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The Impact of Epistemological Beliefs and School Climate on the Sustainability of Critical Thinking Dispositions in Middle School Students

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Abstract: The objective of this study is to ascertain whether school climate and students' epistemological beliefs serve as predictors of sustainable critical thinking dispositions in middle school students. This research is designed as a correlational study. A total of 585 students from four middle schools in Çanakkale, Turkey, participated in the research. To this end, the researchers administered the Critical Thinking Disposition Scale, the Middle School Students' Epistemological Belief Scale, and the School Climate Survey, gradually collecting the raw data. Following the collection of the data, they were subjected to analysis using multiple linear regression. The results of the statistical analysis demonstrated that the students' critical thinking dispositions were significantly predicted by both epistemological beliefs and school climate. In other words, belief in the omniscient power of authority and quick learning were found to have a negative correlation with critical thinking, whereas belief in simple knowledge was observed to have an inverse positive relationship. The dimension of the school climate, relating to positive student–teacher relations, appeared to constitute a prospective positive predictor, while authoritarian student–teacher relations and the lack of resources were identified as the main negative classroom environment factors. The study highlights the complex mutual influence of individual beliefs and the learning environment in the development of critical thinking dispositions.

Keywords: critical thinking dispositions; epistemological beliefs; middle school students; school climate; sustainable critical thinking

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1. Introduction

The 21st-century benchmark for global citizenship and employability has been established by critical thinking skills, which serve as a foundation for cognitive capacity [1,2]. Nevertheless, educational systems are faced with the challenge of activating global projects while focusing on local aspects, which will undoubtedly encounter obstacles in terms of fostering critical thinking skills [3].

While there is no doubt that critical thinking skills are vital for navigating the complexities of the 21st century, it is essential to establish a clear understanding of what constitutes critical thinking and why it is so vital in addressing global challenges. The essence of critical thinking is problematic thinking, which refers to a deep engagement with new knowledge and the posing of pertinent questions and reasoning through personal decisions rather than the mere acceptance of information presented [4–7]. A Delphi study was conducted by experts on the subject of critical thinking, resulting in a consensus definition of the term. This definition was reached after extensive discussion and analysis. It was agreed that

critical thinking is a self-integrity check, which is not enhanced by emotions. Instead, it is a process that includes a diversified form of interpretation, analysis, evaluation, inference, explanation, and self-regulation [8]. The necessity of critical thinking has never been greater as societies grapple with global challenges. In particular, community members must be aware of and capable of analyzing, assessing, and making informed decisions regarding the various issues to be addressed [9].

Despite the clear definition and recognized importance of critical thinking, its effective integration into educational practices presents a complex challenge. Despite the global recognition of the necessity of critical thinking, its adoption in educational practice varies significantly across diverse regions. Some countries have prioritized the integration of critical thinking in their higher education systems with the objective of fostering an active citizenry and a skilled labor force capable of meeting the demands of the 21st century. Nevertheless, the implementation of critical thinking-sustaining programs and teaching styles has encountered obstacles due to the incompatibility between educational environments and the reality of local cultures and socioeconomic settings, which must be considered while attempting to fulfill global requirements. In order to facilitate the essential development of critical thinking skills, educators must move beyond the traditional approach of imparting knowledge and emphasize the importance of more sophisticated, effective thinking [10]. A shift in educational methodology necessitates a comprehensive understanding of the student population's perception, construction, and valuation of critical thinking. Additionally, it requires that teachers receive adequate training and resources and integrate critical thinking into their teaching activities in order to facilitate its incorporation into their programs.

The pedagogical implications of fostering critical thinking are further illuminated by the ongoing evolution and diversification of local and global intellectual requirements within the context of an evolving educational landscape. This underscores the significance of critical thinking as both a foundational skill and a mental process. By addressing the challenges associated with the implementation of curricula and pedagogical approaches that foster critical thinking, educational systems can equip students with the skills necessary to navigate the complexities of the 21st century and to contribute to the advancement of their communities at the global and local levels in a positive manner. Education is a fundamental component of sustainable development [11]. The crux of this relationship is the importance of individuals possessing sound critical thinking skills, which enable them to effectively navigate the challenges of the present and make well-informed decisions that benefit the collective welfare of society [12–14]. The cultivation of critical thinking abilities among the citizenry in a democracy is of paramount importance for their active and informed engagement with political and social matters [15,16]. Critical thinking is defined as the ability to follow evidence, explore options, and consider the potential consequences of decisions. This is the fundamental concept underlying the term's proper definition: focusing on pertinent issues, identifying potential risks, and making informed decisions that will facilitate sustainable development [14].

In order to cultivate this vital capacity for critical thinking and its function in sustainable development, it is imperative that sustainable education prioritizes the advancement of higher-order thinking among learners [17]. This necessitates a profound transformation in our pedagogical approach, a shift away from the mere memorization of facts and toward the promotion of independent, evaluative, and analytical thinking. Inquiring of students to question assumptions, explore diverse perspectives, and engage in reasoned debates can facilitate the development of their social skills, thereby enabling them to assume an active role in the shaping of a more sustainable future. The capacity for critical thinking, which is underpinned by questioning, drawing conclusions, and analyzing problems systematically, is essential for learners when confronted with complex questions, identifying creative ideas, and making well-founded choices that are not only aligned with societal and ecological norms but also crucial for their future sustainable development [1].

The importance of critical thinking in education and sustainable development cannot be overstated. It is a vital skill for effective education and lifelong learning, and it should be incorporated as a fundamental element in the concept of sustainable development [16]. The significance of critical thinking is clearly evident at each stage of sustainable development, including the initial stages of awareness, the identification of issues, the exploration of solutions, and the implementation of actions. A foundation for sustainable education may be established through the evolution of critical thinking. The delivery of critical thinking dispositions to learners is essential for their ability to navigate the complexities of pertinent issues, including global violence prevention and the realization of sustainable development goals. Ultimately, this will foster pupil awareness of the responsibility of critical thinking. The capacity for critical thinking, the ability to establish integral connections, and the capacity for sound reasoning are essential competencies for the resilience of our communities in the context of increasing complexity. The approach of sustainable education should become an advocate for the engine of enlightenment and a significant factor in societal progress, with the training of critical thinking skills being a primary objective. A substantial body of research at the global and national levels has demonstrated a dearth of critical thinking skills among middle school students. The capacity to engage in critical thinking, encompassing interpretation, analysis, evaluation, and inference, has been identified as a pivotal competency for navigating the intricate challenges of the 21st century [8]. Nevertheless, evidence from disparate sources indicates that students frequently fail to master these skills, and they are simultaneously unable to think analytically in subsequent careers and to function as global citizens [1]. The significance of critical thinking abilities has been underscored by international educational initiatives, including the United States Ministry of Education's emphasis on the "4C" skills (collaboration, communication, creativity, and critical thinking) as vital for students from kindergarten to grade 12 [18]. These skills, which include collaboration, communication, creativity, and critical thinking, are believed to equip individuals with the necessary tools to thrive in an ever-changing world [18–20].

Notwithstanding these ambitious objectives, empirical evidence indicates that critical thinking abilities remain underdeveloped in a considerable proportion of student populations. In the context of Turkey and the global landscape, research has revealed troubling trends in the critical thinking skills of middle school students. A study conducted at Karabuk University in Turkey investigated students' perceptions and understanding of the significance of critical thinking in their learning and development. The findings revealed that students demonstrated a limited awareness and appreciation for this essential skill set [21]. Furthermore, the implementation of the 2013 curriculum in Turkey represented a governmental initiative to cultivate students' critical thinking abilities, with the objective of transitioning away from rote memorization and toward a focus on higher-order thinking skills [22,23]. Similarly, a study evaluating critical thinking competencies among Indonesian secondary school students revealed that these learners frequently encountered challenges in activating the higher-order thinking skills essential for successful critical thinking [24]. Research-based learning approaches have been put forth as a potential means of enhancing students' critical thinking abilities. However, further work is needed to address the pervasive deficit in this crucial area of education [25].

This phenomenon is not unique to Turkey; research from a range of countries indicates comparable difficulties in fostering critical thinking among students. The process of developing critical thinking abilities is a challenge not only in Turkey but also on a global scale. It is expected that teachers and requesters will collaborate to facilitate the transformation of insight and other sources into indispensable skills for children, which should be encouraged to enable them to navigate the years of their lives. This will prove beneficial in the future, as they will find themselves in the age of the digital century [1,18,25].

One significant factor that may contribute to the challenges in developing critical thinking skills is the influence of students' epistemological beliefs. Epistemological beliefs are fundamental beliefs about reality and the process of knowledge acquisition [26]. The sig-

nificance of these beliefs in the advancement of students' academic achievement, learning methodologies, and cognitive development has been underscored in numerous scholarly works. It is of particular significance to comprehend the influence of critical thinking on teachers through their epistemological values in middle-grade students. Epistemological beliefs can be analyzed in a multidimensional manner, wherein the core beliefs about the nature of knowledge—including its detail, originality, and knowledgeability—are identified and examined [27]. These beliefs may range from a straightforward acceptance of knowledge as unchangeable and passed on by authorities to a more advanced understanding of knowledge as inexact, variable, and fully co-created [26]. The most significant factor influencing an individual's acquisition of epistemic knowledge, as identified by psychologists, is the verifiable nature of the knowledge in question, its simplicity, the sequence in which it is acquired, and the rationale behind it [28]. Epistemic cognition is defined as the ability of an individual to integrate, reflect upon, and utilize knowledge. It is a cognitive function that depends on one's capacity for critical thinking in life [29]. Students who have a more advanced understanding of science and technology tend to believe that knowledge is both complex and contextual, requiring further exploration. Consequently, they are more inclined to employ critical strategies such as analytical questioning, considering different perspectives, and making decisions meticulously [29]. Conversely, students who possess a more rudimentary understanding of the nature of knowledge may be less amenable to uncertain truth standards, the multiplicity of perspectives, and the deterioration of the quality of certain matters.

An understanding of the evolution of epistemological beliefs during middle school can inform the development of pedagogical strategies designed to foster critical thinking and lifelong learning. The research on how middle school students develop their epistemological beliefs indicates that they may provide accounts of knowledge and knowing that are quite distinct from one another [27]. Some children may reflect the true nature of knowledge by perceiving it as an absolute and immutable entity, as dictated by authority figures. In contrast, others may demonstrate a more nuanced understanding of the contextual and temporal aspects of knowledge [30]. These factors are subject to variation depending on the individual's age, academic background, and sociocultural environment. The relative importance of each factor can also differ substantially at this stage of an individual's education. The capacity to think in an advanced manner is of great consequence to the academic success of middle school pupils, who must develop this ability in order to excel in their studies [31]. Consequently, educators can facilitate this process by implementing curriculum systems that challenge students' existing beliefs, encourage critical analysis of evidence, and promote active knowledge construction through inquiry and discussion. By fostering advanced knowledge construction skills in their students, educators can empower learners to become active, critical thinkers, equipping them with the essential abilities to navigate the complexities of modern 21st-century education.

In addition to individual cognitive factors, the characteristics of the school environment can either facilitate or impede the development of critical thinking. The quality and character of school life, commonly referred to as the school climate, can have a considerable impact on the development and academic achievement of students [32,33]. The most recent studies have revealed its considerable importance in the development of students' critical thinking skills [34]. For example, various elements of the school environment that are acknowledged to be highly conducive to the improvement of students' critical thinking abilities, as defined in the literature, include a balance of fairness and order, students' social capabilities, and the school–parents–students relationships [32,35]. Researchers have indicated that a school climate that is perceived positively and characterized by a high level of justice, strong enforcement of safety and discipline, high parental involvement, fair resource distribution, and positive student–teacher and student–student relationships is associated with improved critical thinking abilities among students [32,34]. This may be attributed to the educational environment providing students with the requisite knowledge to engage in deep thinking, analyze the purpose of the problem effectively, and generate sophisticated

ideas. Moreover, they are encouraged by their peers to challenge their assumptions and develop creative ideas [32].

Conversely, research has also identified negative school climates as a significant barrier to critical thinking development. Schools that are perceived to lack a fair climate and structured organization with discipline, as well as parental support for their students and available resources, can foster a school environment that impedes the development of critical thinking skills in students [35]. In such environments, students experience a diminution of their sense of empowerment, a decline in motivation, and an unwillingness to assume intellectual risks. Consequently, their critical analysis and problem-solving skills are diminished. While the research underscores the significance of a positive school atmosphere in fostering critical thinking skills in students, one of the pivotal links between school climate and critical thinking is that it fosters an environment where students' sense of personal involvement and security of trust flourish, enabling them to engage fully in the occasionally challenging process of re-examining and refocusing the current knowledge base, which is pivotal to critical thinking [34].

These insights underscore the necessity for educators to proactively foster a school environment that fosters the growth of critical thinking abilities. The extant literature unequivocally indicates that the school climate is the paramount factor that must be calibrated in the development of students' critical thinking skills. Educators can create an environment that promotes equity, order, discipline, parental involvement, resource sharing, and the nurturing of interpersonal relationships among fellow students and between students and teachers. This unique atmosphere can fortify and enhance the necessary skills for academic and personal success [9,18,36–38].

1.1. Problem State

The acquisition of critical thinking skills by middle school students represents a crucial educational component, as it serves as the foundation for the development of qualified and functional learning. Researchers have highlighted the importance of examining the contextual factors that contribute to the long-term sustainability of critical thinking skills, with a particular focus on the role of school climate and programmable belief systems [38,39]. The epistemological beliefs, which are the focus of this study, represent a crucial element in the development of critical thinking skills [29]. Similarly, school climate, which encompasses the affective and life stages components of the educational setting, has been identified as a primary determinant of students' cognitive and academic outcomes [9]. It is imperative to examine the interrelationship between epistemological beliefs, school climate, and the sustainability of critical thinking skills. This investigation is crucial for elucidating the intricate interplay between these factors and their collective impact on the overall quality and durability of the educational experience. By identifying the connections among epistemological beliefs, school climate, and the sustainability of critical thinking skills, educators and policymakers may gain insight into how to cultivate informed, discerning, and globally engaged citizens [1,18]. Nevertheless, few studies have examined the manner in which these two components of the school environment have the potential to shape critical thinking dispositions among middle school students, particularly those undergoing significant cognitive, social, and emotional changes. This research aims to address the existing gap in the literature by incorporating the perspectives of the association between epistemological beliefs and school climate on critical thinking dispositions among middle school students.

1.2. Significance of the Study

This research has significant implications for both educational theory and practice, contributing to the understanding of critical thinking development in middle school students in several key ways:

The theoretical contribution of this study is as follows: The study makes a significant contribution to the theoretical understanding of critical thinking by examining the interplay

between individual epistemological beliefs and the broader school climate. It elucidates the intricate interrelationship between these variables, indicating that the cultivation of critical thinking necessitates the consideration of both individual and contextual factors.

The practical implications of this study are as follows: The findings offer practical insights for educators and policymakers seeking to cultivate and sustain critical thinking skills in middle school students. By identifying specific epistemological beliefs and school climate factors that predict critical thinking tendencies, the study provides actionable targets for intervention and curriculum development.

The objective is to empower students. The study underscores the significance of empowering students by nurturing their epistemic agency and a growth mindset. By encouraging students to question assumptions, evaluate information critically, and assume responsibility for their learning, educators can facilitate the development of lifelong critical thinking habits.

The creation of conducive learning environments: The research highlights the pivotal function of school climate in influencing critical thinking dispositions. By fostering fairness, positive student–teacher relationships, and equitable access to resources, schools can create environments that nurture and sustain critical thinking skills.

The study's findings also inform future research avenues, including exploring the causal relationships between the identified predictors and critical thinking, examining the influence of peer interactions on critical thinking, and investigating the impact of specific pedagogical approaches on fostering epistemological development and critical thinking in middle school students.

1.3. Research Questions and Hypothesis

1. What are the critical thinking dispositions of middle school students, their epistemological belief levels, and the school climate in which they are educated?
2. Do epistemological beliefs and school climate predict the critical thinking dispositions of middle school students?

To investigate these research questions, the following hypotheses were formulated:

H1 Hypothesis. *Epistemological beliefs and school climate significantly predict critical thinking tendencies in middle school students.*

Null Hypothesis (H0). *There is no significant predictive relationship between epistemological beliefs and school climate on the critical thinking dispositions of middle school students.*

2. Materials and Methods

2.1. Research Design

Correlational research, as defined by Cohen et al. [40], is a non-experimental research method that examines the relationships (correlation or prediction) between two or more variables without manipulating any of them. This type of research aims to identify patterns or associations between variables in order to gain insight into how changes in one variable may be related to changes in another. Although we recognize the value of understanding the relationships between variables, our primary objective is to uncover predictive patterns that can inform educational interventions and practices aimed at fostering critical thinking skills.

In the present study, a correlational research design was employed to investigate the predictive relationship between epistemological belief, school climate (independent variables), and critical thinking disposition (dependent variable). This approach permitted an examination of the extent to which variations in the independent variables are associated with changes in the dependent variable without establishing causality.

2.2. Sampling

In the present study, a correlational research design was employed to investigate the predictive relationship between the variables in question. The sampling procedure entailed

the random selection of four distinct middle schools, with all students within those schools being included in the study.

The research problem is situated within the context of middle school students, who are understood to be at a unique developmental stage as they transition into the formal operational stage of cognitive development [41]. This period is distinguished by the emergence of an enhanced capacity for abstract thought and reasoning, rendering it a pivotal juncture for elucidating the intricacies of critical thinking development. The objective of this study is to examine the predictive relationship between epistemological beliefs, school climate, and critical thinking tendencies in this population. The findings will inform the development of educational interventions and practices designed to foster critical thinking skills, not only during the middle school years but also in subsequent stages of education.

The schools are located in Çanakkale, Turkey, in an area with a moderate sociocultural and socioeconomic background. It should be noted that the participant group does not include any foreign students. The participants in this study were drawn from nuclear families and did not include any students identified as having learning disabilities or giftedness.

In the context of correlational research, a widely cited guideline for determining the minimum sample size is as follows:

$$N \geq 50 + 8m$$

where the minimum sample size, denoted by N, is determined by the following formula: $N \geq 50 + 8m$, where m is the number of independent variables (predictors) in the model. This formula was proposed by Green [42] and suggests that a minimum of 50 participants is needed, plus an additional 8 participants for each predictor included in the analysis. Accordingly, in this study, which includes ten independent variables, the minimum sample size would be 50 + 8(10) = 130. In this research, 585 participants (middle school students) participated voluntarily, which provides an adequate sample size.

Table 1 presents the distribution of students by sex (female and male) and grade level (5th, 6th, 7th, and 8th). In total, there are 585 students. There are 296 female students (50.6%) and 289 male students (49.4%). The students are spread across grades 5th to 8th, with 150 students in 5th grade, 147 in 6th grade, 155 in 7th grade, and 133 in 8th grade. These numbers correspond to 25.6%, 25.1%, 26.5%, and 22.6% of the total number of students, respectively.

Table 1. Sampling.

	Sex		**Grade**			
	Female	**Male**	**5th**	**6th**	**7th**	**8th**
f	296	289	150	147	155	133
%	50.6	49.4	25.6	25.1	26.5	22.6

2.3. Data Collection Tools

Data collection was conducted in a face-to-face manner, thereby ensuring direct interaction with the participants. The researchers distributed the questionnaires to the students in their respective classrooms during designated time slots that did not impinge upon the students' regular instructional activities. Prior to data collection, informed consent was obtained from all participants, emphasizing the voluntary nature of their involvement and assuring them of the confidentiality of their responses. The questionnaires were designed in such a way as to ensure anonymity, with the exclusion of any personally identifiable information. Throughout the process, the researchers were available to address any questions or concerns raised by the students regarding the questionnaires or the research itself. The participants were informed of the ethical considerations pertinent to the study, including the purpose of the study and their rights as participants.

2.3.1. Critical Thinking Disposition Scale

The Critical Thinking Disposition Scale, developed by Yıldırım Döner and Demir [43], is designed to assess the intrinsic propensity of secondary school students toward critical thinking, encompassing their attitudes, beliefs, and self-perceptions about critical thought. Furthermore, this measurement tool, also referred to as a scale, is the result of a three-factor structure (dialectical thinking, disposition, and analysis), which illustrates the diverse facets of critical thinking disposition as distinct yet interrelated. Dialectical thinking can be defined as the inclination or willingness of an individual to engage in a thought process that considers multiple perspectives, addresses contradictions, and strives to identify common ground rather than disunity. Disposition can be defined as the student's inherent inclination or willingness to engage in critical thinking. The term "analysis" refers to an individual's inclination toward analytical thinking. These factors, identified through exploratory and confirmatory factor analyses, provide a nuanced understanding of the construct being measured. The scale exhibited robust internal consistency reliability, as evidenced by a Cronbach's alpha value of 0.87 in Yıldırım Döner and Demir's [43] study and 0.84 in the present investigation. This indicates that the items within the scale consistently measure the same underlying construct. The scale has previously been validated by Yıldırım Döner and Demir's [43] study, and the current study provides further support for its reliability with a Cronbach's alpha of 84. The scale, comprising 21 items, employs a 5-point Likert-type response format (ranging from "never" to "always"), enabling students to rate their level of agreement with each item on a scale. A high score indicates that the student is generally predisposed to approach learning and problem-solving with a critical and analytical mindset. They are more likely to question assumptions, seek evidence, and evaluate information meticulously before forming conclusions.

2.3.2. Middle School Students' Epistemological Belief Scale

The epistemological belief scale, developed by Üztemur, Dinç, and İnel [44], is designed to assess middle school students' perceptions of knowledge and the learning process. The scale is comprised of four sub-factors. The four sub-factors are "omniscient authority", "innate ability", "quick learning", and "simple knowledge". The measured constructs pertain to the source of knowledge, the role of innate talent in learning, the speed of knowledge acquisition, and the complexity of knowledge, respectively. The results of the survey demonstrated that the scale exhibited both validity and reliability through factor analysis, an exploratory and confirmatory method, with a Cronbach's alpha value of 0.73, indicating a relatively high inter-item correlation in the study by Üztemur, Dinç, and İnel [44]. As indicated in the report, the Cronbach's alpha value is 0.725, which substantiates the reliability of the scale. The scale comprises 20 items, each of which is rated on a 5-point Likert scale, ranging from "totally disagree" to "totally agree". The data obtained from the scale are subjected to analysis with specific factors in mind. The omniscient authority factor is a psychometric measure that quantifies students' beliefs regarding the role of authority figures in providing access to content and the importance of adhering to their guidance in the acquisition of knowledge. Individuals who exhibit high scores on the quick learning factor are perceived to adhere to the conviction that the learning process should be expeditious, with minimal investment of time and effort. Those who score highly on the innate ability factor are deemed to hold the belief that genetic traits are decisive in learning. Finally, students who score highly on the simple knowledge factor are evaluated as believing that knowledge is uncomplicated and lacks a complex structure. High scores achieved by students suggest that their epistemologies are nearing the dualist stage, while low scores indicate that they are approaching the committed relativist stage.

2.3.3. School Climate Survey

The School Climate Survey, developed by Emmons, Haynes, and Comer [45] and adapted to the Turkish language by Atik and Yerin Güneri [46], aims to measure the overall climate and quality of relationships within middle schools. The Turkish adaptation

of the scale consists of 36 items divided into six factors: fairness, order and discipline, parental involvement, sharing of resources, students' interpersonal relations, and student–teacher relations.

Each factor explores specific aspects of the school climate:

- Fairness: Measures the fairness and equity perceived by students in school rules and their application;
- Order and Discipline: Assesses the level of structure, clarity of rules and expectations, and how discipline is handled;
- Parental Involvement: Evaluates the extent to which parents are actively engaged in school activities and their children's education;
- Sharing of Resources: Examines the perceived availability and accessibility of school resources for all students;
- Students' Interpersonal Relations: Measures the quality of peer interactions, including feelings of respect, support, and inclusion among students;
- Student–Teacher Relations: Assesses the nature of interactions between students and teachers, focusing on aspects like respect, trust, and open communication.

In the study of Atik and Yerin Güneri [46], the internal consistency coefficient was examined for reliability analysis. The examination was carried out on 2 groups; the Cronbach alpha value was found to be 0.90 for the first group and 0.89 for the second group. In this study, the Cronbach alpha value was calculated as 0.89 as a result of the reliability analysis carried out on the participants. The measurement tool is highly reliable.

The survey, which was originally answered with a 3-point Likert scale (disagree, not sure, agree), was presented to the participants with a 5-point Likert scale (from totally disagree to totally agree) in this study. Getting high scores on the factors from the survey ensures that the school climate is evaluated as positive.

2.4. Data Analysis

Quantitative data analysis techniques are preferred for data analysis. For descriptive statistics, arithmetic mean and standard deviation analysis results are presented.

Multiple linear regression analysis was employed to examine the predictive relationship between critical thinking dispositions, epistemological beliefs, and school climate. Multiple linear regression analysis was employed as the primary statistical method due to its well-established capacity for predicting a dependent variable based on a set of independent variables [47]. This technique enables the quantification of the unique contribution of each predictor while accounting for the influence of others, providing valuable insights into the complex interplay of factors affecting critical thinking dispositions. Additionally, multiple regression facilitates the evaluation of the overall predictive accuracy of the model, aiding in the identification of key variables that significantly contribute to the prediction of critical thinking tendencies. Prior to analysis, the data were assessed to ensure adherence to the assumptions of multiple linear regression. These assumptions include the following:

1. Linearity: The relationship between the independent and dependent variables is linear. This was assessed visually using scatterplots and statistically using partial regression plots;
2. Independence: The residuals (errors) are independent of each other. This was confirmed by examining the Durbin–Watson statistic. Generally, a Durbin–Watson statistic between 1.5 and 2.5 is considered acceptable, suggesting no significant autocorrelation and upholding the independence assumption. Durbin–Watson values are presented in the relevant tables in the findings;
3. Homoscedasticity: The variance of the residuals is constant across all levels of the independent variables. This was visually assessed using a plot of residuals against predicted values;
4. Normality: The residuals are normally distributed. This was checked using a histogram and a normal probability plot (Q-Q plot) of the residuals;

5. No Multicollinearity: The independent variables are not highly correlated with each other. This was assessed using variance inflation factors (VIFs). Low VIFs (close to 1) and moderate VIFs (between 1 and 5) are acceptable. VIF values are presented in the relevant tables in the findings.

All assumptions were deemed to be satisfactorily met, thus allowing for the valid interpretation of the multiple linear regression results. The analysis was conducted using SPSS21.0.

3. Results

The results in Table 2 present the descriptive statistics for the three factors of the Critical Thinking Disposition Scale (dialectical thinking, disposition, analysis) and the overall critical thinking disposition score. The mean scores for each factor and the overall critical thinking disposition were all above the midpoint of the 5-point Likert scale (3.0), indicating that, on average, the participants demonstrated a moderate to high inclination toward critical thinking. The highest mean score was observed for dialectical thinking (M = 3.79, SD = 0.63), followed by analysis (M = 3.46, SD = 0.78), and then disposition (M = 3.20, SD = 1.13). The overall critical thinking disposition score had a mean of 3.48 (SD = 0.67). The standard deviations for all factors and the overall score were relatively small, suggesting that the responses were clustered around the mean and there was not a high degree of variability in the participants' critical thinking dispositions.

Table 2. Participants' level of critical thinking dispositions.

	Dialectical Thinking	Disposition	Analysis	Critical Thinking Disposition
Mean	3.79	3.20	3.46	3.48
s	0.63	1.13	0.78	0.67

The overall level of students' epistemological beliefs, as reflected in the mean scores in Table 3, falls below the midpoint (3.0) of the 5-point Likert scale, where 1 represents the committed relativist stage, and 5 represents the dualist stage. This suggests that, in general, the students' beliefs about the nature of knowledge and learning lean toward a more advanced epistemological stage, the committed relativist stage, which is characterized by the understanding that knowledge is complex and context-dependent and requires critical evaluation and interpretation. The highest mean score was observed for the "omniscient authority" factor (M = 2.93, SD = 0.92). While still below the midpoint, this indicates a moderate tendency among students to rely on authority figures for knowledge, suggesting that some remnants of a dualistic perspective, where knowledge is seen as absolute and transmitted by authorities, might still be present. The mean scores for "quick learning" (M = 2.28, SD = 0.83) and "innate ability" (M = 2.35, SD = 0.85) are lower, further supporting the notion that students tend to disagree with the beliefs that learning should be quick or that innate abilities are decisive in learning, which are more aligned with a dualistic perspective. The mean score for the "simple knowledge" factor (M = 3.10, SD = 0.81), being slightly above the midpoint, indicates a moderate level of disagreement with the belief that knowledge is simple and straightforward. Overall, the findings in Table 3 suggest that the majority of students' epistemological beliefs are closer to the committed relativist stage, although some vestiges of a dualistic perspective, particularly in relation to the role of authority, may still be present.

Table 3. Participants' level of epistemological beliefs.

	Omniscient Authority	Quick Learning	Innate Ability	Simple Knowledge
Mean	2.93	2.28	2.35	3.10
s	0.92	0.83	0.85	0.81

The results in Table 4 present the descriptive statistics for the six factors of the School Climate Survey: fairness, order and discipline, parental involvement, sharing of resources, students' interpersonal relations, and student–teacher relations. The mean scores for all factors were above the midpoint of the 5-point Likert scale (3.0). However, the scores are generally closer to the midpoint than the highest possible score of 5, indicating that students' perceptions of school climate lean toward neutral rather than strongly positive. The highest mean score was observed for student–teacher relations (M = 3.80, SD = 0.87), followed by fairness (M = 3.43, SD = 1.04), suggesting that students view their relationships with teachers and the overall fairness within the school more favorably compared to other aspects of the school climate. The lowest mean score was found for order and discipline (M = 2.72, SD = 0.85), highlighting this area as a potential concern that warrants attention. The relatively small standard deviations for all factors indicate limited variability in students' perceptions, suggesting a general consensus among students regarding the school climate.

Table 4. School climate according to participants.

	Fairness	Order and Discipline	Parent Involvement	Sharing of Resources	Student Interpersonal Relations	Student–Teacher Relations
Mean	3.43	2.72	2.95	3.15	3.06	3.80
s	1.04	0.85	0.82	1.02	0.90	0.87

The results in Table 5 present the predictors of dialectical thinking.

The general form of the equation to predict dialectical thinking from epistemological beliefs and school climate factors is as follows:

According to Model 1

$$\text{Dialectical Thinking} = 4.58 - (0.259 \times \text{quick learning}) - (0.089 \times \text{innate ability})$$

These variables statistically significantly predicted dialectical thinking, $F = 28.894$, $p < 0.05$, $R^2 = 0.186$. These two variables statistically significantly affect the prediction, $p < 0.05$.

Omniscient authority and simple knowledge variables are not predicted.

According to Model 2

$$\text{Dialectical Thinking} = 3.833 - (0.071 \times \text{omniscient authority}) - (0.206 \times \text{quick learning}) - (0.075 \times \text{innate ability}) - (0.079 \times \text{order and discipline}) + (0.063 \times \text{parent involvement}) - (0.054 \times \text{sharing resources}) + (0.240 \times \text{student-teacher relations})$$

Table 5. The predictors of dialectical thinking—multiple linear regression analysis.

		Dialectical Thinking								
		Unstandardized Coefficients		Standardized Coefficients			Correlations		Collinearity	
Model	Predictors	B	Std. Error	β	t	*p*	Partial	Part	VIF	
1	(Constant)	4.580	0.126		36.469	0.000				R = 0.408 R^2 = 0.186 Adjusted R^2 = 0.160 F = 28.894 $p < 0.05$
	Omniscient authority	−0.006	0.027	−0.008	−0.210	0.834	−0.009	−0.008	1.04	
	Quick learning	−0.259	0.033	−0.340	−7.923	0.000 *	−0.313	−0.300	1.28	
	Innate ability	−0.089	0.032	−0.120	−2.777	0.006 *	−0.115	−0.105	1.29	
	Simple knowledge	0.010	0.031	0.012	0.312	0.755	0.013	0.012	1.07	

Table 5. *Cont.*

		Dialectical Thinking								
		Unstandardized Coefficients		Standardized Coefficients			Correlations		Collinearity	
Model	**Predictors**	**B**	**Std. Error**	**β**	**t**	***p***	**Partial**	**Part**	**VIF**	
2	(Constant)	3.833	0.181		21.137	0.000				R = 0.540 R^2 = 0.291 Adjusted R^2 = 0.279 F = 23.613 $p < 0.05$
	Omniscient authority	−0.071	0.027	−0.103	−2.659	0.008 *	−0.110	−0.093	1.22	
	Quick learning	−0.206	0.031	−0.270	−6.645	0.000 *	−0.267	−0.233	1.34	
	Innate ability	−0.075	0.030	−0.102	−2.525	0.012 *	−0.105	−0.089	1.31	
	Simple knowledge	−0.001	0.029	−0.001	−0.026	0.979	−0.001	−0.001	1.09	
	Fairness	−0.024	0.030	−0.040	−0.804	0.422	−0.034	−0.028	1.99	
	Order and discipline	−0.079	0.031	−0.106	−2.550	0.011 *	−0.106	−0.090	1.40	
	Parent involvement	0.063	0.029	0.082	2.138	0.033 *	0.089	0.075	1.19	
	Sharing of resources	−0.054	.025	−0.088	−2.216	0.027 *	−0.092	−0.078	1.27	
	Student interpersonal relations	0.063	0.033	0.090	1.929	0.054	0.080	0.068	1.75	
	Student–teacher relations	0.240	0.035	0.331	6.804	0.000 *	0.273	0.239	1.92	

Durbin–Watson = 1.976. Dependent variable: dialectical thinking. * $p < 0.05$.

These variables statistically significantly predicted dialectical thinking, $F = 23.613$, $p < 0.05$, $R^2 = 0.291$. These seven variables statistically significantly affect the prediction, $p < 0.05$.

Simple knowledge, fairness, and student interpersonal relations variables are not predicted.

The results in Table 6 present the predictors of disposition.

The general form of the equation to predict disposition from epistemological beliefs and school climate factors is as follows:

According to Model 1

$$\text{Disposition} = 3.8 - (0.266 \times \text{omniscient authority}) - (0.157 \times \text{quick learning}) + (0.201 \times \text{simple knowledge})$$

These variables statistically significantly predicted disposition, $F = 11.894$, $p < 0.05$, $R^2 = 0.076$. These three variables statistically significantly affect the prediction, $p < 0.05$.

The innate ability variable is not predicted.

Table 6. The predictors of disposition—multiple linear regression analysis.

		Disposition								
		Unstandardized Coefficients		Standardized Coefficients			Correlations		Collinearity	
Model	**Predictors**	**B**	**Std. Error**	**β**	**t**	***p***	**Partial**	**Part**	**VIF**	
1	(Constant)	3.800	0.237		16.028	0.000				R = 0.275 R^2 = 0.076 Adjusted R^2 = 0.069 F = 11.894 $p < 0.05$
	Omniscient authority	−0.266	0.050	−0.215	−5.290	0.000 *	−0.215	−0.211	1.04	
	Quick learning	−0.157	0.062	−0.115	−2.549	0.011 *	−0.105	−0.102	1.28	
	Innate ability	−0.034	0.060	−0.026	−0.570	0.569	−0.024	−0.023	1.29	
	Simple knowledge	0.201	0.058	0.143	3.466	0.001 *	0.142	0.138	1.07	

Table 6. *Cont.*

		Disposition								
		Unstandardized Coefficients		Standardized Coefficients			Correlations		Collinearity	
Model	**Predictors**	**B**	**Std. Error**	**β**	**t**	***p***	**Partial**	**Part**	**VIF**	
2	(Constant)	3.883	0.365		10.624	0.000				R = 0.324 R^2 = 0.105 Adjusted R^2 = 0.089 F = 6.726 $p < 0.05$
	Omniscient authority	−0.277	0.054	−0.224	−5.146	0.000 *	−0.210	−0.203	1.22	
	Quick learning	−0.137	0.062	−0.100	−2.190	0.029 *	−0.091	−0.086	1.34	
	Innate ability	−0.044	0.060	−0.033	−0.733	0.464	−0.031	−0.029	1.31	
	Simple knowledge	0.178	0.058	0.127	3.077	0.002 *	0.127	0.122	1.09	
	Fairness	−0.026	0.061	−0.024	−0.433	0.665	−0.018	−0.017	1.99	
	Order and discipline	−0.054	0.063	−0.040	−0.867	0.386	−0.036	−0.034	1.40	
	Parent involvement	0.013	0.059	0.009	0.220	0.826	0.009	0.009	1.19	
	Sharing of resources	−0.155	.049	−0.139	−3.127	0.002 *	−0.129	−0.123	1.27	
	Student interpersonal relations	0.003	0.066	0.002	0.044	0.965	0.002	0.002	1.75	
	Student–teacher relations	0.177	0.071	0.137	2.495	0.013 *	0.104	0.099	1.92	

Durbin–Watson = 1.945. Dependent variable: disposition. * $p < 0.05$.

According to Model 2

$$\text{Disposition} = 3.833 - (0.277 \times \text{omniscient authority}) - (0.137 \times \text{quick learning}) + (0.178 \times \text{simple knowledge}) - (0.155 \times \text{sharing resources}) + (0.177 \times \text{student-teacher relations})$$

These variables statistically significantly predicted disposition, $F = 6.726$, $p < 0.05$, $R^2 = 0.105$. These five variables statistically significantly affect the prediction, $p < 0.05$.

Innate ability, fairness, order and discipline, parent involvement, and student interpersonal relations variables are not predicted.

The results in Table 7 present the predictors of analysis.

The general form of the equation to predict analysis from epistemological beliefs and school climate factors is as follows:

According to Model 1

$$\text{Analysis} = 4.598 - (0.185 \times \text{omniscient authority}) - (0.262 \times \text{quick learning})$$

These variables statistically significantly predicted analysis, $F = 25.687$, $p < 0.05$, $R^2 = 0.150$. These two variables statistically significantly affect the prediction, $p < 0.05$.

Innate ability and simple knowledge variables are not predicted.

According to Model 2

$$\text{Analysis} = 4.354 - (0.221 \times \text{omniscient authority}) - (0.234 \times \text{quick learning}) - (0.089 \times \text{order and discipline}) - (0.075 \times \text{sharing resources}) + (0.141 \times \text{student-teacher relations})$$

These variables statistically significantly predicted analysis, $F = 14.015$, $p < 0.05$, $R^2 = 0.196$. These five variables statistically significantly affect the prediction, $p < 0.05$.

Innate ability, simple knowledge, fairness, parent involvement, and student interpersonal relations variables are not predicted.

The results in Table 8 present the predictors of critical thinking disposition.

Table 7. The predictors of analysis—multiple linear regression analysis.

		Analysis								
		Unstandardized Coefficients		Standardized Coefficients			Correlations		Collinearity	
Model	**Predictors**	**B**	**Std. Error**	**β**	**t**	***p***	**Partial**	**Part**	**VIF**	
1	(Constant)	4.598	0.155		29.581	0.000				R = 0.388 R^2 = 0.150 Adjusted R^2 = 0.145 F = 25.687 $p < 0.05$
	Omniscient authority	−0.185	0.033	−0.219	−5.617	0.000 *	−0.227	−0.215	1.04	
	Quick learning	−0.262	0.040	−0.280	−6.464	0.000 *	−0.259	−0.247	1.28	
	Innate ability	−0.024	0.040	−0.027	−0.615	0.539	−0.026	−0.024	1.29	
	Simple knowledge	0.018	0.038	0.018	0.466	0.641	0.019	0.018	1.07	
2	(Constant)	4.354	0.237		18.386	0.000				R = 0.443 R^2 = 0.196 Adjusted R^2 = 0.182 F =14.015 $p < 0.05$
	Omniscient authority	−0.221	0.035	−0.261	−6.332	0.000 *	−0.256	−0.237	1.22	
	Quick learning	−0.234	0.040	−0.250	−5.778	0.000 *	−0.234	−0.216	1.34	
	Innate ability	−0.026	0.039	−0.028	−0.659	0.510	−0.027	−0.025	1.31	
	Simple knowledge	0.005	0.038	0.005	0.121	0.904	0.005	0.005	1.09	
	Fairness	0.029	0.039	0.039	0.740	0.460	0.031	0.028	1.99	
	Order and discipline	−0.089	0.041	−0.097	−2.203	0.028 *	−0.092	−0.082	1.40	
	Parent involvement	0.061	0.038	0.064	1.580	0.115	0.066	0.059	1.19	
	Sharing of resources	−0.075	0.032	−0.099	−2.344	0.019 *	−0.097	−0.088	1.27	
	Student interpersonal relations	−0.001	0.043	−0.001	−0.030	0.976	−0.001	−0.001	1.75	
	Student–teacher relations	0.141	0.046	0.158	3.057	0.002 *	0.127	0.114	1.92	

Durbin–Watson = 1.961. Dependent variable: analysis. * $p < 0.05$.

The general form of the equation to predict critical thinking disposition from epistemological beliefs and school climate factors is as follows:

According to Model 1

$$\text{Critical Thinking Disposition} = 4.326 - (0.152 \times \text{omniscient authority}) - (0.226 \times \text{quick learning}) + (0.076 \times \text{simple knowledge})$$

These variables statistically significantly predicted critical thinking disposition, $F = 26.711$, $p < 0.05$, $R^2 = 0.150$. These three variables statistically significantly affect the prediction, $p < 0.05$.

The innate ability variable is not predicted.

According to Model 2

$$\text{Critical Thinking Disposition} = 4.023 - (0.189 \times \text{omniscient authority}) - (0.192 \times \text{quick learning}) - (0.074 \times \text{order and discipline}) - (0.095 \times \text{sharing of resources}) + (0.186 \times \text{student-teacher relations})$$

These variables statistically significantly predicted critical thinking disposition, $F = 17.242$, $p < 0.05$, $R^2 = 0.231$. These five variables statistically significantly affect the prediction, $p < 0.05$.

Innate ability, simple knowledge, fairness, parent involvement, and student interpersonal relations variables are not predicted. The general form of the equation to predict analysis from epistemological beliefs and school climate factors is as follows:

According to Model 1

$$\text{Analysis} = 4.598 - (0.185 \times \text{omniscient authority}) - (0.262 \times \text{quick learning})$$

These variables statistically significantly predicted analysis, $F = 25.687$, $p < 0.05$, $R^2 = 0.150$. These two variables statistically significantly affect the prediction, $p < 0.05$.

Innate ability and simple knowledge variables are not predicted.

Table 8. The predictors of critical thinking disposition—multiple linear regression analysis.

		Critical Thinking Disposition								
		Unstandardized Coefficients		Standardized Coefficients			Correlations		Collinearity	
Model	**Predictors**	**B**	**Std. Error**	**β**	**t**	***p***	**Partial**	**Part**	**VIF**	
1	(Constant)	4.326	0.133		32.508	0.000				R = 0.394 R^2 = 0.156 Adjusted R^2 = 0.150 F = 26.711 $p < 0.05$
	Omniscient authority	−0.152	0.028	−0.210	−5.394	0.000 *	−0.219	−0.206	1.04	
	Quick learning	−0.226	0.035	−0.282	−6.523	0.000 *	−0.261	−0.249	1.28	
	Innate ability	−0.049	0.034	−0.063	−1.452	0.147	−0.060	−0.055	1.29	
	Simple knowledge	0.076	0.032	0.092	2.338	0.020 *	0.097	0.089	1.07	
2	(Constant)	4.023	0.199		20.227	0.000				R = 0.481 R^2 = 0.231 Adjusted R^2 = 0.218 F = 17.242 $p < 0.05$
	Omniscient authority	−0.189	0.029	−0.261	−6.473	0.000 *	−0.261	−0.237	1.22	
	Quick learning	−0.192	0.034	−0.240	−5.654	0.000 *	−0.230	−0.207	1.34	
	Innate ability	−0.048	0.033	−0.062	−1.478	0.140	−0.062	−0.054	1.31	
	Simple knowledge	0.061	0.032	0.074	1.925	0.055	0.080	0.070	1.09	
	Fairness	−0.007	0.033	−0.011	−0.216	0.829	−0.009	−0.008	1.99	
	Order and discipline	−0.074	0.034	−0.094	−2.180	0.030 *	−0.091	−0.080	1.40	
	Parent involvement	0.046	0.032	0.056	1.411	0.159	0.059	0.052	1.19	
	Sharing of resources	−0.095	0.027	−0.145	−3.519	0.000 *	−0.145	−0.129	1.27	
	Student interpersonal relations	0.022	0.036	0.029	0.601	0.548	0.025	0.022	1.75	
	Student–teacher relations	0.186	0.039	0.244	4.809	0.000 *	0.197	0.176	1.92	

Durbin–Watson = 1.948. Dependent variable: critical thinking disposition. * $p < 0.05$.

4. Discussion

The research investigates the relationship between epistemological beliefs and school climate to understand the factors that influence critical thinking dispositions in middle school students. The results highlight the significant impact of both epistemological beliefs and school climate on critical thinking. Table 9 below presents the prediction results of the predictor variables on the dependent variable.

4.1. The Role of Epistemological Beliefs

The findings of the study highlighted the pivotal role of epistemological beliefs, specifically the belief in omniscient authority, in shaping critical thinking dispositions. This was investigated through an examination of the scientific and critical factors. The omniscient authority, which was the predominant belief, was identified as a negative predictor of critical thinking skills and the overall critical thinking disposition across both models (Model 1 and Model 2) for all dimensions of critical thinking. It can thus be inferred that students who habitually defer to authority figures are least likely to engage in critical

and creative thinking when confronted with various school climate factors. The durability and high repeat rate of the negative association from the school climate in Model 2 indicate that this belief exerts a significant corrupting influence on the primary creative process of critical thinking. The study revealed the crucial importance of instilling a sense of epistemic agency through fostering a culture of deep questioning and critical evaluation of information as a fundamental aspect of students' formal education, in addition to the broader educational process of the individual. In light of the paramount importance of fostering ownership of one's own learning and knowledge construction, educators can play a pivotal role in guiding students toward the development of critical thinking dispositions that can be applied both within the academic setting and beyond.

Table 9. Prediction results.

		Dependent Variables			
	Predictor Variables	**Dialectical Thinking**	**Disposition**	**Analysis**	**Critical Thinking Disposition (Overall)**
Model 1 (Only Epistemological Beliefs)	Omniscient authority	NotP	NP	NP	NP
	Quick learning	NP	NP	NP	NP
	Innate ability	NP	NotP	NotP	NotP
	Simple knowledge	NotP	PP	NotP	PP
Model 2 (Epistemological Beliefs and School Climate)	Omniscient authority	NP	NP	NP	NP
	Quick learning	NP	NP	NP	NP
	Innate ability	NP	NotP	NotP	NotP
	Simple knowledge	NotP	PP	NotP	NotP
	Fairness	NotP	NotP	NotP	NotP
	Order and discipline	NP	NotP	NP	NP
	Parent involvement	PP	NotP	NotP	NotP
	Sharing of resources	NP	NP	NP	NP
	Student interpersonal relations	NotP	NotP	NotP	NotP
	Student–teacher relations	PP	PP	PP	PP

NP	: Negative Predictor	PP	: Positive Predictor	NotP	: Not Predictor

Similarly, the notion of expeditious learning was perceived as a detrimental predictor for all facets of critical thinking in both models. This indicates that the perception of learning as an effortless and expeditious process has a detrimental impact on critical thinking abilities, irrespective of the instructional context. The consistent negative correlation across both models substantiates the assertion that this disposition is detrimental to critical thinking.

A growth mindset, which views learning as a gradual process requiring effort and perseverance, can facilitate the long-term maintenance of critical thinking skills. The central role of fostering personal resilience, effort, and continuous improvement is to facilitate the active learning of critical thinking skills through growth-oriented methodologies by teachers.

The analysis of both models revealed that innate ability was not a significant predictor, indicating that success in learning was linked to innate ability, which had no direct impact on the critical thinking process. This suggests that the assumption that intelligence is fixed may be a contributing factor to the potential impact on critical thinking engagement.

Moreover, this suggests that promoting a growth mindset, with an emphasis on effort and strategies, may not directly result in optimal critical thinking outcomes. Although the growth mindset is generally conducive to learning, the survey suggests that it may not be the sole determining factor in fostering sustainable critical thinking. Other factors, including the students' meaning-making beliefs and the context in which the school operates, may exert a more significant influence on the process.

The straightforward assumption that simple knowledge belief is a positive predictor of disposition and critical thinking was shown to be interesting, as it was a significant predictor in the first model, yet this was not a factor in the second model where variables of school climate were taken into account. This suggests that although the initial conceptualization of critical thinking advancement is associated with high-level comprehension of knowledge, the influence of the surrounding context may negate this or act as a mediator between the knowledge concept and its effects. The significant positive correlation observed in Model 2, which can be attributed to the complex interplay between epistemological beliefs and the learning environment, represents a key insight from this analysis. It is imperative to adopt practical approaches that address both individual beliefs and the broader school system to ensure the sustainability of critical thinking. Fostering an appreciation for the diversity of knowledge among students while providing them with guidance and structure through the school's syllabi and routines can have a profoundly positive impact on the development of critical thinking skills over time.

4.2. Discussion on the Role of Epistemological Beliefs

The present results clearly demonstrate the significant influence of epistemological beliefs on individuals' inclination toward critical thinking. This finding aligns with the existing literature that has consistently evidenced a correlation between these two variables [26,48]. The fact that the belief in omniscient authority was approaching a negative correlation with critical thinking dispositions in both models illustrates a significant detrimental effect of uncritical reliance on the authority of others. This is also consistent with the notion that the way in which a learner perceives the sources of knowledge is the primary factor influencing their engagement in critical inquiry [49]. By prompting students to engage in critical thinking about the information available to them and to question the sources thereof, we can facilitate their epistemic agency, thereby ensuring that critical thinking continues beyond the classroom.

Similarly, the negative correlation between the belief that one learns quickly and the disposition to critical thinking lends support to the notion that an individual may be hindered from attaining high-order cognitive abilities if they perceive learning as a straightforward process [50]. These findings align with the notion that a growth mindset, defined as the belief that abilities can be enhanced through effort, is a pivotal factor in the development of critical thinking skills [51]. Instructors may facilitate the continuous growth and development of critical thinking skills by emphasizing the significance of effort and persistence during the learning process.

The absence of a correlation between the belief in innate ability and critical thinking dispositions may initially appear incongruous, particularly when one considers the detrimental impact of fixed thinking on learning and motivation [52]. It can be concluded from the above that although a growth mindset is often conducive to the development of critical thinking skills, it is not the only factor that contributes to this process. Other variables, such as epistemological beliefs or the school environment, may play a more significant role in the growth and maintenance of critical thinking skills.

The complex interrelationship between an individual's perception of the simplicity of knowledge and the educational context provides insight into the process of critical thinking development. An enhanced comprehension of the complexities of knowledge may initially prompt an individual to engage in critical thinking. However, the impact of the school environment may interact with this process. This finding aligns with the ecological perspective on learning, which emphasizes the interrelationship between the individual

and contextual factors during cognitive development [53]. It is thus imperative to maintain equilibrium between individual beliefs and the broader classroom context to ensure the continued cultivation of critical thinking.

These findings contribute to the existing literature on the role of learners' epistemological beliefs in promoting critical thinking. The findings confirm the importance of educational programs that not only address students' beliefs about knowledge and learning but also foster a supportive school environment for the development and maintenance of critical thinking skills. By creating an environment that encourages epistemic agency, a growth mindset, and the complexity of knowledge, schools can ultimately facilitate the social construction of critical thinking abilities over time.

4.3. The Role of School Climate

The study also underscores the pivotal function of school climate in influencing critical thinking dispositions. The incorporation of school climate variables into Model 2 resulted in a significant enhancement in the explained variance in critical thinking dispositions relative to Model 1, which solely considered epistemological beliefs. This evidence clearly demonstrates that school climate plays a vital role in fostering critical thinking, irrespective of individual beliefs about knowledge and learning. Consequently, the establishment of an optimal school climate is crucial for the advancement and maintenance of critical thinking abilities. The findings indicate that a positive school climate can provide the necessary support and reinforcement for critical thinking skills to become established and to continue to develop beyond the immediate learning context.

In addition to the aforementioned factors, the study revealed that the creation of a positive school climate was associated with the presence of fairness, parental involvement, and, notably, positive student–teacher relations. This suggests that a supportive, equitable, and trusting school environment, particularly through positive teacher–student interactions, may play a significant role in the development of critical thinking skills. The findings indicate that the relationships between students and teachers are of paramount importance in fostering critical thinking skills. These results underscore the significant role that teachers play in creating a climate that supports critical inquiry. In light of the study's findings, it can be posited that fostering a climate of critical thinking hinges on the establishment of a safe and empowering environment for students, wherein they feel encouraged to engage in pedagogical processes. This necessitates a focus on the cultivation of equitable teacher–student relationships and the active involvement of parents, who can serve as a conduit for fostering a sense of fairness.

In contrast, the findings revealed that order and discipline and the sharing of resources were identified as negative predictors for the critical thinking dimensions in Model 2 of the study. A school environment that is rigid or characterized by an unequal distribution of resources presents significant obstacles to the emergence of critical thinking, as evidenced by the aforementioned results. These findings reinforce the significance of constructing a school environment that integrates order with flexibility while assuring equal opportunities are provided to support the development of critical thinking in all students. The establishment of an environment wherein the requisite resources are accessible and students are afforded a sense of autonomy and agency within a secure and nurturing framework can, therefore, facilitate the long-term sustainability of critical thinking abilities.

The finding that students' interpersonal relations did not play a crucial role in any of the models has vital predictive significance, as peer affiliation was found to be a poor predictor of critical thinking skills, ranking first in the latter. This finding is significant in that it challenges the commonly held belief that a strong peer connection is a prerequisite for strong critical thinking. It prompts the question of whether other factors, such as epistemology and school climate, may be more influential and should be prioritized to achieve the goal of sustainable critical thinking. While positive peer relationships are undoubtedly beneficial for overall well-being, the study highlights that they may not be the primary factor in the application of critical thinking skills.

4.4. Discussion on the Role of School Climate

The notable enhancement in the explained variance observed with the incorporation of school climate variables in Model 2 substantiates the indisputable impact of the learning environment on the formation of critical thinking dispositions. This result is consistent with the broader educational psychology literature, which consistently highlights the interplay between individual and contextual factors in cognitive growth and skill acquisition [54,55]. The results of the current study provide compelling evidence that a positive school climate acts as a catalyst, fostering the development and sustenance of critical thinking skills in students, regardless of their pre-existing epistemological beliefs.

The positive correlation between school climate factors, such as fairness, parental involvement, and particularly student–teacher relations, and critical thinking dispositions is consistent with previous research findings. A climate of fairness, where students perceive just and equitable treatment, fosters a sense of psychological safety and encourages intellectual risk-taking, which is a cornerstone of critical thinking [56]. This finding is consistent with the self-determination theory proposed by Deci and Ryan [57], which suggests that a sense of autonomy and relatedness are essential for intrinsic motivation, which in turn facilitates deeper learning and critical thinking. This collaborative approach aligns with Bronfenbrenner's [53] ecological systems theory, which emphasizes the interconnectedness of various systems (e.g., home, school) in a child's development.

The particularly strong relationship between positive student–teacher relationships and critical thinking dispositions highlights the pivotal role of teachers as facilitators of a culture of critical inquiry. This finding is consistent with the tenets of attachment theory, which posits that secure attachments to teachers can encourage students' exploration and mastery of their environment, including intellectual activities [58]. Such a welcoming and nurturing relationship between a teacher and a student provides the student with a sense of security, allowing them to approach complex critical thought with the knowledge that they can consult with a figure who can offer guidance and support.

In contrast, the negative correlation between order and discipline and certain dimensions of critical thinking indicates that an excessive or authoritarian school environment can impede the development of the very skills it aims to foster. This is consistent with the tenets of self-determination theory, which posits that intrinsic motivation and autonomous learning—both of which are essential for critical thinking—are more likely to flourish in environments that foster autonomy and competence [59]. Therefore, by emphasizing order and discipline, the very requirements that should be met for the advancement of critical thinking can be undermined, impeding the process.

Similarly, the detrimental impact of unequal access to resources on critical thinking underscores the vital importance of equity in education. In his book *Visible Learning*, Hattie [60] asserts that equality of resources is a significant determinant of pupil achievement. This indicates that students must have access to all necessary materials and a pedagogical approach that is responsive to the diverse needs of learners. The detrimental impact of unequal access to resources on critical thinking is further substantiated by the findings of recent studies that highlight the correlation between socioeconomic inequalities and cognitive development and academic success [61].

The lack of significance in the relationship between peer connections and the delivery of critical thinking in students, though it might have been unexpected, requires further examination. While positive peer relationships have been linked to emotional stability, it is possible that they may not be sufficient to foster critical thinking. Conversely, the relationship between peer influence and critical thinking may be influenced by factors such as the nature of peer interactions and the school environment. Further studies on this topic would contribute to the existing body of knowledge.

The discovery of peer connections as a determinant of critical thinking skills emphasizes the requirement for a more in-depth analysis of the elements that connect to the formation of critical thinking capabilities in the school environment. The nature of peer relationships is not a direct causation of improved critical thinking skills; rather, the

overall school level, including the type of peer and external events, can directly affect the building of these skills. The stability of the educational environment, propelled by both internal dynamics and external events, is indeed the crucial factor in the development of a critical mind.

Furthermore, it is crucial to be aware of the multilateral character of the school climate, which is created by a complex interaction of internal and external factors. If our study was concentrated on the internal aspects such as the nature of student–teacher relationships and the distribution of resources, for example, the external occurrences can influence the conditions of the learning environment, and the advancement of critical thinking may be delayed to a large extent. It was also affirmed by the anthropocenic study of experts Sujaya, Abdul-Haq, and Imran [62] on the 2022 Pakistan floods that unexpected disruptions can become hurdles while creating and having the very rudiments of educational sustainability. This makes it necessary for educational institutions to be modelers of resilience and adaptability so that critical thinking skills remain on the agenda even in the face of unforeseen challenges. Through an approach of problem-solving and critical reflection, educational institutions can help students acquire the required cognitive tools for sustaining ambiguity and uncertainty both in the classroom and in the outside world.

Indeed, external elements are capable of disturbing the process of learning; nevertheless, this study shows explicitly the essential part of the school environment in cultivating critical thinking skills. The concept of critical thinking as not just an individual pursuit but also a faculty that is encouraged within a sustainable school environment is revealed in the study.

This study enhances our understanding of the intricacies of critical thinking. The study underscores the notion that critical thinking is not merely an individual endeavor, but rather, it is firmly embedded within the social structure of the educational environment. To illustrate, a positive school climate that guarantees fairness, ensures maternal creativity, cultivates positive student–teacher relationships, and provides all students with equal access to resources could serve as a catalyst for critical development and the exercise of rationality.

An educational environment that encourages critical thinking provides students with the requisite tools to navigate complex issues, including the urgent challenges of sustainability. This emphasizes the importance of integrating sustainability education into the curriculum, not merely as a discrete subject, but as a means of fostering environmental awareness and critical engagement.

This emphasizes the importance of integrating sustainability education into the curriculum as a fundamental principle that is applicable to all disciplines. As Imran, Almusharraf, and Abdellatif [63] posit, efficacious sustainability education cultivate not only environmental awareness but also the critical thinking abilities essential for students to evaluate information, challenge assumptions, and ultimately contribute to a more sustainable future. By integrating authentic environmental challenges into the curriculum and encouraging students to analyze and propose solutions, educators can bridge the gap between theoretical knowledge and practical application, thereby nurturing a generation of environmentally responsible and critically engaged citizens.

5. Conclusions

The present study addresses the sophisticated topic of the factors that contribute to middle school students developing a critical thinking disposition toward the content and processes of learning. This has been achieved by approaching the problem from the perspective of epistemological beliefs and school climate, thereby defining the complex lines of factor interaction for the growth and sustenance of critical thought.

The findings of this study indicate that students who engage in epistemic agency, or the active creation of knowledge, are more likely to demonstrate the characteristics associated with critical thinking. Conversely, an individual who is critical may, on occasion, exhibit a tendency to adhere unquestioningly to authority. It appears that when students

are constrained by assertions of authority, they become disinclined to engage in critical thinking and lose the motivation to challenge established perspectives.

Furthermore, the study highlights the necessity for the cultivation of a growth mindset among students. Individuals who perceive learning as a challenging yet rewarding experience and regard effort and persistence as pathways to mastery are more likely to flourish in critical thinking. Conversely, those who espouse the view that learning should be a rapid and straightforward process are less likely to develop the requisite skills. It would appear that students who are accustomed to providing prompt and definitive responses may be unable to discern the nuances and ambiguities inherent in a given problem, which could ultimately lead to a diminution in their confidence in their capacity to engage in critical thinking.

The school climate plays an instrumental role in fostering students' critical thinking dispositions. A supportive learning environment, characterized by positive student–teacher relationships, provides evidence of intellectual curiosity and the ability to navigate the challenges of critical inquiry. In this environment, students are more likely to develop the confidence and resilience required to navigate the complex and often indecisive journey of critical thought.

Conversely, an authoritarian learning environment or one lacking in resources impedes the development of critical thinking. When students are constrained by inflexible regulations or denied access to essential resources, their curiosity and inclination to challenge the status quo may be stifled. It can be argued that these young minds are constrained by an environment that is devoid of intellectual stimulation, which consequently impedes their ability to develop critical thinking skills.

In conclusion, the findings of this study demonstrate that the formation of critical thinking dispositions is a complex process that is influenced by both individual and environmental factors. The beliefs that students hold regarding the nature of knowledge, in conjunction with the characteristics of the learning environment, exert a profound influence on their engagement with critical inquiry. By fostering epistemic agency, encouraging a growth mindset, and providing a supportive and empowering learning environment in their schools, educators can effectively promote the development of critical thinking skills in their students. This will empower them to effectively navigate the challenges of life and its intricacies as 21st-century individuals.

6. Recommendations

This study reveals a nuanced interplay of factors influencing critical thinking dispositions in middle school students. Based on our findings, we propose the following recommendations for various stakeholders invested in the promotion of sustainable critical thinking skills:

6.1. For Educators

The challenge of the omniscient authority is an important one. In light of the robust negative correlation between "belief in omniscient authority" and critical thinking dispositions, it is imperative for educators to proactively challenge this belief. In lieu of assuming the role of the sole purveyor of knowledge, educators can cultivate epistemic agency by prompting students to solicit information, pursue alternative viewpoints, and engage in discourse with their peers. In order to achieve this, educators could prepare learning tasks that directly expose students to conflicting points of view or situations that are not yet resolved. This would provide students with the opportunity to evaluate evidence and form their own reasoned evaluations.

It is necessary to reframe the concept of "quick learning". The negative correlation between "quick learning" and critical thinking indicates a necessity for a transformation in the manner in which students perceive the learning process. It is imperative that educators place an emphasis on the role of effort, struggle, and the learning process itself. One method for achieving this is to assign students tasks that require deep learning, such

as comprehensive research on a topic, problem-solving, or multiple revisions of written work. These activities illustrate the time and effort required for deep understanding and emphasize the importance of diligence in the learning process.

It is recommended that the "simple knowledge" effect be maximized. The present study, despite the relatively weak predictive power of "simple knowledge" as a function of school climate factors, along with the resulting paucity of sessions during the students' coursework, nevertheless allows us to identify potential avenues for action. It is incumbent upon educators to strive to establish a learning environment that is conducive to the realization of a complex view of knowledge. One potential approach to achieve this would be to present the material in a way that interweaves different threads of content and highlights the subtleties of the material, thereby encouraging students to make connections between the pieces of knowledge and engage in a deeper exploration of the issue, particularly focusing on the "why" and "what" aspects.

It is recommended that educators cultivate positive student–teacher relationships. The compelling evidence from the predictive aspect of the positive student–teacher relationship substantiates the assertion that the learning environment is a significant determinant of learning outcomes. It is imperative that teachers prioritize the establishment of positive and supportive relationships with their students, fostering a sense of trust and security and encouraging intellectual risk-taking in order to optimize the impact of their teaching on learning outcomes. This could entail incorporating more student-led discussions, offering constructive and growth-oriented feedback, or providing in-class assistance on an individual basis.

6.2. For Policy Makers and Curriculum Developers

It is imperative to address the resource inequities and rigid structures that impede critical thinking in a school setting. A thorough analysis is required to examine the detrimental effects of "order and discipline" and "resource allocation" on the development of critical thinking skills. It is imperative that educational institutions cultivate learning environments that embody a harmonious balance of structure and autonomy, ensuring that all students have equitable access to the same resources. Such measures could include the implementation of diversified teaching methods, the provision of individualized learning assistance, and the advocacy for policies that address resource disparities.

It is recommended that efforts be made to encourage the holistic development of critical thinking. It is incumbent upon those responsible for the development of educational policy and the design of curricula to ensure that the capacity for critical thinking is established as a fundamental skill in all subjects and at all levels of study. This may entail amending the curriculum to incorporate critical thinking skills, providing training for educators on the development of these skills, and developing assessment tools that evaluate not only subject content knowledge but also critical thinking disposition.

6.3. For Theorists and Researchers

Further study of the "simple knowledge" paradox is necessary to gain a deeper understanding of the intricate relationship that exists between "simple knowledge" convictions and the educational environment. Theorists and researchers may wish to examine the extent to which the environmental influences of schools' climates act as moderators or mediators between students' epistemological beliefs and their desire to engage in critical thinking.

It would be beneficial to investigate the role of peer interactions. Although this study is centered on epistemological beliefs and the learning environment of the school, future research could concentrate on the potential of peer relationships to foster critical thinking. This may entail examining the extent to which diverse opportunities for peer interaction, such as collaborative learning or peer feedback, facilitate the development and sustainability of critical thinking skills.

It would be beneficial to explore the cultural and socioeconomic influences. Given the distinctive characteristics of the sample in this study, future research must consider

cultural and social differences as potential factors influencing the relationships between epistemological beliefs, school climate, and critical thinking dispositions. This may be achieved through the utilization of cross-cultural surveys or, alternatively, by the examination of the impact of social inequalities on both the quality of education received and critical thinking capabilities.

7. Limitations

This study makes a valuable contribution to our understanding of the relationship between epistemological beliefs, school climate, and critical thinking dispositions. However, it also acknowledges certain limitations that warrant further consideration.

The study employed a correlational design. The correlational nature of the research precludes the establishment of definitive causal relationships. Although the findings indicate predictive associations, further experimental or longitudinal studies are necessary to determine the causal impact of epistemological beliefs and school climate on critical thinking development.

Self-report measures were employed. The use of self-report questionnaires to assess epistemological beliefs and school climate may be susceptible to response bias and social desirability effects. It would be beneficial for future research to incorporate observational or behavioral measures in order to triangulate the data and enhance the validity of the findings.

Sample specificity is a crucial aspect of any empirical study. The study's sample was comprised of middle school students from a particular region in Turkey. While the findings offer valuable insights within this context, it is possible that they may not be generalizable to other age groups or cultural settings. Further research could investigate the generalizability of these findings to diverse populations.

The School Climate Survey employed in this study assessed six specific dimensions of school climate. However, future research could utilize more comprehensive measures to capture a broader range of school climate factors that might influence critical thinking.

The study controlled for several demographic variables, yet other potential confounding factors, such as prior academic achievement or socioeconomic status, might influence the relationship between the studied variables. Future research could explore these potential influences through more sophisticated statistical modeling or experimental designs.

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