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Critical Thinking in Turkish High School Geography Curriculum: A Component-Based Analysis

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Abstract

This study examines the 2024 Turkish high school geography curriculum in terms of how critical thinking is embedded across its aims, learning areas, learning outcomes, disciplinary skills, and assessment guidance. Adopting a qualitative design, the study uses document analysis and directed content analysis based on six dimensions of critical thinking: inquiry, use of evidence, comparison, cause-effect reasoning, problem solving, and decision making. Findings show that critical thinking is not presented as a single declarative goal but is distributed through process-oriented verbs and curriculum structures. Across grade levels, use of evidence and cause-effect reasoning are the most visible dimensions, whereas decision making is the least represented. Inquiry and comparison become more pronounced in the upper grades, while problem solving and decision making are concentrated especially in the unit on disasters and sustainable environment. The curriculum therefore provides a strong basis for data-based reasoning, geographical interpretation, and multi-perspective thinking; however, the classroom enactment of critical thinking still depends heavily on teachers' task design and assessment literacy. The study concludes that the curriculum would be strengthened by more explicit performance indicators, model tasks, and rubric-supported assessment tools aligned with critical-thinking outcomes.

Keywords: Critical Thinking, Geography Education, High School Geography Curriculum, Curriculum Analysis, Türkiye

1. Introduction

Contemporary education systems are increasingly moving beyond knowledge-transmission models. In their place, they emphasize learners who can question assumptions, use evidence, evaluate alternatives, and make reasoned judgments.

This shift has made critical thinking a core curricular concern. Ennis (2011) defines it as "reasonable and reflective thinking focused on deciding what to believe or do". From this perspective, critical thinking involves questioning, justification, source evaluation, inference, comparison, and defensible judgment.

Previous scholarship shows that critical thinking is teachable and transferable, but that it develops more effectively through explicit instruction, metacognitive monitoring, and repeated practice across contexts (Halpern, 1998; Abrami et al., 2015). Debate continues, however, over whether it is a general skill or one that develops in discipline-specific ways. This makes curriculum analysis within disciplinary contexts especially important (Davies, 2013).

For geography education, this issue is particularly significant. Geography links learners with environmental problems, human–environment relations, inequalities, migration, disasters, sustainability, and resource use. It therefore offers a strong basis for interpreting data, explaining causal relations, and making informed judgments about real-world issues (Xuan et al., 2019).

Geography should therefore be treated not simply as a setting in which critical thinking appears as a generic "21st-century skill", but as a discipline in which such thinking can be developed through its own epistemic and pedagogical structures. In Türkiye, the 2024 Geography Curriculum reflects this potential through a skills-based and process-oriented framework that encourages interpretation, analysis, and solution generation (Ministry of National Education, 2024).

Research has likewise shown that critical thinking in geography often becomes visible through critical spatial thinking, geographic media literacy, and GIS-supported inquiry (Kim and Bednarz, 2013; Lukinbeal, 2014; Nursa'ban et al., 2020). GIS is therefore important not merely as a technical tool, but as a learning environment that supports data selection, justification, and active citizenship (Labianca, 2021).

In this study, critical thinking is examined through six subdimensions: inquiry, use of evidence, comparison, establishing cause-and-effect relationships, problem solving, and decision making. These dimensions were selected because critical thinking theory consistently highlights questioning, evidence evaluation, causal inference, problem solving, and justified decision making as central processes (Ennis, 2011).

The geography education literature similarly emphasizes data interpretation, comparison, causal explanation, and solution-oriented reasoning as core features of geographical learning (Xuan et al., 2019; Hintermann et al., 2020; Kim, 2018). The analytical framework adopted here is also consistent with broader international approaches that relate critical thinking to argumentation, evidence evaluation, and justified judgment (Kuhn, 1993; Halpern, 1998; Davies, 2013).

Granados Sánchez (2017) further strengthens this connection by showing that good geographical questions are not merely classroom prompts, but epistemic and pedagogical tools that help students engage with complex issues and distinguish different levels of cognitive demand in geographical reasoning.

In the Turkish context, however, studies that separately examine all six subdimensions remain limited. National research tends to focus more broadly on inquiry skills, general thinking skills, and problem-solving skills, while international studies examine these dimensions more explicitly and with greater analytical differentiation (Aydın, 2012; Bozyiğit and Akça, 2017; Koçak and Ünlü, 2013; Yiğit Özüdoğru, 2023; Engelen and Budke, 2023; Härmä et al., 2021; Havelková and Hanus, 2021; Karkdijk et al., 2019; Ma and Lu, 2024; Sadykova et al., 2023; Simon and Budke, 2024a, 2024b).

This gap is also important considering international textbook analyses showing that geography tasks and textbook questions often privilege description and explanation, while giving more limited space to higher-order comparison, evidence use, and spatially explicit reasoning (Jo and Bednarz, 2009; Mishra, 2015). Some works have shown that geography textbooks can be examined productively in relation to GIS representation, climate change knowledge transformation, and ecological sustainability framing (Martinha, 2013; Ikonen, 2024; Meissl et al., 2025). Such studies expand the context of the present research by showing that the curricular visibility of critical thinking is closely related to how curriculum priorities are later translated into textbooks, representations, and classroom tasks.

Against this background, the present study investigates how critical thinking is structured in the 2024 Turkish high school geography curriculum and through which components and pedagogical emphases it becomes visible.

1.1. Inquiry

Inquiry constitutes the point of departure for critical thinking. In Ennis's (2011) framework, a critical thinker first focuses on the question itself and then generates questions that call for explanation, justification, and the consideration of alternatives. From this perspective, inquiry should be understood not merely as a subskill of critical thinking, but as the core mechanism that activates other higher-order cognitive processes. Within the context of geography education, inquiry refers to an intellectual process directed toward understanding why a phenomenon emerges in a particular place, how spatial patterns are formed, how human activities transform environments, and how the same phenomenon may vary across different scales. Xuan et al. (2019) demonstrate that geography curricula provide a particularly fertile ground for inquiry, especially through processes such as observation, data collection, interpretation, and explanation. More broadly, educational literature likewise indicates that inquiry-based learning substantially supports the development of critical thinking. The systematic review and meta-analysis conducted by Arifin et al. (2025) shows that inquiry-based learning practices exert a strong and statistically significant positive effect on students' critical thinking skills. This finding suggests that the inclusion of inquiry-oriented guidance in the geography curriculum should be regarded not simply as a pedagogical preference, but as a research-grounded necessity for fostering critical thinking.

This makes questioning central to curriculum analysis: the quality of inquiry depends not only on whether students are asked to investigate, but also on whether the questions require explanation, comparison, evidence use, judgment, and metacognitive reflection (Granados Sánchez, 2017).

In the context of secondary geography education in Türkiye, the most direct findings on inquiry skills indicate that these competencies are not distributed evenly among students and may vary according to school context. In a study conducted with 481 high school students in Isparta, participants reported that activities fostering critical thinking ($\bar{x} = 3.43$) and problem-solving skills ($\bar{x} = 3.21$) were frequently included in geography lessons (Aydın, 2012). In a longitudinal study carried out with 485 secondary school students in Ankara, scores for geographical inquiry process skills ranged from 69.32 to 80.41 depending on school type; development was more visible at the 11th and 12th grade levels, while vocational high school students displayed lower mean scores (Yiğit Özüdoğru, 2023). In addition, instruction based on geographical inquiry skills at the 9th-grade level was found to improve both students' academic achievement and the retention of learning (Bozyiğit and Akça, 2017). The literature further shows that geographical inquiry skills have increasingly been treated as a distinct domain of assessment for secondary school students, and that these skills can be monitored through dimensions such as question generation, information gathering, organization, analysis, and communication (Sadykova et al., 2023).

1.2. Use of Evidence

The use of evidence is one of the central dimensions of critical thinking. According to Ennis (2011), critical thinking involves evaluating the credibility of sources, judging observation reports, weighing reasons, and drawing conclusions based on available information. Accordingly, for a line of thought to be considered critical, it must do more than merely advance a claim; it must also support that claim with appropriate data and sound justification. Geography education offers an exceptionally rich context for this dimension, because its core instructional tools include maps, graphs, tables, visual materials, statistics, field observations, and a wide range of geographical representations. Xuan et al. (2019) demonstrate that the dimension of "recording and interpreting data in different formats" is strongly represented in the geography curriculum and is often developed through map reading. The same study further emphasizes that data interpretation in geography learning frequently serves as the basis for causal explanation and the generation of reasonable solutions. From this perspective, the use of evidence in the geography curriculum should be understood not simply as access to information, but as a process of analyzing data, making sense of it, and transforming it into justified explanation. The critical reading and evaluation of geographical representations is also identified in international literature as one of the core components of geographical media literacy (Lukinbeal, 2014).

In Türkiye, existing findings are based largely on students' perceptions of their own thinking skills and on the outcomes of inquiry-based instructional practices, and they suggest that textbooks and data sources are not always regarded as sufficient for the processes of selecting, verifying, and justifying evidence (Aydın, 2012; Bozyiğit and Akça, 2017). On the other hand, a study conducted with German secondary school students found that although students were able to gather multi perspectival information from the internet, effective information searching alone was not sufficient to produce high-quality argumentation (Engelen and Budke, 2023). Similarly, research on upper secondary school students in Finland reports that nearly half produced unsupported claims and had trouble linking evidence to claims (Härmä et al., 2021).

1.3. Comparison

Comparison is one of the most critical—though often insufficiently explicit—dimensions of critical thinking. Critical thinking requires more than understanding a single viewpoint; it involves evaluating alternative explanations, contrasting different perspectives, scales, cases, and representations, and weighing them against one another. In Ennis's (2011) framework, a willingness to take perspectives other than one's own seriously and to remain open to alternative explanations constitutes a core disposition of critical thinking. Geography education, by its very nature, is especially conducive to comparative thinking. Identifying similarities and differences across places, regions, societies, environmental processes, and scales is one of the fundamental operations of geographical inquiry. In this context, comparison should not be reduced to a simple exercise in identifying similarities and differences; rather, it is a process through which geographical patterns are explained, perspectives are weighed, and more refined judgments are reached. The study by Hintermann et al. (2020) shows that, in selecting, ranking, and interpreting media texts, students engage in the comparison of different modes of reading and are even encouraged to construct the arguments of an opposing position. In this respect, comparison constitutes one of the key operations through which discipline-specific forms of thinking become visible (Davies, 2013).

In Türkiye, students appear to perceive that thinking skills such as comparison and problem solving are frequently addressed in geography classes (Aydın, 2012). However, the accessible national literature tends to examine comparison not as an independent competence, but rather within the broader framework of general thinking skills. In international literature, by contrast, comparison has been examined more explicitly as a distinct domain of competence in geography education. A study conducted with French and German secondary school students found that students initially demonstrated low levels of comparative competence, but that significant improvement could be achieved through explicit methodological instruction (Simon and Budke, 2024b). Similarly, research designed to assess comparison skills indicates that comparison constitutes a complex process of written reasoning and structuring for students (Simon and Budke, 2024a).

1.4. Establishing Cause-and-Effect Relationships

Establishing cause-and-effect relationships represents one of the strongest points of intersection between geography and critical thinking. Geographical phenomena and processes are typically explained through multiple variables, reciprocal interactions, and connections across scales. For this reason, description alone is insufficient; it is equally necessary to examine why phenomena emerge and what consequences they produce. In their analysis of the geography curriculum from the perspective of scientific literacy, Xuan et al. (2019) distinguish data interpretation from the construction of causal explanations and associate the dimension of scientific reasoning with the capacity to generate cause-and-effect-based explanations for geographical phenomena. This distinction is important because reading data and generating explanations based on that data are not equivalent processes. In geography teaching, students' ability to explain the relationships among climate, landforms, population, settlement, migration, economic activities, or disasters requires a high-level skill that reflects the depth of critical thinking. Accordingly, curricular expressions, learning outcomes, and assessment guidance that encourage students to establish cause-and-effect relationships constitute a powerful indicator of the visibility of critical thinking within the curriculum.

In Türkiye, the most notable findings regarding the ability to establish cause-and-effect relationships suggest that high school students experience scientific thinking and causal explanation activities in geography classes more frequently than certain other dimensions of thinking. In Aydın's (2012) study, the mean score for activities related to scientific thinking skills was 3.77, higher than for the other thinking dimensions, and most students reported that topics in geography classes were examined through cause-and-effect relationships. At the same time, this result does not necessarily indicate that students are able to construct complex, multivariable causal networks at a high level; rather, it suggests that there is an instructional intention in this direction. International research likewise shows that secondary school students often struggle to explain abstract and multilayered geographical relationships. For example, it has been reported that students in Dutch secondary education have trouble in establishing complex, abstract, and physical-geographical relationships and in understanding the interdependence among such relationships (Karkdijk et al., 2019). By contrast, an instructional design supported by causal diagrams was found to significantly improve the geographical relational thinking of 37 high school students, with gains in diagram-construction competence corresponding to stronger cause-and-effect-based reasoning (Ma and Lu, 2024).

1.5. Problem Solving

The problem-solving stage represents the practical dimension of critical thinking. In Ennis's (2011) framework, problem solving is considered a supportive yet indispensable component of critical thinking, because the purpose of thinking is often to reduce uncertainty, resolve a difficulty, or determine a course of action. Geographical education, with its strong connections to real-life contexts, provides an especially fertile ground for problem solving. Issues such as climate change, the sustainable use of resources, urbanization, transportation, land use, migration, and disaster risks require students not only to acquire knowledge, but also to define problems, evaluate alternatives, and develop feasible solutions. Kim's (2018) study of a community-based project implemented through geospatial information technologies demonstrates that, when students work on local issues, they participate more actively in the processes of formulating research questions, collecting data, conducting analysis, and developing solution proposals. This suggests that problem solving in geography is not merely about producing outcomes, but about mobilizing inquiry, investigation, and justification in an integrated manner. From this perspective, the inclusion of problem solving in the curriculum also signifies the recognition, at the programmatic level, of the applied dimension of critical thinking.

Findings from the context of secondary geography education in Türkiye indicate that problem-solving skills can be improved through direct instructional interventions. In Aydın's (2012) study, the mean score for problem-solving skill activities was found to be 3.21, and students reported that considerable attention was given to problem solving in geography lessons. Consistent with this, in the experimental group where a problem-based learning approach was implemented, students' problem-solving skill levels improved in favor of the post-test, and this approach was found to be more effective than traditional instruction (Koçak and Ünlü, 2013). International research similarly shows that upper secondary school students possess a broad repertoire of strategies for spatial tasks, but that the efficient and adaptive use of these strategies is strengthened through instructional support (Havelková and Hanus, 2021).

1.6. Decision Making

The decision-making stage constitutes the outcome dimension of critical thinking. Ennis's (2011) definition explicitly links critical thinking to "deciding what to believe or do". Accordingly, processes such as inquiry, the use of evidence, comparison, the establishment of cause-and-effect relationships, and problem solving must ultimately converge in the formation of judgment and the making of informed choices. Geography education likewise seeks to cultivate students not merely as knowledgeable individuals, but as citizens capable of making conscious and well-reasoned decisions regarding environmental, social, and spatial issues. Xuan et al. (2019) emphasize that the geography curriculum contributes to students' capacity for decision making and problem solving in relation to problems encountered in everyday life. Similarly, in the study by Hintermann et al. (2020), students were asked to explain why they selected media texts, why they preferred a certain sequence, and why they regarded one interpretation as more compelling than another. This demonstrates that critical geographical literacy is directly linked to processes of decision making. In teaching geography, decision making should therefore be understood not only within the scope of citizenship or values education, but also as a higher-order cognitive outcome through which geographical knowledge and inquiry are translated into practice.

Within the context of secondary geography education in Türkiye, studies that directly measure decision-making skills remain more limited than those focusing on other subdimensions. Available findings suggest that the dimension of decision making is often addressed in close conjunction with problem solving, inquiry, and the use of evidence (Aydın, 2012; Koçak and Ünlü, 2013). In the international literature, decision-making skills are likewise frequently examined through the formation and justification of judgments in relation to multi perspectival geographical conflicts. A study conducted with German secondary school students found that, although students were able to access information from multiple perspectives, they encountered difficulty in transforming this information into high-quality arguments and well-justified decisions (Engelen and Budke, 2023). Similarly, research with upper secondary school students in Finland showed that students' argumentation skills could be improved, but that they continued to require support, particularly in the areas of justification and the construction of counterarguments (Härmä et al., 2021).

The subdimensions of inquiry, the use of evidence, comparison, establishing cause-and-effect relationships, problem solving, and decision making are directly related both to the theoretical foundations of geography education and to its instructional practices. Geography education demonstrates that these components become concretized through specifically geographical practices such as map reading, data interpretation, multiscale thinking, critical media analysis, the development of solutions to local problems, and spatial decision making (Ennis, 2011; Hintermann et al., 2020; Kim, 2018; Xuan et al., 2019). For this reason, examining the 2024 Geography Curriculum implemented in Türkiye through the lens of these subdimensions is important not only for determining whether critical thinking is addressed in the curriculum, but also for revealing the extent to which this competence is structured, through which components, and according to what kind of pedagogical rationale.

In conclusion, critical thinking is widely recognized across both international frameworks and national policy documents as one of the central aims of contemporary education, while geography as a school subject offers a particularly strong domain within which this aim can be concretized at the curricular level (Facione, 1990; Vincent-Lancrin S. et al., 2019; Ministry of National Education, 2024).

1.7. Research Question and Sub-Problems

Based on the foregoing discussion, the central research problem of this study was formulated as follows: How, to what extent, and through which curriculum components is critical thinking structured in the High School Geography Curriculum implemented in Türkiye in 2024, with specific reference to the subdimensions of inquiry, the use of evidence, comparison, establishing cause-and-effect relationships, problem solving, and decision making? To address this overarching problem, the following sub-problems were developed:

1. What explicit and implicit emphases, expressions, and orientations related to critical thinking are present at the level of the curriculum's overall approach, objectives, and learning domains?
2. How are the subdimensions of critical thinking, namely inquiry, the use of evidence, comparison, establishing cause-and-effect relationships, problem solving, and decision making, represented at the levels of units, themes, learning outcomes, and explanatory notes within the curriculum?
3. What is the distribution, intensity, and continuity of these subdimensions of critical thinking across grade levels within the curriculum?
4. How are the subdimensions of critical thinking structured within the framework of the field-specific skills included in the curriculum, and how are they associated with these skills?
5. To what extent do the assessment and evaluation guidelines, together with the proposed examples of classroom practice, support the classroom visibility, implementability, and assessability of critical thinking?

2. Method

2.1. Research Design

This study was structured within a document analysis design grounded in the qualitative research paradigm. Qualitative research is an approach that seeks to interpret the meanings, structures, and patterns associated with a particular phenomenon within its context (Creswell and Creswell, 2022; Creswell and Poth, 2018). The focus of the present study is to reveal how critical thinking is structured in the High School Geography Curriculum implemented in Türkiye in 2024, specifically in terms of its components and subdimensions. Because the research questions are directed explicitly at the written curriculum text itself, the study was conducted through document analysis within the broader framework of qualitative inquiry. Document analysis is a suitable method insofar as it enables the systematic examination, analysis, and interpretation of official, institutional, and written documents (Bowen, 2009).

In the analysis of the data, the study employed directed qualitative content analysis. In this approach, analysis begins with predetermined categories derived from existing theoretical frameworks and the relevant literature, while also allowing for the development of subcategories in response to new patterns emerging from the data (Hsieh and Shannon, 2005; Assarroudi et al., 2018). In the present study, the subdimensions of critical thinking were identified in advance based on the relevant theoretical and disciplinary literature, and the curriculum text was analyzed considering this conceptual framework. In this respect, the study is based both on deductive analytic logic and on an interpretive approach that remains open to new subpatterns emerging from the text.

2.2. Data Source

The data source of the study consisted of the 2024 High School Geography Curriculum (Grades 9, 10, 11, and 12) published by the Turkish Ministry of National Education (Ministry of National Education, 2024). In qualitative research, the data source is expected to be directly relevant to the research problem and suitable for generating meaning (Creswell and Poth, 2018). Because the purpose of the present study was not to examine the curriculum's reflections in practice, but rather to analyze how critical thinking is represented at the level of the written text, the curriculum document itself was selected as the primary data source. In document analysis studies, policy and curriculum documents are regarded as powerful sources of data, insofar as they make visible institutional priorities, normative orientations, and the pedagogical structures expected to guide practice (Bowen, 2009).

2.3. Data Collection Instrument and Data Collection Process

In this study, an analytical review matrix/coding guide developed by the researcher was used as the data collection instrument. In qualitative research, it is important to establish a conceptual framework aligned with the research questions to systematize the processes of data collection and analysis (Creswell and Creswell, 2022). The coding guide developed for this purpose was constructed around two principal axes. The first axis comprised the following structural components of the curriculum: overall approach, objectives, learning domains, unit/theme structure, learning outcomes, explanatory notes, field-specific skills, and assessment and evaluation guidelines. The second axis consisted of the subdimensions of critical thinking that formed the basis of the study: inquiry, use of evidence, comparison, establishing cause-and-effect relationships, problem solving, and decision making.

In the data collection process, the units of analysis were first identified. In this study, statements of objectives, descriptions of learning domains, learning outcomes, explanatory notes accompanying the outcomes, definitions of field-specific skills, and assessment and evaluation guidelines were treated as the primary recording units. The context unit was defined as the broader curriculum component within which the relevant statement was located. In the subsequent stage, the coding guide was pilot tested on selected sections of the text, category definitions that created ambiguity were reviewed, and additional subcodes were incorporated where necessary. In content analysis, the explicit structuring of the preparation and pilot-testing stages is important for ensuring the reliability and traceability of the analytical process (Elo and Kyngäs, 2008; Elo et al., 2014).

2.4. Data Analysis

The research data were analyzed through directed qualitative content analysis. In this approach, analysis is initiated through predetermined categories derived from a theoretical and conceptual framework, after which subcategories may be developed in response to emerging patterns of meaning within the data (Hsieh and Shannon, 2005; Assarroudi et al., 2018). In the present study, the first-level code consisted of six subdimensions of critical thinking: inquiry, use of evidence, comparison, establishing cause-and-effect relationships, problem solving, and decision making. At the second level, the analysis focused on identifying in which curriculum components, in what contexts, at which grade levels, and with what pedagogical function these subdimensions were represented.

The analytical process was carried out by following the stages of preparation, organization, and reporting, in accordance with established methodological recommendations for content analysis (Elo and Kyngäs, 2008; Mayring, 2014). During the preparation stage, the text was read repeatedly, the units of analysis were finalized, and the preliminary coding framework was established. In the organization stage, the predetermined main categories were applied, after which subcodes were developed based on recurring patterns of meaning in the text. In the reporting stage, the findings were organized according to curriculum components, the subdimensions of critical thinking, and grade levels. In this process, attention was paid not only to explicit statements directly articulated in the text, but also to curricular constructions that implicitly invoked critical thinking. In qualitative content analysis, the joint consideration of manifest and latent levels of meaning is essential for revealing the depth and complexity of the text's meaning (Graneheim and Lundman, 2004).

The analysis was not limited to a simple determination of presence or absence. It also examined the curriculum components in which the relevant dimensions of critical thinking were more visible, how they were distributed across grade levels, the extent to which they demonstrated continuity, and the kinds of pedagogical emphases with which they were associated. Numerical summaries regarding the visibility of the codes were used only for descriptive support, and at no point was the interpretive process reduced to frequency counting. This approach is consistent with the meaning-centered nature of qualitative data analysis (Creswell and Poth, 2018).

2.5. Trustworthiness and Consistency

Several measures were taken to enhance the trustworthiness of the study and the methodological consistency of the analysis. First, the coding guide was prepared in detail to include clear definitions, inclusion and exclusion criteria, decision rules, and illustrative examples. Second, all decisions made during the analytical process, category revisions, and analytical memos were systematically documented in accordance with the logic of an audit trail. In qualitative research, transparent documentation of the research process strengthens the traceability of interpretations and the reliability of the analysis (Creswell and Poth, 2018; Nowell et al., 2017).

Third, recording was conducted for selected sections to check coding consistency, and, where possible, a second-round review and consensus-based revision process was adopted. Although inter-coder agreement alone is not considered a sufficient indicator of quality in qualitative analysis, systematic comparison and consensus-building processes can support analytical consistency (O'Connor and Joffe, 2020).

In the present study, consistency was therefore pursued through a clearly defined category structure, repeated reading, decision memos, the use of illustrative text excerpts, and iterative review procedures. Finally, particular attention was paid to explicitly linking the category structure to the research questions, the data source, and representative text excerpts, thereby enhancing the transferability of the findings and the defensibility of the interpretations (Elo et al., 2014; Graneheim and Lundman, 2004).

3. Findings

3.1. Critical Thinking at the Level of the General Orientation, Objectives, and Learning Domains of the High School Geography Curriculum in Türkiye

Within this framework, explicit and implicit emphases pointing to critical thinking were examined collectively at the levels of the curriculum's general orientation, specific objectives, and learning domains.

Table 1 summarizes the main thematic indicators through which critical thinking becomes visible at the level of objectives and learning domains. As shown in the Table, the curriculum foregrounds inquiry, analysis, cause-and-effect reasoning, and solution generation rather than naming critical thinking as a single explicit objective.

The strongest backbone among these themes is constituted by the recurring clusters of verbs in the curriculum's objective statement, namely inquiry, analysis, and solution generation. Rather than explicitly naming critical thinking as a concept, this structure renders it visible through indicators of cognitive processes (inquiring, analyzing, establishing cause-and-effect relationships, and generating solutions).

Table 2 specifies how these broad themes are translated into concrete objective-level indicators. The Table shows that critical thinking is operationalized mainly through verbs associated with inquiry, analysis, causality, and problem-oriented reasoning.

These objective statements show that the curriculum positions critical thinking particularly along the axes of inquiry, analysis, causality, and problem solving.

Table 3 contextualizes critical thinking at the unit level by showing how different learning domains create distinct opportunities for inquiry, analysis, evaluation, and responsibility. In particular, the Table indicates that the curriculum links critical thinking not only to content coverage but also to authentic geographical problems and spatial interactions.

Within the learning domains, critical thinking becomes especially visible through (i) cross-scalar inquiry and (ii) the analysis of spatial interactions. The curriculum constructs units not merely as content clusters, but as domains of reasoning shaped by real life, data/technology, systems thinking, and evaluative dimensions. Although at the level of objectives and unit introductions critical thinking is usually conveyed through indirect indicators (e.g., inquiry/analysis), direct references to the critical dimension are occasionally encountered within the unit components themselves (e.g., "critical viewing" among dispositions and "encouragement of critical thinking" in the learning process).

Theme	Indicators pointing to critical thinking	Basis in the curriculum (example from an objective/learning domain)
1) Inquiry-based geographical reasoning	"Inquiry": asking questions, examining multiple dimensions	In the objectives: questioning economic activities and interrogating organizations and relationships at local, regional, and global levels
2) Analysis and analytical thinking	"Analysis": analyzing system/process relationships	In the objectives: analyzing the functioning of natural and human systems and processes
3) Problem solving and solution generation	Generating "solutions" to encountered problems; a solution-oriented perspective	In the objectives: generating solutions to problems by relating geographical knowledge/skills to daily life
4) Cause-and-effect reasoning	Establishing causality, "structuring" relationships	In the objectives: structuring cause-and-effect relationships among current geographical events
5) Cross-scalar evaluation	Examining and relating phenomena across local, regional, and global scales	In the objectives: inquiry in the context of local/regional/global effects
6) Digital/spatial data literacy	Spatial information technologies, digital literacy	In the objectives: the ability to use spatial information technologies
7) Evaluation and responsibility in relation to current issues	Approaching current issues with geographical awareness; evaluating them in the context of disasters/sustainability	In the objectives: approaching current issues such as disasters/environmental problems with geographical awareness

Table 1. Themes of critical thinking at the level of objectives and learning domains. Source: Author's elaboration.

Objective No.	Indicator of critical thinking (verb/focus)	Related theme(s)
2	Generating solutions to problems	3
6	Analyzing systems and processes	2
7	Questioning economic activities	1, 5
9	Questioning organizations in relation to scale	1, 5
11	Establishing/structuring cause-and-effect relationships	4
12	Questioning regional–global relationships	1, 5

Table 2. Indicators of critical thinking in specific objectives. Source: Author's elaboration.

Unit (learning domain)	Emphasis pointing to critical thinking	Comment
Nature of Geography	Developing a geographical perspective; geography's contribution to solving spatial problems	Opens onto the "public problem" dimension of critical thinking (positioning geography as an analytical tool).
Spatial Information Technologies	Adaptation to technology, digital literacy, creating an environment for the use of technology	Working with data/representations strengthens the information-literacy dimension of critical thinking.
Natural Systems and Processes + Human Systems and Processes	A systems–process approach; addressing human–nature interaction through process components	Structures analytical thinking and causal explanation through "process components".
Economic Activities and Their Effects	A dimension extending from the local to the global; connection to real life	The current/experiential link brings inquiry and evaluation into an authentic context.
Disasters and Sustainable Environment	Evaluating disasters within a holistic disaster-management framework; fostering responsibility	The emphasis on "evaluation" merges with the decision-making/responsibility axis of critical thinking.
Regions, Countries, and Global Connections	Questioning geographical connections and analyzing spatial interactions	Critical thinking becomes directly visible along the "inquiry + analysis" axis.

Table 3. Emphases related to critical thinking at the level of learning domains (units). Source: Author's elaboration.

3.2. Subdimensions of Critical Thinking in the Units, Learning Outcomes, and Explanatory Notes of the High School Geography Curriculum in Türkiye

Within the scope of the second sub-problem, the unit structure, learning outcomes, and process components in the curriculum were coded in terms of the subdimensions of inquiry, use of evidence, comparison, establishing cause-and-effect relationships, problem solving, and decision making.

Table 4 presents the grade-level distribution of the six subdimensions of critical thinking. The Table makes visible a clear pattern: use of evidence and cause-and-effect reasoning are the most consistently represented dimensions, whereas decision making remains comparatively weak across grades.

Cause-and-effect reasoning and the use of evidence are the two subdimensions with the highest density across all grade levels. For example, in Grade 10, a direct emphasis on causality appears in expressions such as "the processes that cause plate tectonics", and some outcomes explicitly require relationships to be established "within a cause-and-effect framework".

The use-of-evidence dimension becomes particularly visible in the process components through forms of reasoning grounded in sources of evidence such as "observation/data/representation". In Grade 9, the expression "based on experience, observation, data, and/or geographical representations" directly exemplifies this emphasis. While the inquiry dimension is relatively limited in Grade 9, it increases markedly in Grades 11 and 12 (Grade 11: 36.8%; Grade 12: 30.0%). The inquiry pattern becomes visible in outcomes structured around the sequence of "asking questions of interest–gathering information–analyzing–sharing conclusions".

The comparison dimension strengthens in the upper grades (especially Grade 12 at 40.0%). For example, the "comparison of cultural landscapes in terms of sustainability" establishes an explicit logic of comparison.

Grade	Total learning outcomes	Inquiry	Use of evidence	Comparison	Cause-and-effect	Problem solving	Decision making
9	19	2 (10.5%)	9 (47.4%)	5 (26.3%)	10 (52.6%)	3 (15.8%)	1 (5.3%)
10	18	5 (27.8%)	10 (55.6%)	2 (11.1%)	13 (72.2%)	5 (27.8%)	1 (5.6%)
11	19	7 (36.8%)	13 (68.4%)	6 (31.6%)	12 (63.2%)	1 (5.3%)	1 (5.3%)
12	20	6 (30.0%)	15 (75.0%)	8 (40.0%)	14 (70.0%)	3 (15.0%)	2 (10.0%)

Table 4. Distribution of the subdimensions of critical thinking by grade level. Source: Author's elaboration.

Unit	Total learning outcomes	Inquiry	Use of evidence	Comparison	Cause-and-effect	Problem solving	Decision making
1	6	1 (16.7%)	4 (66.7%)	2 (33.3%)	5 (83.3%)	1 (16.7%)	1 (16.7%)
2	7	1 (14.3%)	4 (57.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
3	14	4 (28.6%)	9 (64.3%)	2 (14.3%)	10 (71.4%)	1 (7.1%)	0 (0.0%)
4	10	6 (60.0%)	6 (60.0%)	3 (30.0%)	9 (90.0%)	0 (0.0%)	0 (0.0%)
5	12	4 (33.3%)	8 (66.7%)	5 (41.7%)	8 (66.7%)	0 (0.0%)	0 (0.0%)
6	16	3 (18.8%)	10 (62.5%)	4 (25.0%)	12 (75.0%)	9 (56.2%)	4 (25.0%)
7	11	1 (9.1%)	6 (54.5%)	5 (45.5%)	5 (45.5%)	1 (9.1%)	0 (0.0%)

Table 5. Density of the subdimensions at the unit level. Source: Author's elaboration.

Decision making has the lowest density. However, where it does appear, the process components include advanced steps of critical thinking such as "generating alternatives–making choices–reflecting". In Grade 10, "deciding on disaster-protection practices" and "making choices" are stated explicitly. In Grade 12, a more comprehensive decision cycle is established through "making choices to eliminate threats".

Table 5 extends the analysis from grade levels to unit-level density. As the Table shows, the curriculum does not distribute all subdimensions evenly; rather, some units concentrate on more advanced forms of problem solving and decision making than others.

Unit 6 is by far the unit in which the dimensions of problem solving (56.2%) and decision making (25.0%) are most concentrated. This finding is consistent with the prominence of applied critical-thinking steps such as "generating alternatives–making choices–reflecting" in outcomes related to disasters and environmental themes.

Units 3 and 4 display a high level of cause-and-effect dimension. Particularly in the teaching of physical processes, direct prompts such as "identifying the causal processes" and "presenting them within a cause-and-effect framework" are included.

The increase in the density of comparison in Unit 7 (45.5%) indicates that more synthetic and comparative learning outcomes are concentrated in this unit (e.g., comparison tables and similarity–difference listings in contexts such as sustainability and human activities).

3.3. Distribution, Density, and Continuity of the Subdimensions of Critical Thinking across Grade Levels in the High School Geography Curriculum in Türkiye

Table 6 highlights the vertical continuity of the subdimensions across grade levels. The Table is important because it shows not only frequency, but also the curricular trajectory through which evidence is used, inquiry, comparison, and causality gain or lose visibility over time.

Within the scope of the third sub-problem, the distribution and vertical continuity of the subdimensions of critical thinking by grade level were evaluated based on Table 6 and the detailed grade-level coding matrices provided in Appendix A.

Cause-and-effect codes appear at high density across all grade levels (especially in Grades 10–12). This suggests that the curriculum clearly prioritizes relating geographical phenomena and processes through an “impact/consequence” pattern.

Use-of-evidence codes increase markedly in Grades 11 and 12. This increase suggests that prompts calling for data-/source-based justification and substantiation become stronger in the upper grades. The decision-making subdimension appears explicitly in a limited number of outcomes (e.g., accept/refute, explicit decision-making emphasis).

To reduce redundancy and strengthen interpretability, the detailed grade-level coding matrices have been relocated to Appendix A as Tables A1-A4. In the main findings, these detailed matrices are synthesized through two analytical figures and one compact synthesis box. This revision preserves empirical transparency while making the grade-level patterns more visible and easier to interpret.

Figure 1 shows the grade-level distribution of the six critical-thinking subdimensions. The visualization confirms that cause-and-effect reasoning and use of evidence are the most consistently represented dimensions, whereas decision making remains limited across all grade levels.

Figure 2 condenses the same coding results by showing the overall intensity of each subdimension across Grades 9-12. This synthesis shows that the curriculum privileges explanatory and evidence-based reasoning, while problem solving and especially decision making remain comparatively less visible.

Figure 3, together with the detailed matrices provided in Appendix A, indicates that the curriculum has a strong analytical core, but that the practical and decision-oriented dimensions of critical thinking require more systematic curricular support.

Grade	Use of evidence	Decision making	Comparison	Cause-and-effect	Problem solving	Inquiry
9	4	0	7	8	1	4
10	3	2	1	10	4	5
11	8	1	6	10	2	7
12	8	1	7	10	3	4

Table 6. Distribution of the subdimensions by grade level. Source: Author’s elaboration.

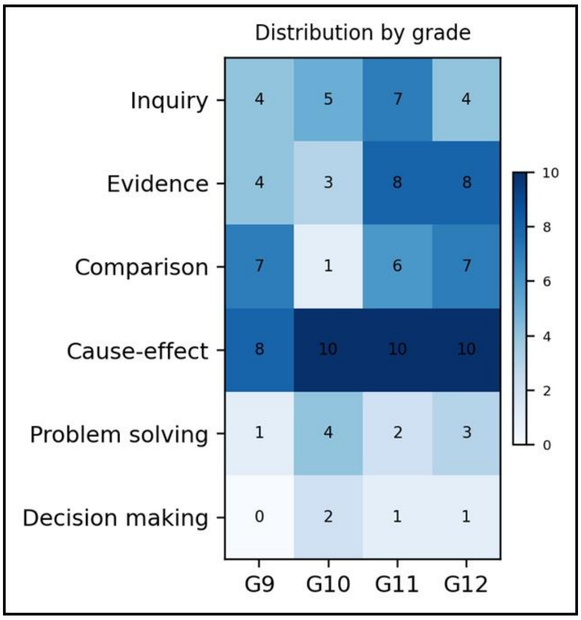

Figure 1. Distribution of critical-thinking subdimensions across grade levels (synthesized from Appendix A, Tables A1-A4).

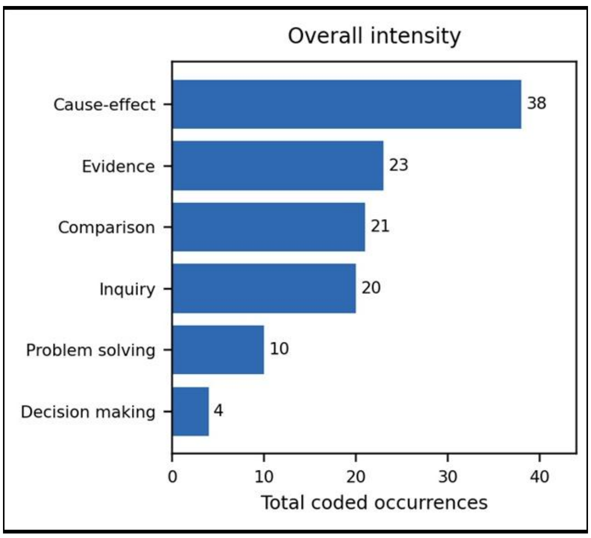

Figure 2. Overall intensity of critical-thinking subdimensions across Grades 9-12 (synthesized from Appendix A, Tables A1-A4).

Subdimension	**Intensity**	**Pattern**
Evidence use	**High**	Increasing
Cause-effect	**High**	Stable
Inquiry	**Medium**	Increasing
Comparison	**Medium**	Increasing
Problem solving	**Low–Med.**	Concentrated
Decision making	**Low**	Limited

Figure 3. Overall intensity pattern of critical-thinking subdimensions across grade levels (synthesized from Appendix A, Tables A1-A4).
Note: High, medium, and low categories summarize the relative visibility and developmental pattern of each subdimension across Grades 9–12.

3.4. Critical Thinking within the Framework of Field-Specific Skills in the High School Geography Curriculum in Türkiye

Within the scope of the fourth sub-problem, the study examined how the geographical field-specific skills and process components included in the curriculum are related to the subdimensions of critical thinking.

Table 7 synthesizes the relationship between field-specific skills and the subdimensions of critical thinking. The Table demonstrates that the curriculum embeds critical thinking not only in learning outcomes, but also in the skill architecture of geography through inquiry, evidence use, inference, comparison, and judgment.

According to Table 7, the curriculum's "field-specific skill + process component" logic makes the subdimensions of critical thinking visible particularly along the axes of inquiry, use of evidence, comparison, and inference/ relationship building.

3.5. Critical Thinking in the Assessment and Evaluation Guidelines of the High School Geography Curriculum in Türkiye

Table 8 shows how critical thinking becomes assessable through the curriculum's proposed tools and evidence types. The Table is analytically important because it connects classroom assessment practices with the visibility of justification, evidence use, comparison, and metacognitive evaluation.

Within the scope of the fifth sub-problem, the study examined the extent to which the curriculum makes critical thinking visible and assessable through learning evidence, performance tasks, rubrics, and other assessment tools.

According to Table 8, the curriculum's most critical move in making critical thinking measurable lies in the combination of "performance task + rubric + process-component criteria".

Table 9 offers a holistic synthesis of the curriculum's strengths and limitations in relation to critical thinking. Rather than presenting isolated findings, the Table integrates the results into an overall interpretive framework that clarifies both the curriculum's internal coherence and its implementation challenges.

Field-specific skill emphasized in the curriculum	Process/subdimension related to critical thinking	Concrete indicator in the curriculum (example)
SBAB7 Spatial Thinking	Questioning spatial effects; cause-and-effect; comparison/inference	The process component "questioning spatial effects" and its presentation together with KB3.3 Critical Thinking within inter-skill relationships
SBAB8 Geographical Inquiry	Inquiry → information gathering → organization → analysis → inference (evidence-based reasoning)	Together with the inquiry skill, the curriculum includes KB2.6 Information Gathering, KB2.7 Comparison, KB3.1 Decision Making, KB3.2 Problem Solving, and the emphasis on "critical viewing" among dispositions; the inquiry process is structured step by step (asking questions, gathering information, organizing, analyzing, inferring)
SBAB9 Geographical Observation and Fieldwork	Generating evidence/justifying with evidence; data-based prediction	The fieldwork skill is associated within the same skill network with "prediction based on existing information/data" and KB3.3 Critical Thinking
SBAB10 Map	Reading/analyzing evidence through spatial representations; inference; decision making	Practices involving "map reading–analysis–inference–map construction" through thematic maps
SBAB11 Table/Graph/Figure/Diagram	Use of evidence; comparison; drawing conclusions; data-based judgment	Positioning it together with KB3.3 Critical Thinking within inter-skill relationships; the learning outcomes explicitly require drawing "conclusions" from data and "comparison" steps

Table 7. Field-specific skills and processes supporting critical thinking. Source: Author's elaboration.

Type of tool/evidence (in the curriculum's wording)	Point at which it makes critical thinking visible	Basis in the curriculum
Open-ended questions	Justified explanation, defending with evidence, weighing alternatives	"Learning can be assessed through open-ended questions".
Performance tasks (report, presentation, news item, map/model, etc.)	Collecting evidence–analyzing–producing an output–defending it in the context of a real problem	The curriculum includes performance tasks in every unit; examples of outputs include table/graph/map/model, report, presentation, and newspaper article
Analytic scoring rubric	Making critical thinking scorable by linking process steps to criteria (e.g., gathering information, organizing, analyzing, producing an output, presenting)	Recommendation to use a rubric/checklist/observation, etc., in assessment; example of rubric criteria for geographical inquiry
Checklist + observation	Monitoring the process (using evidence, completing procedural steps, making decisions collaboratively)	Recommendation to use checklists and observation in assessing field-specific skills
Self/peer/group assessment forms	Metacognition (questioning one's own reasoning), justified evaluation, criterion-based decision making	Emphasis on self/peer/group forms and feedback
Assessment with digital technologies	Enriching processes of working with data/evidence (especially spatial data and representational literacy)	Using digital technologies in the assessment process

Table 8. Assessment and evaluation tools and dimensions of critical thinking. Source: Author's elaboration.

Dimension	Empirical status	Meaning in terms of critical thinking
Structural coherence	Learning outcomes are structured through content + field/conceptual skills + process components.	Critical thinking is designed not as a "general aim" but as a traceable process embedded in instructional steps.
Evidence-based assessment structure	There is at least one "learning evidence" item for each learning outcome; the tools are process- and product-based.	The possibility of interpreting critical thinking not only from the outcome but also from the process (evidence, justification, comparison) increases.
Tool diversity and participatory assessment	Rubrics, checklists, observation, and self/peer/group assessment are recommended.	The dimensions of "making justified judgments" and "metacognition" in critical thinking can be incorporated into assessment.
Real-life problem and feedback	Assessment calls for problem tasks related to everyday life and motivating feedback.	The contextual use of critical thinking (problem solving/decision making) is supported in classroom practice.
Implementation flexibility (expectation of adaptation)	The tools are provided as examples for teachers, and teachers are expected to adapt them or use additional tools.	There is a framework for measurability, but the level of standardization and detail has become more dependent on the teacher's assessment literacy.
Assessing value/disposition/literacy components	These components are not provided through direct tools in the evidence, but their inclusion in rubric/assignment criteria is requested.	The dispositional aspects of critical thinking (e.g., critical viewing) can be made measurable, but they need to be actively incorporated into the teacher's rubric design.

Table 9. Holistic evaluation of the findings: strengths and limitations in terms of critical thinking. Source: Author's elaboration.

4. Discussion

This study indicates that critical thinking is structurally embedded in the 2024 Secondary School Geography Curriculum in Türkiye, yet its subdimensions are not distributed with equal intensity across curriculum components or grade levels. Rather than being articulated as a single explicit curricular priority, critical thinking is operationalized through inquiry, evidence use, comparison, and cause-and-effect reasoning embedded in aims, learning domains, and learning outcomes. This pattern is consistent with foundational conceptions of critical thinking as a composite of interpretation, analysis, evaluation, inference, and reasoned judgment (Facione, 1990; Ennis, 2011). It is likewise congruent with the epistemic character of geography, a discipline in which explanation, multiscalar reasoning, and the interpretation of representations and evidence are central to knowledge construction (Kim and Bednarz, 2013; Xuan et al., 2019). Within this structure, the particularly strong visibility of evidence uses and causal reasoning suggests that the curriculum aligns closely with the analytical and explanatory logic of geographical thinking. By contrast, the comparatively weak representation of decision making suggests that the curriculum privileges the interpretive and evaluative phases of critical thinking over its more advanced practical expression in selecting, justifying, and defending alternatives.

Seen through Granados Sánchez's (2017) notion of good geographical questions, this imbalance is also a matter of task architecture: if questions remain primarily descriptive or explanatory, students may not be pushed toward weighing alternatives, making decisions, and reflecting on the grounds of their judgments.

A second major implication concerns the relationship between curricular design and pedagogical enactment. The curriculum does not confine critical thinking to learning outcomes alone; it also embeds it in field-specific skills and in an assessment architecture that includes open-ended questions, performance tasks, and rubric-supported evaluation (MoNE, 2024). In principle, this creates a substantial basis for rendering critical thinking observable and assessable in classroom practice. This finding is consistent with evidence that critical thinking develops more robustly when instructional and assessment processes explicitly foreground evidence, justification, and structured reasoning across repeated contexts (Halpern, 1998; Abrami et al., 2015). However, the concentration of problem solving and decision making in a limited set of units indicates that the written curriculum does not yet ensure balanced vertical continuity across all subdimensions. The curriculum therefore offers a strong intended framework for critical thinking, but not a self-sufficient guarantee of balanced enactment. Its practical force depends on whether teachers translate this framework into tasks, criteria, and classroom interactions that make inquiry, comparison, evidence use, and especially decision-oriented reasoning systematically visible.

5. Conclusion

This study demonstrates that critical thinking is meaningfully embedded in the 2024 Secondary School Geography Curriculum in Türkiye, but that its subdimensions are structured with uneven visibility across grade levels, units, and curriculum components. The curriculum most strongly foregrounds inquiry, evidence use, and cause-and-effect reasoning, thereby reflecting the analytical and explanatory core of geographical thinking. However, the comparatively limited visibility of decision making and, to a lesser extent, problem solving indicates that the curriculum does not yet support all dimensions of critical thinking with the same degree of explicitness or continuity.

Overall, the curriculum provides a strong intended framework for critical thinking through its process-oriented objectives, field-specific skills, and assessment repertoire. Yet the findings also show that this framework remains only partially self-sustaining at the level of written curriculum design. A more explicit and systematic integration of decision-oriented reasoning, problem-solving tasks, and rubric-supported performance indicators would strengthen both the internal coherence of the curriculum and its pedagogical enactability. In this respect, the study suggests that the next stage in curriculum development should not be to reaffirm critical thinking as a general aspiration, but to make its less visible dimensions more consistently traceable, teachable, and assessable across the program.

6. Recommendations

The findings of this study indicate that the geography curriculum provides an important theoretical and pedagogical foundation for critical thinking, but that decision making and problem solving still need more balanced distribution and clearer assessment support.

Recommendations for curriculum developers

- It is recommended that the subdimensions of critical thinking be distributed more evenly across Grades 9–12, with particular attention to decision making and problem solving.
- It is recommended that learning outcomes use more explicit process verbs related to generating alternatives, weighing evidence, establishing criteria, and justifying decisions.
- It is recommended that each unit includes at least one decision-making or problem-solving task based on maps, tables, graphs, field data, or multiple sources, supported by sample tasks and rubric criteria.

Recommendations for teachers

- Teachers are advised to use a claim–evidence–reasoning structure systematically so that evidence use becomes more visible in classroom practice.
- Tasks in all units should include generating alternatives, comparing options, and defending decisions rather than confining such work mainly to disasters and sustainability contexts.
- Analytic rubrics, together with self-, peer-, and group-assessment tools, should be used to assess both process and product, and should be supported by digital maps, GIS, and current datasets where appropriate.

Recommendations for the central organization of the Ministry of National Education

- It is recommended that a national task–rubric bank be developed, including open-ended questions, decision scenarios, performance tasks, analytic rubrics, and sample student products.
- It is recommended that in-service training focus more directly on rubric design, evidence-based assessment, geographical data literacy, and GIS-supported task design.
- It is recommended that critical thinking indicators be incorporated into textbook/material review criteria and supported through a monitoring and feedback cycle based on student products, rubrics, and teacher input.

Recommendations for researchers

- It is recommended that multi-source studies examine the relationship among the intended, implemented, and learned curriculum through classroom observation, teacher interviews, student products, and assessment tools.
- It is recommended that future research investigate why decision making and problem solving remain relatively limited, particularly in relation to textbooks, assessment literacy, time pressure, and exam-oriented practices.
- It is recommended that studies analyze how teacher-developed rubrics reflect critical-thinking subdimensions and develop more sensitive analytical frameworks that go beyond verb-based coding to include task complexity, evidence depth, and multi-criteria reasoning.
- It is recommended that teacher education and instructional-material studies focus more strongly on evidence-based task design, rubric use, data literacy, and the integration of decision scenarios and problem-solving tasks across units.

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Appendix A. Grade-Level Coding Matrices

The following matrices provide the detailed grade-level coding evidence that underpins the synthesized Figures and compact Table reported in the Findings section.

Code	Learning outcome	Inquiry	Use of evidence	Comparison	Cause-and-effect	Problem solving	Decision making
COĞ. 9.1.1.	Analyze the subject matter and branches of geography						
COĞ. 9.1.2.	Analyze the importance of learning geography through spatial thinking using a case, phenomenon, or topic				✓		
COĞ. 9.1.3.	Gather information about the development of geography as a discipline		✓				
COĞ. 9.1.4.	Analyze the fundamental methodology, perspective, and approaches of geography						
COĞ. 9.2.1.	Analyze the consequences of the Earth's shape and movements				✓		
COĞ. 9.2.2.	Determine the location of any place on Earth by using the geographic coordinate system						
COĞ. 9.2.3.	Classify map types according to their purposes of use			✓			
COĞ. 9.2.4.	Compare map scales			✓			
COĞ. 9.2.5.	Compare methods of representation on maps according to their purpose of use			✓			
COĞ. 9.3.1.	Inquire into the developmental and functional characteristics of change in natural systems	✓			✓		
COĞ. 9.3.2.	Inquire into the atmosphere and weather events	✓			✓		
COĞ. 9.3.3.	Inquire into the components and variables of the climate system	✓			✓		
COĞ. 9.4.1.	Analyze the causes of the occurrence of natural disasters				✓		
COĞ. 9.4.2.	Evaluate the effects of natural disasters in terms of natural systems				✓		
COĞ. 9.4.3.	Evaluate the importance of combating natural disasters and disaster management					✓	
COĞ. 9.5.1.	Analyze the distribution of water resources in Türkiye						
COĞ. 9.5.2.	Inquire into the effective use of natural resources	✓					
COĞ. 9.5.3.	Analyze the effects of the unconscious use of natural resources on nature				✓		
COĞ. 9.5.4.	Evaluate solutions aimed at the conservation of natural resources					✓	

Table A1. Grade 9 learning outcomes-subdimension code matrix.

Code	Learning outcome	Inquiry	Use of evidence	Comparison	Cause-and-effect	Problem solving	Decision making
COĞ.10. 1.1.	Relate the fundamental concepts and methods of geography						
COĞ.10. 2.1.	Summarize the characteristics of the population in Türkiye from a geographical perspective						
COĞ.10. 2.2.	Draw inferences by using data related to population in Türkiye		✓		✓		
COĞ.10. 3.1.	Analyze the factors affecting the development of settlements				✓		
COĞ.10. 3.2.	Structure the distribution of settlements according to their functions				✓		
COĞ.10. 3.3.	Analyze the characteristics of cities in Türkiye				✓		
COĞ.10. 3.4.	Investigate rural settlements in Türkiye	✓					
COĞ.10. 3.5.	Inquire into problems related to settlements in Türkiye	✓				✓	
COĞ.10. 4.1.	Make decisions about the causes and consequences of migration				✓		✓
COĞ.10. 4.2.	Classify migrations according to various characteristics			✓			
COĞ.10. 5.1.	Classify economic activities in Türkiye						
COĞ.10. 5.2.	Compare economic activities in Türkiye			✓			
COĞ.10. 5.3.	Prepare a data-based report on the effects of economic activities in Türkiye		✓		✓		
COĞ.10. 6.1.	Inquire into examples of good practice in combating disasters	✓				✓	
COĞ.10. 6.2.	Analyze practices aimed at reducing disaster risks				✓	✓	
COĞ.10. 6.3.	Make decisions about selecting the most appropriate option among alternatives in disaster-management processes					✓	✓
COĞ.10. 6.4.	Reflect on one's learning about disasters						
COĞ.10. 7.1.	Inquire into the effects of global connections on daily life	✓			✓		

Table A2. Grade 10 learning outcomes-subdimension code matrix.

Code	Learning outcome	Inquiry	Use of evidence	Comparison	Cause-and-effect	Problem solving	Decision making
COĞ.11.1.1.	Explain geographical events and phenomena through patterns by means of inquiry	✓			✓	✓	
COĞ.11.2.1.	Carry out mapping applications through web-based GIS		✓				
COĞ.11.3.1.	Draw inferences by using data related to landforms		✓		✓		
COĞ.11.3.2.	Inquire into the interaction of climate elements	✓			✓		
COĞ.11.4.1.	Compare the factors affecting population and settlement at the global scale			✓	✓		
COĞ.11.4.2.	Inquire into the social, economic, and environmental effects of migration	✓			✓		
COĞ.11.5.1.	Inquire into problems related to the environmental effects of economic activities	✓					
COĞ.11.5.2.	Compare differences in regional development			✓	✓		
COĞ.11.5.3.	Evaluate the production-consumption relationship by substantiating it with data and examples	✓	✓	✓	✓		
COĞ.11.5.4.	Discuss the effects of global trade networks on the basis of evidence		✓	✓	✓		
COĞ.11.6.1.	Discuss solution proposals aimed at reducing disaster risks					✓	
COĞ.11.6.2.	Evaluate decisions taken in disaster management by justifying them with evidence		✓				✓
COĞ.11.7.1.	Inquire into the interaction between Türkiye and places with which it has cultural ties	✓					
COĞ.11.7.2.	Summarize the characteristics of agricultural production in an example country from a geographical perspective						
COĞ.11.7.3.	Compare the industrialization processes of example countries from a geographical perspective			✓			
COĞ.11.7.4.	Evaluate the roles of example countries in the global system				✓		
COĞ.11.7.5.	Analyze the economic effects of transportation systems				✓		
COĞ.11.7.6.	Analyze the spatial patterns of global connections				✓		

Table A3. Grade 11 learning outcomes-subdimension code matrix.

Code	Learning outcome	Inquiry	Use of evidence	Comparison	Cause-and-effect	Problem solving	Decision making
COĞ.12.1.1.	Inquire into the role of geographical thinking in scientific and social problem areas	✓				✓	
COĞ.12.2.1.	Select the appropriate tool by evaluating the areas of use of spatial information technologies		✓				
COĞ.12.3.1.	Analyze the change-continuity relationship in natural systems and processes				✓		
COĞ.12.3.2.	Evaluate the causes and consequences of climate change on the basis of data		✓		✓		
COĞ.12.3.3.	Draw inferences from maps about the effects of geographical factors on the diversity and distribution of vegetation		✓	✓	✓		
COĞ.12.4.1.	Analyze the dynamics and consequences of urban systems				✓		
COĞ.12.5.1.	Interpret the spatial patterns of economic activities on the basis of evidence		✓		✓		
COĞ.12.5.2.	Inquire into the effects of global production networks	✓			✓		
COĞ.12.5.3.	Compare Türkiye’s foreign trade structure			✓			
COĞ.12.6.1.	Inquire into models of inter-institutional cooperation in reducing disaster risks	✓				✓	
COĞ.12.6.2.	Compare approaches to sustainable environmental management through evaluation			✓			
COĞ.12.6.3.	Evaluate the effects of climate adaptation/mitigation policies				✓	✓	
COĞ.12.6.4.	Discuss post-disaster recovery processes on the basis of evidence		✓		✓		
COĞ.12.6.5.	Inquire into disaster risk communication practices	✓					
COĞ.12.7.1.	Discuss the solutions offered by international associations to conflicts		✓			✓	✓
COĞ.12.7.2.	Compare the transportation systems of example countries			✓			
COĞ.12.7.3.	Synthesize an example country in terms of its commercial activities						
COĞ.12.7.4.	Analyze the spatial effects of global connections				✓		
COĞ.12.7.5.	Evaluate the consequences of Türkiye’s geopolitical position				✓		

Table A4. Grade 12 learning outcomes-subdimension code matrix.
Note: A check mark indicates that the relevant critical thinking subdimension is explicitly or strongly implicitly represented in the corresponding learning outcome.