectures varies slightly from university to university, but the main content of the lectures involves green building design, supplemented by lectures on land conservation and greenery protection, building energy consumption, the economic analysis of building energy savings across the entire lifecycle, as well as the application of Revit 2013–2024 and other quantitative software. With the support and cooperation of partner universities, the purpose, process, and use of the study were explained to the classroom teachers, and two versions of self-assessment questionnaires, the teacher version (felt responsibility) and the student version (participation in green building learning, the green building learning climate, and helping behaviors), were distributed; 687 questionnaires were recovered from the classrooms of the classes led by the 62 classroom teachers. To ensure the accuracy, completeness, and authenticity of the raw data, the raw data of the questionnaires were individually reviewed, resulting in 543 valid questionnaires from 51 classroom teachers, with a validity rate of the recovered questionnaires at 68.15%.

3.2. Measurement Tools

In this paper, a 5-point Likert scale was used to measure the extent to which the measurement questionnaire matched the management reality, and all the variable items involved in the study were translated and back-translated according to the translation and back-translation procedures proposed by Brislin [61] in order to ensure the accuracy of the meaning of the Chinese measurement items.

(1) Perception of responsibility among university teachers: This study utilized a research scale developed by Zhou Xihua, composed of four dimensions: perception of professional responsibility, emotional engagement in professional responsibility, awareness of professional responsibility, and professional responsible behavior. For the purposes of this research, six specific items from two dimensions—perception of professional responsibility and professional responsible behavior (items 1, 2, 3, and 10, 11, 12)—were selected. These items were further adjusted and modified based on the scale developed by Morrison et al. [62], culminating in a 5-item scale for this paper. An example item is: 'Are you enthusiastic about uncovering students' eagerness to learn, specifically directing them to actively learn knowledge or skills related to green architecture?' The Cronbach's alpha value for this scale was 0.85.

(2) Engagement in green building learning. Fang Laitan et al. [63] introduced Schaufeli et al.'s [64] learning engagement scale (UWES-S) into China, and then translated the Chinese version of the learning engagement scale, which focuses on the three aspects of learning engagement, namely, vitality, dedication, and concentration. In this paper, we simplify the question items according to the characteristics of the research content, and form a 5-item scale, such as "You have a clear purpose to study green building related courses, and you are willing to take the initiative to explore the knowledge and skills related to green building". The Cronbach's alpha value is 0.956.

(3) Green building learning climate: This paper refers to the organizational climate and innovation climate scale (which has been widely researched and applied in the world and proven to apply to students [65])—TCI [66] based on the descriptions of some of the sub-dimensions in the scale, and it draws on the "Teenagers' Perceived Campus Climate Scale" compiled by Jia [67] and so on. The scale includes three dimensions: teacher support, peer support, and autonomy opportunities. This paper selected the teacher support part of the three dimensions that matched the content of this paper as the basis, and modified some of the terminology, such as adding the term "green building" to form a four-question questionnaire for the green building learning climate. "In the green building learning process, you are able to communicate your problems or deficiencies with the teacher under the teacher's guidance". The Cronbach α value is 0.884.

(4) Helping behavior: Drawing on Sparrowe et al.'s [68] research on helping behavior, this paper deletes and adjusts some of the questions or expressions, forming a four-question questionnaire for helping behavior. For example, "You are willing to share your green building expertise with others or learn green building related skills together". The Cronbach's alpha value is 0.923.

4. Analysis of Empirical Results

4.1. Data Aggregation Test

Organizational-level data of college teachers' felt responsibility and engagement in green building learning are aggregated from individual-level data, and the feasibility of data aggregation needs to be tested. Currently, ICC(1), ICC(2), and r_{wg} are usually used as indicators of the data aggregation test, and the range of values of the cut-off criteria should be greater than 0.05, 0.70, and 0.70. In this paper, the value of ICC(1) for college teachers' felt responsibility is 0.258, the value of ICC(2) is 0.787, the mean value of r_{wg} is 0.705, and the values of the intra-group variance and the inter-group variance are 0.370 ($p < 0.01$), 1.738 ($p < 0.01$); the ICC(1) value for green building learning climate was 0.316, ICC(2) was 0.831, r_{wg} mean value was 0.711, and the within-group variance and between-group variance values were 0.368 ($p < 0.01$), 2.177 ($p < 0.01$). The above results

indicate that the felt responsibility knowledge and green building learning climate have 25.8% and 31.60% of variance between groups, respectively, and the consistency of the group means is reliable, which meets the requirements for data aggregation.

4.2. Validation Factor Analysis

In order to obtain reliable estimates for multilevel data, a validated factor analysis model for the four variables of felt responsibility, engagement in green building learning, green building learning climate, and helping behavior, was constructed using multilevel validated factor analysis (MCFA) [69]. The results, as shown in Table 1, show that the model fit indexes of the four-factor model were met ($\chi^2/df = 1.98$; RMSEA = 0. 043; CFI = 0.983; TLI = 0.98; SRMR = 0.025), and the model fit of the four-factor model was good ($\chi^2/df < 3$, CFI and TLI were both greater than 0.9, RMSEA < 0.1, and SRMR < 0.08). Meanwhile, the four-factor model outperformed the model fit indicators of the other models, indicating good discriminant validity of the variables.

Table 1. Model comparison table.

Mold	(Math.) Factor	Chi-Square	DF	Chi-Square/DF	CFI	TLI	RMSEA	SRMR
quadruple factor	FR, GBLC, HB, GBSE	255.801	129	1.98	0.983	0.98	0.043	0.025
triple factor	FR + GBLC, HB, GBSE	1024.29	132	7.76	0.881	0.862	0.112	0.083
bi-factor	FR + GBLC + HB, GBSE	1919.739	134	14.32	0.754	0.72	0.159	0.121
one factor	FR + GBLC + HB + GBSE	3001.633	135	22.23	0.619	0.568	0.198	0.145

4.3. Descriptive Statistical Analysis

The correlation coefficients are 0.400, 0.318, and 0.350, and the correlation coefficients are greater than 0, which means that there is a positive correlation between teachers' felt responsibility and green building learning climate, helping behavior, and engagement in green building learning. The mean, standard deviation, and correlation coefficient of each latent variable are shown in Table 2.

Table 2. Mean, standard deviation, and Pearson correlation coefficient table.

	Average Value	(Statistics) Standard Deviation	Higher Education Teachers Felt Responsibility Knowledge	Green Building Learning Climate	Helping Behavior	Green Building Learning Engagement
High School Teachers' Felt Responsibility Knowledge (Within-Level)	3.476	0.705	1			
Green building learning climate (Within-level)	3.158	0.732	0.400 **	1		
High School Teachers' Felt Responsibility Knowledge (Between-Level)	3.476	0.4	-	-		
Green Building Learning Climate (Between-level)	3.158	0.448	-	-		
helping behavior	3.572	1.07	0.318 **	0.478 **	1	
Green building learning engagement	3.344	1.123	0.350 **	0.485 **	0.630 **	1

Note(s): * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.4. Hypothesis Testing

In this paper, the hypothesized model is tested by robust maximum likelihood (MLR) using Mplus 8.3 software. Among the advantages of MSEM is that it can analyze more levels of mediation models that cannot be specifically analyzed using the simpler HLM approach [70]. In this paper, a multilevel structural equation modeling approach is used to synthesize inter-conceptual relationships at each level, aiming to test the relationship between college faculty members' felt responsibility and the impact on students' engagement

in green building learning. This examination considers the mediating effects of the green building learning climate and helping behaviors, with a focus on the nested nature of the data and the exploration of multiple pathways.

This paper is specifically divided into three models to carry out the analysis (See Table 3), firstly, to test the main effect of the predictor variable at the teacher level (college teachers felt the responsibility to know) on the outcome variable at the student level (engagement in green building learning), the p-value is less than 0.05 ($\gamma = 0.357, p < 0.05$), and the 95% confidence interval does not include 0, which indicates that the main effect is significant, and Hypothesis 1 is valid.

Next is the mediating effect of helping behavior. College teachers' felt responsibility has a significant positive effect on helping behavior ($\gamma = 0.312, p < 0.05$), and helping behavior has a significant positive effect on engagement in green building learning ($\gamma_{between-level} = 0.932, p < 0.01, \gamma_{within-level} = 0.606, p < 0.01$). The direct effect of college teachers' felt responsibility on engagement in green building learning ($\gamma = 0.056, p > 0.05$) is not significant, so the mediating effect with helping behavior as the mediator is fully mediated, and Hypothesis 2 is valid.

Similarly, the teacher-level variable, green building learning climate, was introduced as a mediator between college teachers' felt responsibility perception and helping behavior. College teachers' felt responsibility is not significant on helping behavior; college teachers' felt responsibility has a significant positive effect on the green building learning climate ($\gamma = 0.389, p < 0.01$), and green building learning climate has a significant positive effect on helping behavior ($\gamma = 0.466, p < 0.01$). So, the green building learning climate is a full mediator between college teachers' felt responsibility and helping behavior, and Hypothesis 3 is established.

Table 3. Model Validation.

		Estimate	S.E.	Est./S.E.	*p*-Value	Lower 2.5%	Upper 2.5%
main effect	High school faculty felt responsibility to know → engagement in green building learning	0.357	0.126	2.831	0.005	0.11	0.604
Mediating effects of helping behavior	High school faculty felt responsibility to know → engagement in green building learning	0.056	0.151	0.369	0.712	–0.241	0.352
	High school teachers felt responsibility → helping behavior	0.312	0.118	2.653	0.008	0.082	0.543
	Helping behavior → green building learning engagement (Between-level)	0.932	0.261	3.565	0	0.42	1.445
	Helping behavior → green building learning engagement (Within-level)	0.606	0.036	16.788	0	0.536	0.677
	intermediary effect	0.293	0.041	7.083	0	0.212	0.374
Mediating effects of the green building learning climate	High school teachers felt responsibility → helping behavior	0.162	0.124	1.314	0.189	–0.08	0.405
	High school faculty felt responsibility → green building learning climate	0.389	0.105	3.713	0	0.183	0.594
	Green building learning climate → helping behavior	0.466	0.081	5.72	0	0.305	0.624
	intermediary effect	0.181	0.054	3.337	0.001	0.074	0.287

Finally, to test the chain-mediated relationship proposed in Hypothesis 4—that college teachers' felt responsibility positively and indirectly influences students' engagement in green building learning in an orderly manner through the green building learning climate and helping behavior—the product of the cross-level three-part path coefficients (college teachers' felt responsibility knowledge–green building learning climate, green building learning climate–helping behavior, helping behavior—engagement in green building learning) was calculated to test this chain-mediated effect. As shown in Table 4, the cross-level

chain-mediated effect was 0.159 ($p < 0.05$), with 95% confidence intervals not including 0. This indicates that the chain mediation effect is significantly established, validating Hypothesis 4. Since only the chain mediation effect is significantly established in this model, and neither the rest of the mediation effects nor the direct effect is established, this indicates that the chain mediation effect proposed in Hypothesis 4 is a full chain mediation effect.

Table 4. Chain-mediation effect test table.

	Estimate	S.E.	Est./S.E.	*p*-Value	Lower 2.5%	Upper 2.5%
chain broker	0.159	0.065	2.438	0.015	0.031	0.286
Mediating effects of the green building learning climate	0.011	0.061	0.185	0.853	–0.109	0.131
mediating effect	0.136	0.121	1.128	0.259	–0.100	0.373
High school teachers felt responsibility → helping behavior	0.062	0.13	0.478	0.633	–0.193	0.318

Meanwhile, in order to more intuitively show the chain-mediated effects of green building learning climate and helping behavior between the perceived responsibility of college faculty and student engagement in green building learning, this paper presents a chain-mediated effect estimation diagram, as shown in Figure 2.

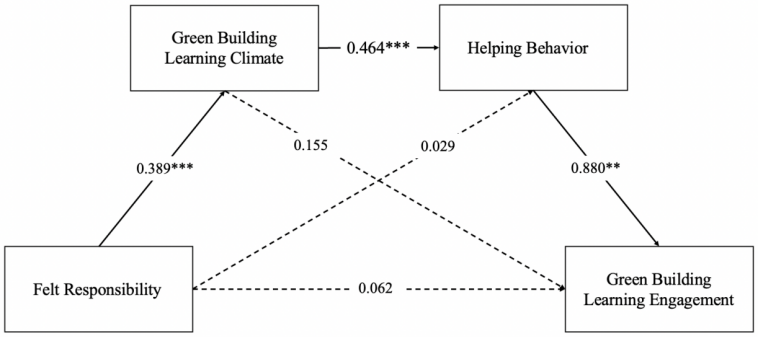

Figure 2. Estimated chain-mediation effect. ** $p < 0.05$, *** $p < 0.01$.

5. Conclusions and Discussion

This study introduces two cross-level mediating variables—green building learning climate and helping behavior—to integrate social cognitive theory into the analysis of how teachers of college-level green building courses' perceived responsibility influences student engagement with green building-related knowledge and skills. This approach offers a fresh perspective from educational management. We employed the multilevel structural equation modeling (MSEM) method to examine the cross-level mediation mechanism linking teachers' perceived responsibility and students' learning engagement. The empirical results show that college teachers' felt responsibility knowledge is positively correlated with engagement in green building learning; helping behavior plays a fully mediating role between green building learning climate and engagement in green building learning; green building learning climate plays a fully mediating role between college teachers' felt responsibility knowledge and helping behavior; and college teachers' felt responsibility knowledge indirectly and sequentially affects students' engagement in green building learning through green building learning climate and helping behavior. The findings of this paper have some theoretical and practical implications.

(1) Helping behavior is an important mediating variable that influences students' green building learning engagement.

The conclusions reached in this study are more similar to the findings of previous scholars and further refine the process of the role of helping behaviors [71,72]. This cultural backdrop fosters a learning environment where mutual assistance among students

becomes a vital component in enhancing individual green building learning efforts. Positive student interactions and robust peer support significantly contribute to the effectiveness of green building education. Additionally, mutual help behaviors among students can mitigate the adverse effects of 'peer pressure'. These behaviors stem from two emotional pathways: 'benefiting oneself by helping others' and 'value highlighting'. They promote a sense of cooperative and mutually beneficial relationships, thereby augmenting students' engagement in learning about green building concepts, knowledge, and skills.

(2) Green building learning climate can indirectly influence students' engagement in green building learning through helping behaviors.

The conclusions reached in this study are more similar to the findings of previous scholars [51,73]; specifically, the zone of proximal development (ZPD) emphasizes that when students are in an active learning environment, they can collaborate with more experienced people (e.g., classmates) to solve knowledge problems, strengthen their own learning, and stimulate their own learning potential. For learning green building knowledge in university classrooms, this implies that students in a positive green building learning environment are more likely to assist each other in exploring their learning, fostering a collective learning culture in green building teaching [74], which makes students more willing to collaborate in their learning and gradually form beneficial interactions.

By making learning challenging yet attainable, a positive learning environment is established. This approach motivates students to engage more deeply in green building studies, thereby indirectly enhancing their learning engagement in this field.

(3) The direct effect of college faculty's perceived responsibility on students' engagement in green building learning is not significant.

Faculty-level teachers' perceived responsibility does not have a direct impact on students' engagement in green building learning. This is because it primarily reflects the work ethic and attitude of educators specializing in green building, and it remains uncertain whether this individual characteristic can translate into student engagement in green building courses. The influence of educators' perceived responsibility on students' learning engagement is indirect and gradual, mediated through the green building learning climate and helping behaviors, which collectively inspire students to actively participate in green building courses.

At the same time, social cognitive theory's application in teaching green building courses at the college level is multifaceted, encompassing aspects such as the teacher's role, the learning environment, and student participation. This theory shifts the focus from mere knowledge transfer by the teacher to a more dynamic role, involving guidance and fostering students' social participation and interaction. Thus, green building teachers' perceived responsibility can inspire them to approach their teaching tasks with seriousness and responsibility, serving as positive role models. This modeling effect resonates with students, contributing to a favorable green building learning climate. According to social cognitive theory, the learning climate and environment are pivotal in determining learning outcomes. In green building courses, teachers with a strong sense of responsibility enhance students' understanding and acceptance of green building concepts by creating supportive learning environments. This approach not only promotes students' interest in green building but also fosters a positive identification with the curriculum.

Furthermore, the social cognitive theory highlights that learning is inherently social. Within a positive green building learning climate, the teachers' sense of responsibility can encourage cooperative behaviors among students, leading to a mutually supportive and collaborative learning model. This collaborative approach enables students to co-construct knowledge, solve problems collectively, and grow through interactions, ultimately amplifying the overall learning effectiveness.

This paper responds to the call for a comprehensive, multi-level exploration of green building education in colleges and universities. Adopting an integrated, multidisciplinary approach, we introduce "felt responsibility" and "helping behaviors" as new variables into the realm of building education. Our goal is to blend traditional educational psychology

theories with practical green building education, fostering innovation and expansion in the field. Our research synthesizes psychological, educational, and architectural theories to construct an interdisciplinary analytical model. This model not only offers a fresh theoretical perspective on the complexities of green building education but also lays down new theoretical foundations and research directions for the field and related areas. It provides insights for enhancing and reforming university education, emphasizing the importance of teachers recognizing and exercising their teaching responsibility. Effective teaching strategies in green building courses can significantly improve teaching effectiveness and student learning experiences. Teachers should increase their responsibility in teaching green building subjects, actively participate in students' learning processes, and tailor teaching content and methods to students' academic needs and interests. Moreover, green building educators should aim to foster students' critical thinking and innovation skills, perhaps through case studies, interactive teaching, and a cooperative learning environment. This is vital for developing skilled green building professionals who can meet the industry's future demands.

Lastly, peer assistance and the learning climate transcend specific course contexts, such as green building education, to influence the broader spectrum of teaching and learning. The centrality of teacher–student and peer interactions to the educational climate is undeniable. A positive learning climate, characterized by strong teacher–student connections and supportive teacher behaviors, significantly elevates student achievement and satisfaction. This leads to enhanced learning experiences and increased interest. Likewise, positive peer relationships contribute to a supportive learning climate, boosting engagement levels. In the context of higher education, the emphasis on thorough instruction, efficient classroom management, and dedicated teaching attitudes underscores the significance of a nurturing learning climate. This study highlights the learning climate and peer support as crucial determinants of engagement. It advocates for educational institutions and faculties to acknowledge the paramount importance of a teaching-led climate, augmented by interpersonal and management support, to foster comprehensive development. Initiatives should focus on promoting student autonomy, igniting interest in learning, and cultivating an active and positive classroom climate. The diversity of student capabilities, as illuminated by the theory of multiple intelligences, necessitates the expansion of teaching resources and development opportunities to accommodate varied learner needs. Moreover, fostering strong interpersonal relationships is essential for educational activities and mutual support, positioning teachers as pivotal in enhancing motivation and academic self-efficacy. This creates a purer and more relaxed learning climate conducive to peer assistance.

Despite its contributions, this paper has limitations. It does not account for the varying emphasis on green building education across different universities, and it relies on cross-sectional questionnaire data, limiting our ability to establish causal relationships. Future studies are encouraged to adopt a longitudinal approach, gathering data at various intervals to capture the dynamic evolution and interactions among the college faculty's sense of responsibility, the green building learning climate, helping behaviors, and student contributions to green building education. This method will facilitate a comprehensive understanding of the developmental trajectories and critical junctures within these interactions. Additionally, a longitudinal framework will provide insights into the stability and consistency of these relationships over time, contributing to the robustness of research findings in this domain. While we find that teachers' sense of responsibility positively influences student engagement in green building learning, future research should explore additional mediating or moderating factors like ambivalence, self-educational expectations, and psychological distress to fully understand this relationship. Also, expanding the research to include diverse geographic, racial, and national contexts would provide a broader perspective on green building education globally. Our study, positioned at the forefront of multidisciplinary research with a decentralized emphasis, invites future investigations within the realm of educational psychology to further validate our findings.

This approach would enrich the understanding and applicability of our conclusions across diverse educational contexts and frameworks.

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References

1. Haidt, J. The emotional dog and its rational tail: A social intuitionist approach to moral judgment. *Psychol. Rev.* **2001**, *108*, 814. [CrossRef] [PubMed]
2. Kreber, C.; Cranton, P.A. Exploring the scholarship of teaching. *J. High. Educ.* **2000**, *71*, 476–495. [CrossRef]
3. Liu, Q.; Wang, H. A survey on the current situation of hidden truancy of college students in a local institution. *J. Henan Inst. Sci. Technol.* **2012**, 54–56.
4. Wang, B.; Li, N. Exploration on the Construction of New Engineering Specialties in Architecture with the Cultivation of Green Building Innovation and Practice Ability as the Core Development Direction. *J. High. Educ.* **2022**, *8*, 89–93.
5. Kingsland, A.J. Time expenditure, workload, and student satisfaction in problem-based learning. *New Dir. Teach. Learn.* **1996**, *1996*, 73–81. [CrossRef]
6. Wilhelm, W.B. Marketing education for sustainability. *J. Adv. Mark. Educ.* **2008**, *13*, 8–20.
7. Cole, L.B. Green building literacy: A framework for advancing green building education. *Int. J. STEM Educ.* **2019**, *6*, 18. [CrossRef]
8. Cole, L.B.; Altenburger, E. Framing the Teaching Green Building: Environmental education through multiple channels in the school environment. *Environ. Educ. Res.* **2019**, *25*, 1654–1673. [CrossRef]
9. Alkathiri, M.S. *Preparing Doctoral Students for the Professoriate: An Ethnographic Study of Students' Experiences in a Formal Preparatory Course*; The University of North Dakota: Grand Forks, ND, USA, 2016.
10. Zou, P.X.; Couani, P. Managing risks in green building supply chain. *Archit. Eng. Des. Manag.* **2012**, *8*, 143–158. [CrossRef]
11. Martin, E.; Benjamin, J.; Prosser, M.; Trigwell, K. Scholarship of teaching: A study of the approaches of academic staff. In *Improving Student Learning: Improving Student Learning Outcomes*; Oxford Centre for Staff Learning and Development: Oxford, UK, 1999; pp. 326–331.
12. Warnick, B.R.; Bitters, T.A.; Falk, T.M.; Kim, S.H. Social media use and teacher ethics. *Educ. Policy* **2016**, *30*, 771–795. [CrossRef]
13. Cardilini, A.P.; Risely, A.; Richardson, M.F. Supervising the PhD: Identifying common mismatches in expectations between candidate and supervisor to improve research training outcomes. *High. Educ. Res. Dev.* **2022**, *41*, 613–627. [CrossRef]
14. Jie, G. An Analysis of Current Status and Strategy Optimization for Elective Courses—Taking a University in Jiangsu as an Example. *J. Chang. Univ.* **2012**.
15. Feden, P.D. About Instruction: Powerful New Strategies Worth Knowing. *Educ. Horiz.* **1994**, *73*, 18–24.
16. Weston, C.B.; McAlpine, L. Making explicit the development toward the scholarship of teaching. *New Dir. Teach. Learn.* **2001**, *2001*, 89–97. [CrossRef]
17. Nicholls, G. Scholarship in teaching as a core professional value: What does this mean to the academic? *Teach. High. Educ.* **2004**, *9*, 29–42. [CrossRef]
18. Bandura, A. *Social Foundations of Thought and Action*; Prentice Hall: Englewood Cliffs, NJ, USA, 1986; Volume 1986.
19. Bandura, A.; Freeman, W.H.; Lightsey, R. Self-efficacy: The exercise of control. *J. Cogn. Psychother.* **1999**, *13*, 158. [CrossRef]
20. Skinner, E.A.; Belmont, M.J. Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *J. Educ. Psychol.* **1993**, *85*, 571. [CrossRef]
21. Newmann, F.M.; Wehlage, G.G. Five standards of authentic instruction. *Educ. Leadersh.* **1993**, *50*, 8–12.
22. Astin, A.W. Student involvement: A developmental theory for higher education. In *College Student Development and Academic Life*; Routledge: London, UK, 2014; pp. 251–262.
23. Marks, H.M. Student engagement in instructional activity: Patterns in the elementary, middle, and high school years. *Am. Educ. Res. J.* **2000**, *37*, 153–184. [CrossRef]
24. Park, S.; Holloway, S.D.; Arendtsz, A.; Bempechat, J.; Li, J. What makes students engaged in learning? A time-use study of within-and between-individual predictors of emotional engagement in low-performing high schools. *J. Youth Adolesc.* **2012**, *41*, 390–401. [CrossRef]

25. Vayre, E.; Vonthron, A.M. Psychological engagement of students in distance and online learning: Effects of self-efficacy and psychosocial processes. *J. Educ. Comput. Res.* **2017**, *55*, 197–218. [CrossRef]
26. Cornell, D.; Shukla, K.; Konold, T.R. Authoritative school climate and student academic engagement, grades, and aspirations in middle and high schools. *Aera Open* **2016**, *2*, 2332858416633184. [CrossRef]
27. Schaufeli, W.B.; Bakker, A.B.; Salanova, M. The measurement of work engagement with a short questionnaire: A cross-national study. *Educ. Psychol. Meas.* **2006**, *66*, 701–716. [CrossRef]
28. Schaufeli, W.B.; Martinez, I.M.; Pinto, A.M.; Salanova, M.; Bakker, A.B. Burnout and engagement in university students: A cross-national study. *J. Cross-Cult. Psychol.* **2002**, *33*, 464–481. [CrossRef]
29. Fredricks, J.A.; Blumenfeld, P.C.; Paris, A.H. School engagement: Potential of the concept, state of the evidence. *Rev. Educ. Res.* **2004**, *74*, 59–109. [CrossRef]
30. Liu, K.; Yao, J.; Tao, D.; Yang, T. Influence of individual-technology-task-environment fit on university student online learning performance: The mediating role of behavioral, emotional, and cognitive engagement. *Educ. Inf. Technol.* **2023**, *28*, 15949–15968. [CrossRef] [PubMed]
31. Schaufeli, W.; Salanova, M. Work engagement: On how to better catch a slippery concept. *Eur. J. Work Organ. Psychol.* **2011**, *20*, 39–46. [CrossRef]
32. Qiao, X. Middle School Students' Mathematics Learning Self-Determination and Its Relationship with Mathematics Learning Engagement. Master's Thesis, Henan University, Kaifeng, China, 2006.
33. Yuan, J. Study on the Definition of Educational Responsibility of Teachers in Colleges and Universities in China in the New Era. *Int. J. Educ. Humanit.* **2023**, *10*, 127–130. [CrossRef]
34. Dao, T.T.T. Renewing the training model for managers of public higher education institutions in vietnam, meeting the requirements of self-control, self-responsibility. *Adv. Soc. Sci. Res. J.* **2019**, *5*. [CrossRef]
35. Lauermann, F.V. Teacher Responsibility: Its Meaning, Measure, and Educational Implications. Ph.D. Thesis, University of Michigan, Ann Arbor, MI, USA, 2013.
36. Sun, Y.; Yang, H.; Wu, X.; Jiang, Y.; Qian, C. How Safety Climate Impacts Safety Voice—Investigating the Mediating Role of Psychological Safety from a Social Cognitive Perspective. *Int. J. Environ. Res. Public Health* **2022**, *19*, 11867. [CrossRef]
37. Liu, Y.; Li, Y.; Tu, Y. Why are employees willing to help? The effect of more and stronger helping-ministerial exchange on helping behavior. *Psychol. J.* **2016**, *48*, 385–397.
38. Swing, S.R.; Peterson, P.L. The relationship of student ability and small-group interaction to student achievement. *Am. Educ. Res. J.* **1982**, *19*, 259–274. [CrossRef]
39. Bargh, J.A.; Schul, Y. On the cognitive benefits of teaching. *J. Educ. Psychol.* **1980**, *72*, 593. [CrossRef]
40. Tranquility. New development on the research of teachers' sense of responsibility. *Exam. Wkly.* **2009**, 209–210.
41. Lauermann, F.; Karabenick, S.A. Taking teacher responsibility into account (ability): Explicating its multiple components and theoretical status. *Educ. Psychol.* **2011**, *46*, 122–140. [CrossRef]
42. Ying, L. *The Meaning and Characterization of Teachers' Sense of Responsibility*; Shanghai Education Research: Shanghai, China, 1997, pp. 38–48.
43. Strati, A.D.; Schmidt, J.A.; Maier, K.S. Perceived challenge, teacher support, and teacher obstruction as predictors of student engagement. *J. Educ. Psychol.* **2017**, *109*, 131. [CrossRef]
44. Sawka, K.D.; McCurdy, B.L.; Mannella, M.C. Strengthening emotional support services: An empirically based model for training teachers of students with behavior disorders. *J. Emot. Behav. Disord.* **2002**, *10*, 223–232. [CrossRef]
45. Han, Z.; Wang, Q.; Yan, X. How responsible leadership predicts organizational citizenship behavior for the environment in China. *Leadersh. Organ. Dev. J.* **2019**, *40*, 305–318. [CrossRef]
46. Babad, E. Measuring and changing teachers' differential behavior as perceived by students and teachers. *J. Educ. Psychol.* **1990**, *82*, 683. [CrossRef]
47. Pekrun, R.; Goetz, T.; Titz, W.; Perry, R.P. Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. *Educ. Psychol.* **2002**, *37*, 91–105. [CrossRef]
48. Ramsden, P. Student learning and perceptions of the academic environment. *High. Educ.* **1979**, *8*, 411–427. [CrossRef]
49. Way, N.; Reddy, R.; Rhodes, J. Students' perceptions of school climate during the middle school years: Associations with trajectories of psychological and behavioral adjustment. *Am. J. Community Psychol.* **2007**, *40*, 194–213. [CrossRef] [PubMed]
50. Wang, J.; Liu, F.; Wang, Y. Exploration and Research on Teaching Reform of Architectural Technology Series Courses-Oriented by Green Building Education. *Archit. Cult.* **2022**, 45–47.
51. Hornstra, L.; Stroet, K.; Weijers, D. Profiles of teachers' need-support: How do autonomy support, structure, and involvement cohere and predict motivation and learning outcomes? *Teach. Teach. Educ.* **2021**, *99*, 103257. [CrossRef]
52. Rayens, W.; Ellis, A. Creating a student-centered learning environment online. *J. Stat. Educ.* **2018**, *26*, 92–102. [CrossRef]
53. Ofoghi, N.; Sadeghi, A.; Babaei, M. Impact of class atmosphere on the quality of learning (QoL). *Psychology* **2016**, *7*, 1645–1657. [CrossRef]
54. Roeser, R.W.; Eccles, J.S. Adolescents' perceptions of middle school: Relation to longitudinal changes in academic and psychological adjustment. *J. Res. Adolesc.* **1998**, *8*, 123–158. [CrossRef]
55. Anderson, C.S. The search for school climate: A review of the research. *Rev. Educ. Res.* **1982**, *52*, 368–420. [CrossRef]
56. Weiner, B. *Judgments of Responsibility: A Foundation for a Theory of Social Conduct*; Guilford Press: New York, NY, USA, 1995.

57. Miri, M.R.; Baghernezhad Hesary, F.; Morowatisharifabad, M.A.; Sharifzade, G.R.; Dastjerdi, R. Female Adolescents and Life Skills based on the Social Cognitive Theory: A Qualitative Study. *Int. J. Pediatr.* **2019**, *7*, 9841–9851.
58. Ho, V.T.; Kong, D.T.; Lee, C.H.; Dubreuil, P.; Forest, J. Promoting harmonious work passion among unmotivated employees: A two-nation investigation of the compensatory function of cooperative psychological climate. *J. Vocat. Behav.* **2018**, *106*, 112–125. [CrossRef]
59. Choi, B.K.; Moon, H.K. Prosocial motive and helping behavior: Examining helping efficacy and instrumentality. *J. Manag. Psychol.* **2016**, *31*, 359–374. [CrossRef]
60. Konicek, V. Adult-centered classroom: A distinct learning atmosphere for college students. *Adult Learn.* **1996**, *7*, 13–18. [CrossRef]
61. Brislin, R.W. Translation and content analysis of oral and written materials. In *Handbook of Cross-Cultural Psychology: Methodology*; Allyn and Bacon: Boston, MA, USA, 1980; pp. 389–444.
62. Morrison, E.W.; Phelps, C.C. Taking charge at work: Extrarole efforts to initiate workplace change. *Acad. Manag. J.* **1999**, *42*, 403–419. [CrossRef]
63. Fang Laitan, S.K.; Fenghua, Z. A study on the reliability of the Chinese version of the learning engagement scale. *Chin. J. Clin. Psychol.* **2008**, *16*, 618–620.
64. Schaufeli, W.B.; Salanova, M.; González-Romá, V.; Bakker, A.B. The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *J. Happiness Stud.* **2002**, *3*, 71–92. [CrossRef]
65. Loo, R. Assessing "team climate" in project teams. *Int. J. Proj. Manag.* **2003**, *21*, 511–517. [CrossRef]
66. West, M.A.; Anderson, N.R. Innovation in top management teams. *J. Appl. Psychol.* **1996**, *81*, 680. [CrossRef]
67. Jia, Y.; Way, N.; Ling, G.; Yoshikawa, H.; Chen, X.; Hughes, D.; Ke, X.; Lu, Z. The influence of student perceptions of school climate on socioemotional and academic adjustment: A comparison of Chinese and American adolescents. *Child Dev.* **2009**, *80*, 1514–1530. [CrossRef]
68. Sparrowe, R.T.; Soetjipto, B.W.; Kraimer, M.L. Do leaders' influence tactics relate to members' helping behavior? It depends on the quality of the relationship. *Acad. Manag. J.* **2006**, *49*, 1194–1208. [CrossRef]
69. Geldhof, G.J.; Preacher, K.J.; Zyphur, M.J. Reliability estimation in a multilevel confirmatory factor analysis framework. *Psychol. Methods* **2014**, *19*, 72. [CrossRef]
70. Zhang, Z.; Zyphur, M.J.; Preacher, K.J. Testing multilevel mediation using hierarchical linear models: Problems and solutions. *Organ. Res. Methods* **2009**, *12*, 695–719. [CrossRef]
71. Wan, K.; Rao, A.; Xu, R. What Factors Influence Learners' Online Learning Engagement?—Analyzing the Development of Online Learning in the Intelligent Era. *Educ. Acad. Mon.* **2021**, *6*, 97–104.
72. Jing, M.; Zhanji, F. Teaching and Learning Strategies for Student Differences in Resources: Mutual Learning. *Educ. Theory Pract.* **2021**, *41*, 7–10.
73. La Salle, T.P.; Rocha-Neves, J.; Jimerson, S.; Di Sano, S.; Martinsone, B.; Majercakova Albertova, S.; Gajdošová, E.; Baye, A.; Deltour, C.; Martinelli, V.; et al. A multinational study exploring adolescent perception of school climate and mental health. *Sch. Psychol.* **2021**, *36*, 155. [CrossRef]
74. Bruner, J. Vygotsky's zone of proximal development: The hidden agenda. *New Dir. Child Dev.* **1984**, *23*, 93–97. [CrossRef]