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ETHICAL LEADERSHIP AS DIDACTIC INFRASTRUCTURE: A SERIAL MEDIATION MODEL OF STUDENTS' SUSTAINABLE BEHAVIORS IN HIGHER EDUCATION

LIDERANÇA ÉTICA COMO INFRAESTRUTURA DIDÁTICA: UM MODELO DE MEDIAÇÃO EM SÉRIE DOS COMPORTAMENTOS SUSTENTÁVEIS DE ESTUDANTES NO ENSINO SUPERIOR

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Abstract
Sustainable development agendas increasingly depend on whether educational institutions can cultivate not only knowledge but also everyday pro-environmental action. Building on ethical leadership theory and self-determination theory, this study examines whether ethical leadership climate functions as a form of "didactic infrastructure" that shapes students' sustainable behaviors through learning-environment conditions and meaning-related psychological mechanisms. Using cross-sectional survey data from higher education students (final analytic sample N = 769 after attention-check screening), we tested a serial mediation model linking ethical leadership climate to sustainable behavior through didactic climate (autonomy-supportive teaching, perceived course value, and belonging/collaboration), basic psychological need satisfaction (autonomy, competence, relatedness), and moral motivation (purpose-oriented study motives, prosocial impact orientation, and openness to value diversity). Path analyses with robust standard errors and bootstrap confidence intervals indicated that ethical leadership climate was strongly associated with didactic climate and, in turn, with need satisfaction and moral motivation. Sustainable behavior was significantly predicted

Resumo
As agendas de desenvolvimento sustentável dependem, cada vez mais, de que as instituições educacionais consigam cultivar não apenas conhecimento, mas também ação pró-ambiental no cotidiano. Com base na teoria da liderança ética e na teoria da autodeterminação, este estudo investiga se o clima de liderança ética funciona como uma forma de "infraestrutura didática" que molda os comportamentos sustentáveis dos estudantes por meio de condições do ambiente de aprendizagem e de mecanismos psicológicos relacionados à construção de sentido. Utilizando dados de um levantamento transversal com estudantes do ensino superior (amostra analítica final N = 769 após triagem por item de atenção), testou-se um modelo de mediação em série que conecta o clima de liderança ética ao comportamento sustentável por meio do clima didático (ensino com suporte à autonomia, valor percebido do curso e pertencimento/colaboração), da satisfação das necessidades psicológicas básicas (autonomia, competência e relacionamento) e da motivação moral (motivos de estudo orientados por propósito, orientação para impacto pró-social e abertura à diversidade de valores). As análises de caminhos, com erros-padrão robustos e

by moral motivation, need satisfaction, and didactic climate, while the direct effect of ethical leadership on sustainable behavior diminished once the mediating mechanisms were included, consistent with an indirect-effects explanation. The model accounted for substantial variance in sustainable behavior even after controlling for demographic and background covariates. Findings suggest that sustainable student conduct is not merely an individual preference but an outcome of ethically grounded institutional climates that support autonomy, belonging, and purpose-making within learning environments.

Keywords: Ethical Leadership Climate. Didactic Climate. Basic Psychological Need Satisfaction. Moral Motivation. Sustainable Behavior.

intervalos de confiança bootstrap, indicaram que o clima de liderança ética se associa fortemente ao clima didático e, por sua vez, à satisfação de necessidades e à motivação moral. O comportamento sustentável foi predito de modo significativo pela motivação moral, pela satisfação de necessidades e pelo clima didático, enquanto o efeito direto da liderança ética sobre o comportamento sustentável enfraqueceu após a inclusão dos mediadores, em consonância com uma explicação predominantemente baseada em efeitos indiretos. O modelo explicou uma parcela substantiva da variância do comportamento sustentável mesmo após o controle de covariáveis demográficas e de contexto. Os resultados sugerem que a conduta sustentável dos estudantes não é apenas uma preferência individual, mas um produto de climas institucionais eticamente ancorados que favorecem autonomia, pertencimento e construção de propósito nos ambientes de aprendizagem.

Palavras-chave: *Clima de Liderança Ética. Clima Didático. Satisfação das Necessidades Psicológicas Básicas. Motivação Moral. Comportamento Sustentável.*

1 INTRODUCTION

Sustainable development is not merely a "well-intentioned" ideal; it is a normative project that has become institutionalized at the international level, with defined goals and a multi-layered sphere of responsibility extending from states to institutions. The United Nations 2030 Agenda brings together the "human-planet-prosperity" triad in a single text, covering a broad spectrum from poverty to climate, while placing behavioral and institutional transformation at the center of the development vision (United Nations General Assembly, 2015). However, the gap between the "existence of law" and the "impact of law" in the environmental field remains clear: while environmental legislation and institutional mechanisms are increasing, fragilities in implementation and compliance capacity deepen ecological risks. This situation brings the debate on the rule of law in the environmental field back to the agenda, not only as a matter of norm-setting but also as a matter of norms finding their counterpart in the social fabric (United Nations Environment Programme [UNEP], 2023).

The critical break here is this: sustainability goals do not advance solely through a logic of control and sanctions; they require patterns of behavior that become sustained in the micro-decisions of daily life, consumption, energy, waste, transportation, resource use, social responsibility. Theoretical approaches that attempt to explain environmentally meaningful behavior therefore focus on the individual's attitudes and intentions (Ajzen, 1991), value–belief–norm chains (Stern, 2000), the activation of personal norms (Schwartz, 1977), and the structural/psychological conditions that facilitate behavioral change. The body of knowledge in environmental psychology insists that sustainable behaviors do not automatically follow from increased knowledge; it emphasizes the decisive role of norms, belonging, valued goals, and internalized motivation (Steg & Vlek, 2009). This point intersects with the idea of environmental citizenship: embracing "what is right for the environment" not only because of legal obligations, but within a broader sense of public responsibility and ethical orientation (Dobson, 2007).

In this context, higher education institutions are powerful social mechanisms that determine how norms are taught and lived, beyond being the "human resource production line" for sustainable development. UNESCO's ESD for 2030 roadmap emphasizes that education for sustainable development requires not only content but also the transformation of learning environments; that is, it proposes an ecology where sustainability is not only taught but also "lived" (UNESCO, 2020). The contribution of higher education to sustainability goals has been shown to be closely linked to institutional culture and organizational transformation; the capacity of universities to "lead by example" influences student habits and social diffusion (Žalėnienė & Pereira, 2021). Similarly, it is emphasized that sustainability competencies require program design that integrates systems thinking and value-based practices rather than individual course outcomes (Wiek et al., 2011).

Nevertheless, the question of how sustainable behaviors take root in higher education is often confined to pedagogical techniques or program content; however, the "moral and psychological architecture" of the learning environment is established at a deeper level. This is precisely where leadership comes into play: Ethical leadership is not merely an administrative virtue, but a sphere of influence that makes norms visible, legitimizes them, and permeates everyday practices through social learning processes (Brown et al., 2005). Ethical leadership has been shown to shape stakeholder behavior

through justice, trust, and role modeling; it opens paths to performance and responsible behavior through mechanisms such as identification and self-efficacy (Walumbwa et al., 2011). These findings indicate that ethical leadership in educational institutions has the potential to create a climate that shapes the student experience, not just "management quality."

This study conceptualizes ethical leadership as the "didactic infrastructure" of sustainable learning cultures: That is, the leadership climate indirectly but powerfully shapes how courses and programs are "felt", how autonomous, competent, and related students feel. Self-Determination Theory (SDT) posits that the satisfaction of three fundamental psychological needs, autonomy, competence, and relatedness, is central to internalization and lasting behavioral regulation (Deci & Ryan, 2000; Ryan & Deci, 2000). In an educational context, need-supportive approaches have been shown to increase students' intrinsic participation in activities and make the learning experience more "owned" (Reeve, 2006). The relatedness dimension, meanwhile, is not merely about social pleasantness but concerns the satisfaction of the fundamental human need for belonging; it has long been known that motivation and self-regulation become fragile in environments where belonging is undermined (Baumeister & Leary, 1995).

SDT provides a particularly productive explanatory framework for the continuity of sustainable behaviors: Environmentally oriented behaviors often involve actions that are costly in the short term, seemingly "rewardless," and conflict with the inertia of daily life. Therefore, the persistence of behavior relies more on internal regulation aligned with the individual's goals than on external pressures. Findings showing that internalizing environmental goals predicts more consistent environmentally friendly behavior in the subsequent period reinforce this point (Osbaldiston & Sheldon, 2003). It has been found that even the manner in which environmental policies are implemented increases motivation for environmental behavior when it creates a perception of autonomy in individuals, while a controlling perception is associated with demotivation and amotivation (Lavergne et al., 2010). In adolescent and student samples, autonomous supportive contexts have also been shown to strengthen autonomous motivation on the path to pro-environmental behavior (Kaplan & Madjar, 2015). This line is also consistent with the psychometric literature on measuring and differentiating environmental motivation (Pelletier et al., 1998; Villacorta et al., 2003). Furthermore, findings that

organizational climate conveys pro-environmental behaviors through personal norms suggest that the climate–norm–behavior pathway is meaningful not only in the workplace but across organizational life in general (Mouro & Duarte, 2021).

At this point, the concept of "moral motivation" shifts sustainable behaviors from the level of mere habit or intention to the realm of identity and meaning. The approach that suggests moral judgments are shaped not only by rational reasoning but also by intuitive and emotional processes is important for explaining why environmental behaviors are sometimes delayed even when we know they are 'right' (Haidt, 2001). Moral identity can be a powerful regulator of behavior, related to how individuals define themselves (Aquino & Reed, 2002). The prosocial motivation literature also links sustainability not only to the "environment" but also to the "human" dimension on a psychological level, showing that the desire to benefit others, especially when combined with intrinsic motivation, increases persistence and productivity (Grant, 2008). This study aims to approach moral motivation multidimensionally, linking students' sustainable actions not only to environmental sensitivity but also to meaning systems such as sense of purpose, orientation toward creating positive impact on others, and openness to diversity.

Although ethical leadership, need satisfaction, and pro-environmental behaviors have been frequently studied at the level of binary relationships in the literature, studies combining these variables in a chain and multidimensional model in the context of higher education are relatively limited. More importantly, from the perspective of sustainable development and environmental law, it is seen that institutions produce "adaptive capacity" not only through policy texts but also through the normative fabric of everyday practices. Therefore, it is meaningful to test whether an ethical leadership climate opens a path to sustainable behaviors by fostering need satisfaction and moral motivation in students, and to discuss the institutional and behavioral foundations of sustainable development together.

The aim of this study is to test an integrated model that positions the ethical leadership climate in higher education as a "didactic infrastructure" and explains sustainable student behaviors. The proposed model assumes that the ethical leadership climate will first strengthen the didactic climate of the course/learning environment (e.g., autonomy support, value attribution, belonging), then basic psychological needs

satisfaction and moral motivation; at the end of this chain, sustainable behaviors will increase. Furthermore, by controlling for the possible effects of age, gender, and similar demographic variables on behavior, the study aims to test the explanatory power of the model in a more reliable manner.

Within this framework, the research focuses on testing the following hypotheses:

1. The ethical leadership climate is positively related to students' level of sustainable behavior.
2. Ethical leadership climate positively predicts didactic climate and basic psychological need satisfaction.
3. Didactic climate and basic psychological need satisfaction predict moral motivation; moral motivation positively predicts sustainable behavior.
4. The effect of ethical leadership climate on sustainable behavior produces meaningful indirect effects through the chain of didactic climate → basic psychological need satisfaction → moral motivation.

2 LITERATURE REVIEW

A significant portion of studies attempting to explain sustainable behaviors in higher education rely on cognitive mechanisms such as an individual's attitude, intention, and perceived control (Ajzen, 1991; Bamberg & Möser, 2007). However, what we call "sustainable behavior" is not merely a decision formed in the individual's mind; it is often an everyday life woven with repetitive practices, social norms, and frames of meaning carried by the silent architecture of the environment. Therefore, contemporary literature finds multi-level approaches that simultaneously address (i) the individual's meaning-making and motivation systems, (ii) the climate/culture dynamics that shape these systems, and (iii) the internalization of norms to be more productive in explaining sustainable behavior (Klöckner, 2013; Schneider et al., 2013; Stern, 2000). The theoretical backbone of this study is positioned precisely at this intersection: the ethical leadership climate functions like a "didactic infrastructure," producing a chain of effects that leads to sustainable behavior through students' need satisfaction and moral motivation.

2.1 Ethical leadership climate and the institutionalization of norms

Ethical leadership is not merely the image of a "well-intentioned leader"; it has a more technical counterpart in organizational psychology: exhibiting normatively appropriate behavior and conveying this behavior to followers through communication, reinforcement, and decision-making processes (Brown et al., 2005). This definition opens two critical doors. First, ethical leadership relies directly on social learning dynamics; that is, the leader makes organizational signals about what is "right" visible (Brown & Treviño, 2006). Second, ethical leadership is less an individual trait and more a pattern that can acquire a climate quality over time: how fairly rules are applied, how consistent communication is, and how "normal" principle-based decision-making is considered... Therefore, ethical leadership not only maps the organization's moral landscape; it makes that map navigable in daily practices (Fehr et al., 2015).

The climate literature shows that when interpreting people's behavior, they use not only explicit rules but also shared perceptions of what the organization "values" (Schneider et al., 2013). Ethical leadership nurtures these shared perceptions in two ways: (i) as a role model, (ii) through reward–punishment and explanation–justification mechanisms (Brown et al., 2005; Brown & Treviño, 2006). In this context, to the extent that ethical leadership makes ethical behavior "expected" and "rewarded," it can increase not only compliance among followers but also organizational citizenship behaviors such as voluntary contribution and voice (Detert & Burris, 2007; Walumbwa et al., 2012). Voice behavior plays a critical role in sustainability agendas: because sustainable transformation often progresses through bottom-up micro-improvements, small objections, and the courage to suggest better ways.

Ethical leadership is also closely linked to perceptions of justice. The division of organizational justice (distributive, procedural, interpersonal, and informational justice) into measurable dimensions clarifies that ethical leadership is not "abstract morality" but concrete process design (Colquitt, 2001). The meaning of ethical leadership is not merely to tell the truth; it is to institutionalize the truth with a clarity that makes consistent procedures and justifications understandable. Such a climate can foster psychological safety in individuals, paving the way for learning and development behaviors (Edmondson, 1999). In the context of higher education, this means an atmosphere that

facilitates the student's transition from a mindset of "I will be punished if I make a mistake" to "I will develop if I ask questions"; in value-laden areas such as sustainability, this atmosphere makes it possible to discuss and jointly design different views.

It has also been shown that the impact of ethical leadership does not remain confined to top management but can produce a trickle-down pattern. In particular, "trickle-down" approaches emphasize that leadership can multiply through unit climate and subordinate leadership behaviors (Mayer et al., 2009). This finding theoretically legitimizes the relationship between program/institutional leadership and the didactic climate within the classroom: ethical-focused norms at the top level can leave a mark that extends to instructional design, assessment fairness, inclusive communication tone, and the student's sense of belonging.

The meta-analytic accumulation of ethical leadership research is also consistent with this general picture: ethical leadership is systematically related to positive outcomes such as trust, perceptions of justice, organizational commitment, and ethical behavior (Bedi et al., 2016). At this point, an important conceptual distinction must be made: the fact that ethical leadership produces "good results" is not automatic magic in every context; the effects gain strength when the climate is truly perceived and translated into daily practices (Fehr et al., 2015). Therefore, for ethical leadership to be effective in higher education, didactic design (the way the course is conducted, assessment practices, the language of interaction with students) must be consistent with the ethical climate.

2.2 Didactic climate and the motivational mechanism of internalization

Didactic climate is concerned not only with "what the student learns" but also with "how they are shaped as a person." In the model of this climate, it is possible to think along three lines: autonomy support, course value, and belonging/commitment. These three lines organize an internalization process based on fundamental psychological needs, which are essentially the "motors of human behavior" (Deci & Ryan, 2000; Ryan & Deci, 2000).

Support for autonomy is often misunderstood: it is not "unlimited freedom"; it is the student seeing the rationale, feeling a sense of choice, and experiencing their own agency. Teacher/institution behaviors that support autonomy increase student

participation and learning energy; the effect is particularly strong when autonomy support is combined with structure (Jang et al., 2010). This finding is consistent with the "disciplined but voluntary" nature of sustainable behaviors: sustainability is not a momentary enthusiasm; it is a set of practices that requires continuity and structure but also fades away with coercion. The effects of intervention studies aimed at making teachers more autonomy-supportive also support this orientation (Cheon et al., 2012; Reeve, 2006).

The value of the lesson is not merely a matter of "finding it interesting"; it is whether the individual can relate an activity to their own goals. The expectancy-value approach states that value is central in explaining achievement behaviors (Eccles & Wigfield, 2002). In particular, "utility value" interventions can increase both interest and performance by enabling students to connect the course content to their own lives (Hulleman & Harackiewicz, 2009; Hulleman et al., 2010). In the context of sustainability, this facilitates the establishment of environmentally related behaviors not as an abstract virtue, but as a goal that finds meaning in the student's life world.

Belonging is often an invisible force: its absence hurts, its presence goes unspoken. Yet the fundamental role of belonging in motivation and well-being has been strongly established in the psychological literature (Baumeister & Leary, 1995). School membership/sense of belonging is related to academic motivation and school adjustment (Goodenow, 1993). More strikingly, short but targeted interventions in belonging can produce long-term academic and health outcomes, especially in disadvantaged groups (Walton & Cohen, 2011). This finding intersects directly with the ethical dimension of sustainability: because sustainability is not only a social contract for "nature" but also for "living together"; it becomes more difficult for students with weak belonging to make an emotional investment in this contract.

These three strands essentially work through need satisfaction. When autonomy, competence, and relatedness needs are satisfied, individuals not only feel better; they also internalize values and norms more (Deci & Ryan, 2000; Ryan & Deci, 2000). The cross-cultural generalizability of need satisfaction and need frustration has also been demonstrated, which removes the model from being "context-specific" (Chen et al., 2015). Furthermore, scale development studies aimed at measuring need satisfaction show that this structure can be empirically tracked in a consistent manner (Van den

Broeck et al., 2010). Therefore, what the didactic climate produces in the student is not merely "satisfaction"; it is a motivational infrastructure that shapes the underlying structure of behavior (is it autonomous or controlled?).

2.3 The multidimensionality of moral motivation and sustainable behavior

Intent often appears at the psychological center of sustainable behavior; however, behind intent lie two deeper questions: What does this behavior mean to me? and Whose/what good does it serve? The study's moral motivation framework addresses these two questions in a multidimensional way: purpose, prosocial impact, and openness to value diversity.

Purpose is not merely a "goal" in the literature; it is a continuous thread of meaning that guides a person's life. Purpose development processes have been discussed in relation to identity and value formation, particularly in young adulthood, along with the psychological functions of purpose (Damon et al., 2003). Meaning is also strongly linked to psychological well-being when considered as a measurable construct (Steger et al., 2006). Sustainable behaviors are inherently linked to long-term values rather than short-term rewards; therefore, purpose and meaning can serve as the "fuel that sustains behavior."

The prosocial impact dimension, on the other hand, relates to the individual's sense that their behavior makes a difference in others. The relationships between prosocial motivation and job satisfaction and performance are well documented in psychology (Grant, 2008). Furthermore, the combined effect of prosocial motivation and intrinsic motivation can even foster productivity and creativity (Grant & Berry, 2011). In terms of sustainable behavior, this shifts environmental action from the level of "individual virtue" to the level of "social contribution." This sense of contribution enables not only compliance with rules but also extra effort.

Openness to value diversity is a dimension often neglected in sustainability discussions. Sustainability requires negotiation in conflicting value domains (economy–environment, individual freedom–collective benefit). Therefore, the capacity to engage with different perspectives can be a critical psychological resource for the social diffusion of sustainable behaviors. Perspective-taking has been shown to be a mechanism that can

reduce prejudice and in-group favoritism (Galinsky & Moskowitz, 2000); meta-analytic findings on intergroup contact also point to similar positive effects, depending on the circumstances (Pettigrew & Tropp, 2006). This literature allows us to consider the "openness to diversity" dimension not merely as a political preference, but as a psychological resource with the potential to generate behavioral cooperation.

This motivational and ethical foundation, when combined with fundamental models in the sustainable behavior literature, provides a more comprehensive picture. The value-belief-norm approach explains environmental behavior through values and normative obligations (Stern, 2000). The Theory of Planned Behavior, on the other hand, emphasizes attitudes, norms, and perceived control (Ajzen, 1991). Meta-analytic studies show that it is not a single variable but multiple psychosocial determinants that work together (Bamberg & Möser, 2007). Therefore, contemporary syntheses have proposed comprehensive models that explain behavior through multiple determinants (Klöckner, 2013). The impact of climate and norms on behavior is also important in this context: which norm becomes "salient" at that moment can guide behavior (Cialdini et al., 1990). On the other hand, barriers to sustainable behavior are not limited to a lack of information; psychological barriers are multi-layered (Gifford, 2011). These barriers can become even more entrenched, particularly with "externally coercive" discourses.

It is precisely at this point that the self-determination perspective offers a powerful additional layer for explaining why environmental behavior is (or is not) sustainable (lasting). Studies suggesting that environmental behaviors become sustainable through more internalized motivation interpret environmental behavior through "autonomous motivation" (Osbaldiston & Sheldon, 2003; Pelletier et al., 1998). The finding that the perceived "autonomy-supportive" or "controlling" style of the state/authority in environmental regulations is related to environmental motivation and behavior frequency also carries this argument to the public sphere (Lavergne et al., 2010). This finding provides a psychological explanation that environmental law operates not only through its coercive power but also through channels of legitimacy and internalization: people act not only to "avoid punishment" but also to "see this as my value."

Finally, demographic and social patterns on sustainable behaviors and environmental concern are also reported. In particular, gender differences have been consistently observed in some samples; women have been reported to score higher on

environmental concern and some pro-environmental attitudes (Xiao & McCright, 2015). Large-scale syntheses emphasize that the effects of factors such as age, gender, education, and social context may be small to moderate but are not explanatory on their own (Gifford & Nilsson, 2014). Studies tracking behavioral change over time remind us of the limitations of cross-sectional models by showing that the relationship between pro-environmental attitudes and behavior may interact with life stages and context (Bleidorn et al., 2021). Therefore, including demographic variables in the model as covariates serves to test the specific contribution of psychological mechanisms (need satisfaction, moral motivation) more cleanly.

When this literature is read together, the chain proposed by the study becomes clearer: an ethical leadership climate creates an "organizational atmosphere" in which norms circulate in a fair and meaningful way; the didactic climate translates this atmosphere into the concrete world of the classroom; need satisfaction becomes the engine of internalization; and moral motivation (purpose, prosocial impact, openness to diversity) establishes the psychological foundation that enables the continuity of sustainable behaviors.

3 METHOD

3.1 Research design and participants

This study is a cross-sectional and quantitative field research conducted to test a chain of psychosocial mechanisms explaining students' sustainable behaviors in higher education. Data were collected at a single point in time via an online survey; the relationships between ethical leadership climate, didactic climate, basic psychological need satisfaction, moral motivation, and sustainable behaviors were examined within a serial mediation path model.

The dataset initially contained 786 completed responses. To enhance measurement reliability, 17 participants who did not provide the desired response to the control question in the lesson value block of the attention items included in the survey were excluded from the analysis. After this exclusion, the final sample consisted of N = 769 students. The survey was administered to a student group with high demographic

diversity: 70.2% of participants were aged 18–25, 23.8% were aged 25–35; the gender distribution was predominantly male (58.5%) and female (38.9%). In terms of educational level, the majority of the sample had a bachelor's degree (78.2%); in terms of course format, face-to-face education was predominant (55.1%).

3.2 Data collection process and ethics

The data collection process was conducted with the informed consent of the participants and on a voluntary basis. The questionnaire began with an information text that included the purpose of the study, the principle of anonymity, the approximate response time (approximately 15–18 minutes), the low potential risks, and the fact that participants could withdraw from the study at any time. Participants' responses were collected without identifying information; only aggregated data were used.

3.3 Measurement tools

All psychosocial variables used in the study were measured using self-report items. Most of the scales were organized on a 7-point Likert scale (1 = *Strongly agree*, 7 = *Strongly disagree*). Sustainable behaviors were assessed using a 5-point frequency scale based on frequency over the last three months (1 = *Always*, 5 = *Never*). The direction of the scales was recoded to maintain consistency in the analyses; thus, high scores across all variables represent a higher level of the relevant construct.

3.4 Ethical leadership climate

The perception of ethical leadership regarding program/department leadership was measured with an 11-item block; the directive control item (single item) was not included in the scale scoring in the analyses. The concept of ethical leadership was addressed in the context of the leader modeling normatively appropriate behavior and encouraging it within organizational relationships (Brown et al., 2005). The internal consistency of the scale is high in this sample (Cronbach's $\alpha = .892$).

3.5 Autonomy-supportive teaching climate

Autonomy-supportive behaviors in typical classes, such as faculty offering choices, explaining reasons, considering the student's perspective, and inviting the student to speak, were assessed with 6 items. This dimension is consistent with the emphasis on autonomy support in the educational context of self-determination theory (SDT) (Deci & Ryan, 2000; Ryan & Deci, 2000). The internal consistency of the scale is high (α = .826).

3.6 Value and meaningfulness of course contente

The 7-item block measuring the value/usefulness and interest of program courses includes a control item; this control item is not included in the scale score. The internal consistency calculated with the remaining items is high (α = .873).

3.7 Belonging and collaboration climate

The student's sense of belonging in the classroom/peer context, feeling valued, and experience of collaboration were measured with 4 items; internal consistency is acceptable (α = .773).

These three components (autonomy support, lesson value, belonging/cooperation) were treated as a higher-order construct representing the "didactic climate" in the conceptual model of the study. In practice, the didactic climate score was calculated by taking the average of these three sub-dimensions.

3.8 Purpose and prosocial learning motivation

Six items relating the student's learning to contributing to others and making a positive difference were scored to represent "purpose" and prosocial orientation (α = .834).

3.9 Basic psychological need satisfaction

Thirteen items assessed the extent to which the student felt autonomous, competent, and related in the program over the past month; the only control item in this block was not included in the scoring. The subscales were calculated as autonomy (4 items; $\alpha = .806$), competence (4 items; $\alpha = .804$), and relational needs (4 items; $\alpha = .828$); the overall need satisfaction score was created by taking the average of these three subscales. This approach is consistent with SDT's framework of fundamental needs (Deci & Ryan, 2000; Ryan & Deci, 2000).

3.10 Prosocial effect orientation

Five items were used that relate the student's work/learning activities to the desire to benefit others and produce a positive effect ($\alpha = .829$).

3.11 Openness to value diversity

Respect for different values, openness to different backgrounds, and a tendency to accept pluralism were measured with 4 items; internal consistency is high ($\alpha = .828$).

The dimensions of purpose, prosocial impact, and openness to diversity were treated as a higher-order construct representing “moral motivation” in the study model; in practice, a single composite score was created by taking the average of these three sub-dimensions.

3.12 Sustainable behaviors

Daily environmentally friendly behaviors (energy saving, waste reduction, reuse, recycling, transportation choices, food choices, environmental care/protection, etc.) performed in the last three months were measured using 13 items. Behaviors were scored on a 5-point frequency scale; in the analyses, high scores were recoded to indicate higher sustainable behavior. The scale has very high internal consistency ($\alpha = .903$).

3.13 Data processing and statistical analysis

During the data cleaning phase, (i) no additional screening was performed based on the "completion" criterion since there were no incomplete surveys, and (ii) participants who did not correctly answer the control question were excluded from the analysis. Such guideline compliance checks are recommended to reduce careless responses in self-reported online data (Oppenheimer et al., 2009). Scale items were reverse-coded so that high scores represent high levels across all constructs; scale scores were obtained by taking the arithmetic mean of the relevant items. The internal consistency of the scales was assessed using Cronbach's alpha coefficient (Cronbach, 1951).

Hypotheses were tested using sequential regression equations to examine the relationships between variables within a chain of mechanisms. Accordingly, a serial mediation path model was established in which ethical leadership climate (ELC) predicted didactic climate (DC); DC explained basic need satisfaction (PNS) and both DC and PNS explained moral motivation (MM); and finally, MM, PNS, DC, and ELC predicted sustainable behavior (SB). To limit potential external effects on SB in the final equation, variables such as age, gender, education level, program year, course format, employment status, income, number of sustainability courses, service learning experience, organizational membership, level of volunteerism, access to nature, political orientation, and religiosity were included in the model as covariates. Categorical variables were represented in regression analyses using standard dummy coding.

To account for the possibility of non-constant error variance in self-report data, heteroscedasticity-robust standard errors were reported in all regression equations (White, 1980). Recommendations regarding the use of robust standard errors, particularly in the context of linear regression, were followed, and HC-type robust variance-covariance estimators were preferred (Long & Ervin, 2000). The significance of indirect effects was assessed using the bootstrap resampling approach, which does not rely on the assumption of normal distribution of indirect effects; 95% confidence intervals were calculated based on 3,000 bootstrap samples, and indirect effects were considered significant when the confidence interval did not include zero (Preacher & Hayes, 2008; Hayes, 2018). The significance level was set at .05 for all analyses; both raw coefficients (b) and standardized coefficients (β) were reported to enhance comparability.

4 FINDINGS

4.1 Descriptive statistics and relationships between variables

After data cleaning based on the control variable, analyses were conducted on N = 769 participants. The means, standard deviations, and Pearson correlations of the main variables in the model are presented in Table 1. Since the scale dimensions were recoded, higher scores reported here indicate a more positive perception/higher level (e.g., higher ethical leadership climate; higher frequency of sustainable behavior).

The correlation pattern between the main variables is as expected: a strong relationship is observed between ethical leadership climate (ELC) and didactic climate (DC); DC appears to be highly correlated with basic psychological need satisfaction (PNS) and moral motivation (MM). Sustainable behavior (SB) is moderately positively related to ELC, DC, PNS, and MM. All of these correlations are statistically significant (all $p < .001$).

Table 1

Means, standard deviations, and correlations of main variables (N = 769)

Variable	M	SD	r(ELC)	r(DC)	r(PNS)	r(MM)
ELC	5.409	0.912				
DC	5.489	0.815	0.693			
PNS	5.402	0.909	0.655	0.833		
MM	5.667	0.822	0.570	0.756	0.762	
SB	3.655	0.862	0.424	0.528	0.510	0.469

Note. Correlations are Pearson coefficients; all correlations are significant at the $p < .001$ level.

4.2 Path model and mediation results

The sequential mediation path model established to test the hypotheses was evaluated through four sequential equations: (i) ELC → DC, (ii) DC and ELC → PNS, (iii) PNS and DC → MM, and (iv) MM, PNS, DC, and ELC → SB. In the SB equation, demographic and background variables were included in the model as covariates (age, gender, education level, program year, course format, employment status, income, number of sustainability courses, service learning experience, organizational

membership, volunteering, access to nature, political orientation, and religiosity). The main path coefficients are reported in Table 2.

The model worked in accordance with the "didactic infrastructure" assumption. First, the ethical leadership climate strongly predicts the didactic climate ($b = 0.620$, $\beta = 0.693$, $p < .001$). The didactic climate is both the strongest predictor of basic need satisfaction ($b = 0.813$, $\beta = 0.730$, $p < .001$) and has a significant additional effect on need satisfaction beyond the didactic climate, even when controlling for ethical leadership climate ($b = 0.149$, $\beta = 0.150$, $p < .001$). In the third equation, both PNS ($b = 0.390$, $\beta = 0.431$, $p < .001$) and DC ($b = 0.401$, $\beta = 0.398$, $p < .001$) significantly explain moral motivation. In the final equation, sustainable behavior is significantly predicted by MM ($b = 0.198$, $\beta = 0.189$, $p < .001$), PNS ($b = 0.126$, $\beta = 0.132$, $p = .020$), and DC ($b = 0.249$, $\beta = 0.235$, $p < .001$) significantly predict sustainable behavior; however, the direct effect of ELC (including mediators and covariates) is not significant ($b = 0.044$, $\beta = 0.047$, $p = .306$). This pattern indicates that the effect of ethical leadership climate on SB is mediated through didactic and psychological mechanisms rather than being a direct effect.

The variances explained at the equation level suggest that the model has strong explanatory power: $R^2 = .480$ for DC, $R^2 = .706$ for PNS, $R^2 = .629$ for MM, and $R^2 = .463$ for SB (including covariates).

Table 2

Path model coefficients (HC3 robust standard errors)

Dependent variable	Predictor	b	SE(HC3)	β	p	R^2 (equation)
DC	ELC	0.620	0.029	0.693	< .001	0.480
PNS	DC	0.813	0.039	0.730	< .001	0.706
PNS	ELC	0.149	0.033	0.150	< .001	0.706
MM	PNS	0.390	0.051	0.431	< .001	0.629
MM	DC	0.401	0.064	0.398	< .001	0.629
SB	MM	0.198	0.059	0.189	< .001	0.463
SB	PNS	0.126	0.054	0.132	= 0.020	0.463
SB	DC	0.249	0.069	0.235	< .001	0.463
SB	ELC	0.044	0.043	0.047	= 0.306	0.463

Note. Demographic and background covariates are included in the SB equation; only the paths between the basic structures are shown in the table. β values are standardized coefficients.

4.3 Indirect effects and testing hypotheses

To evaluate H1 (the positive relationship between ELC and SB) from a total effect perspective, in the model established without adding mediators (with covariates controlled), ELC has a significant total effect on SB (c = 0.360; 95% CI [0.297, 0.424]). However, when mediators are added to the model, the direct effect (c′) remains within a range that includes zero (c′ = 0.044; 95% CI [-0.043, 0.123]), while the total indirect effect remains significantly positive (total indirect = 0.335; 95% CI [0.271, 0.403]). This result strongly supports H4 (serial mediation) and indicates that the relationship is primarily mediated through indirect pathways.

When examining specific indirect effects, the largest share comes from the ELC → DC → SB pathway; in addition, longer chains extending to PNS and MM via DC also make significant contributions (Table 3). These findings show that the mechanism sequence predicted by H2 and H3 (ELC → DC/PNS → MM → SB) is empirically supported.

Table 3

Indirect effects (Bootstrap 95% confidence intervals)

Effect	Estimate (b)	Lower 2.5%	Upper 97.5%
ELC→DC→SB	0.154	0.089	0.243
ELC→DC→PNS→SB	0.063	0.013	0.121
ELC→DC→MM→SB	0.049	0.016	0.081
ELC→PNS→SB	0.019	0.003	0.036
ELC→PNS→MM→SB	0.012	0.003	0.021
ELC→DC→PNS→MM→SB	0.039	0.013	0.063
Total indirect effect	0.335	0.271	0.403
Direct effect (c′)	0.044	-0.043	0.123
Total effect (c)	0.360	0.297	0.424

Note. Confidence intervals were calculated using bootstrap resampling (B = 300). Effects were considered significant when the interval did not include zero.

5 DISCUSSION

The findings of this study show that narratives that reduce sustainable behavior in higher education to “the student's personal good intentions” are often inadequate. An

ethical leadership climate is related to sustainable behavior; however, this relationship is not a direct "instruction–compliance" line, but rather is conveyed through the groundwork laid by the didactic climate and the need satisfaction and moral motivation that sprout from this groundwork. In other words, the impact of leadership lies not so much in "directly touching" the student's everyday environmental practices, but rather in creating the psychological and normative atmosphere in which those practices are possible. This pattern positions ethical leadership not as a tool of "behavioral engineering," but as an organizational climate resource that makes the institution's values visible, infiltrates them into instructional design, and ultimately transforms the student's behavioral regulators (Brown et al., 2005; Brown & Treviño, 2006; Fehr et al., 2015).

The strong prediction of the didactic climate by the ethical leadership climate is consistent with the direction predicted by the social learning approach (role modeling, transmission of norms through rewards–sanctions and justification) (Brown et al., 2005). The organizational climate and culture literature emphasizes that people often answer the question "What does the organization really care about?" not from explicit texts, but from recurring practices and forms of interaction (Schneider et al., 2013). Here, the ethical leadership climate appears not merely as a management quality in the student's eyes, but as a "normative background" where justice, trust, and accountability are felt. Considering the connections of this background, particularly with perceptions of justice, it is not surprising that ethical leadership shapes the didactic environment; justice is one of the quietest but most powerful regulators of pedagogical relationships (Colquitt, 2001). These findings are also consistent with models that argue that the effect of ethical leadership does not remain at the top, but can transform into a pattern that "trickles down" by creating a climate in the units (Mayer et al., 2009).

The fact that the didactic climate strongly explains the satisfaction of basic psychological needs supports the fundamental claim of self-determination theory in an educational context: when students can satisfy their needs for autonomy, competence, and relatedness, learning ceases to be merely an externally directed activity; and more easily evolves into internal regulation and owned goals (Deci & Ryan, 2000; Ryan & Deci, 2000). It has been shown that learning environments that offer both structure and guidance with autonomy support can both activate students and reduce their sense of being "controlled" (Jang et al., 2010; Reeve, 2006). In this study, the strong link between

didactic climate and need satisfaction appears critical in terms of the continuity and effort required for sustainable behavior: environmentally friendly behaviors often conflict with short-term comfort and therefore become sustainable not through external pressure but rather through internalized motivation (Osbaldiston & Sheldon, 2003).

The meaningful prediction of moral motivation, which is in the third ring of the model, by both need satisfaction and didactic climate concretizes the idea of "internalization": the satisfaction of needs is related not only to well-being but also to the individual's capacity to carry their values into the behavioral plane (Deci & Ryan, 2000). This study addressed moral motivation through dimensions such as purpose, prosocial effect orientation, and openness to value diversity. A sense of purpose produces a meaningful trajectory that intertwines with identity and value formation in young adulthood and lends continuity to behavior (Damon et al., 2003; Steger et al., 2006). The prosocial motivation literature, on the other hand, has shown that when individuals relate their actions to the well-being of others, their efforts can become more resilient and productive (Grant, 2008; Grant & Berry, 2011). Findings on the behavioral regulation of moral identity also suggest that sustainability is not merely about environmental awareness; it gains strength through an ethical orientation embedded in the self-narrative (Aquino & Reed, 2002). In this context, the nurturing of moral motivation by didactic climate and need satisfaction points to the mechanism that transforms the discourse of "sustainability" into a relationship of meaning rather than a duty within the student's inner world.

The mediation of sustainable behavior by both moral motivation and need satisfaction as well as didactic climate presents a picture consistent with holistic models in environmental psychology. While the Theory of Planned Behavior emphasizes that behavior is based on cognitive determinants such as intention and perceived control (Ajzen, 1991), the Value–Belief–Norm approach highlights the importance of normative obligations and personal norms (Stern, 2000). More recent syntheses argue that environmental behavior must be explained by multiple determinants and that contextual cues (climate/norms) can have powerful effects on behavior (Klöckner, 2013). Focus theory regarding normative behavior has also shown that which norm is visible at a given moment can determine behavior (Cialdini et al., 1990). In this study, the meaningful contribution of didactic climate to sustainable behavior suggests that "environmental

behavior" is regulated not only by individual values but also by the normative signals of the social context in which one finds oneself. Furthermore, given that the psychological barriers to sustainable behavior are known to be multi-layered (Gifford, 2011), the climate produced by the organization can either soften or harden these barriers.

The fact that the direct effect of an ethical leadership climate on sustainable behavior loses its significance when mediators are included in the model is a theoretically important nuance: Leadership does not function like a "remote control" here. Ethical leadership creates a backdrop that supports psychological safety through justice and trust, enabling people to express their thoughts (Edmondson, 1999; Detert & Burris, 2007). This background is particularly important in value-intensive areas such as sustainability, because sustainable transformation often involves difficult dilemmas and decisions that require collective wisdom. The fact that ethical leadership progresses through indirect effects indicates that institutions must carry their sustainability goals not only through "policies" but also through pedagogical and relational mechanisms.

In terms of application, the study supports addressing the sustainability agenda in higher education not as a "unit added" to course content, but as a structure embedded in instructional design and organizational climate. In particular, autonomy support, the meaningful establishment of the course's value, and a social atmosphere that fosters belonging can serve as a "psychological infrastructure" that facilitates the internalization of sustainable behaviors. (Baumeister & Leary, 1995; Eccles & Wigfield, 2002; Hulleman & Harackiewicz, 2009; Walton & Cohen, 2011). At this point, ethical leadership at the managerial level and need-supportive teaching practices at the pedagogical level must be considered together; because sustainability often remains a "theme" discussed in the classroom, and when it does not transform into a "climate" experienced in the classroom, it becomes difficult to translate into behavior.

The limitations of this study should make the interpretation of the findings more cautious. First, the design is cross-sectional; therefore, although the mediation chain is theoretically consistent and statistically supported, causal inferences are limited. The temporal sequence assumption of cross-sectional mediation analyses should be handled with care, especially in long mediation chains (Maxwell & Cole, 2007). Second, the data are self-reported and subject to potential common method bias; although careless responses were reduced with control items and the sensitivity of estimates was increased

with robust standard errors, single-source measurement may produce certain inflations (Podsakoff et al., 2003; Spector, 2006). Third, the sustainable behavior items are based on subjective frequency assessments over the past three months; social desirability bias or recall bias may inflate behavior levels. Finally, the sample was drawn from a specific context; as cultural and organizational diversity increases, the strength and direction of model paths may change (Chen et al., 2015; Gifford & Nilsson, 2014).

Future studies can advance in three directions to overcome these limitations. First, longitudinal and experimental designs can more robustly test how changes in ethical leadership climate translate into behavior through didactic climate, need satisfaction, and moral motivation. Second, multilevel designs (student–course–program) can disentangle whether climate variables are truly a "shared perception" and at which level they work more effectively (Schneider et al., 2013). Third, linking sustainable behavior not only to self-reports but also, where possible, to more objective indicators such as digital traces, campus consumption data, or behavioral tasks can strengthen the robustness of the findings. These steps will ensure that the relationship between ethical leadership and sustainable behavior moves beyond a "nice correlation" and becomes a transformative design principle.

6 CONCLUSION

This research shows that sustainable behaviors in higher education are not just a "subject to be taught," but also a climate to be built. The ethical leadership climate does not directly strengthen students' sustainable behaviors; rather, it indirectly strengthens them through the quality of the didactic climate, the satisfaction of basic psychological needs, and the deepening of moral motivation. This finding highlights a common misconception about sustainability: Sustainability cannot be achieved solely through correct information or slogans; it takes root in an environment where students can integrate "the right thing" with their own goals, feel competent and belonging, and where their contribution gains meaning (Deci & Ryan, 2000; Ryan & Deci, 2000; Stern, 2000).

The study's main contribution is conceptualizing ethical leadership not as a distant precursor to sustainable behavior, but as a didactic infrastructure component that enables the learning ecosystem for sustainability. This approach combines the social learning and

climate emphasis in the ethical leadership literature (Brown et al., 2005) with multi-determinant models in the field of environmental behavior (Klöckner, 2013), offering a more comprehensive explanation of the institutional-psychological conditions for sustainable behavior. From the perspective of sustainable development goals through education, these findings imply that universities must address sustainability not only as a curriculum item but as a design principle embedded in the normative and relational fabric of the institution (UNESCO, 2020; Wiek et al., 2011). The environmental governance and environmental law perspective, meanwhile, reminds us that "compliance" is conveyed not only through sanctions but also through legitimacy and internalization channels; therefore, the climate produced by educational institutions constitutes a strategic threshold in terms of environmental norms finding resonance in the social fabric (UNEP, 2023).

Ultimately, the pedagogical and managerial roots of sustainable behavior appear to be two inseparable strands: ethical leadership sets the boundaries and tone of the didactic climate; the didactic climate, in turn, shapes the student's psychological needs and moral motivation, paving the way for sustainable behavior. Universities' claim to sustainability is strengthened not only by answering the question "What are we teaching?" but also by addressing a more challenging question: "In what kind of climate are we teaching?"

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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