

From theory to application: Planning geography lessons to develop geographical thinking

MICHAELA SPURNÁ¹, PETR KNECHT², ALEXANDR MOOS³

¹ University of Pardubice, Faculty of Arts and Philosophy, Department of English and American Studies, Pardubice, Czechia; e-mail: michaela.spurna@upce.cz

² University of Ostrava, Faculty of Education, Department of Pedagogy and Andragogy, Ostrava, Czechia; e-mail: petr.knecht@osu.cz

³ Masaryk University, Faculty of Education, Department of Geography, Brno, Czechia; e-mail: 495557@mail.muni.cz

ABSTRACT Geographical thinking has become a central aim of geography education internationally. However, student teachers and teachers still have limited conceptual and didactic support for translating this aim into lesson planning and classroom practice. Geography didactics needs a coherent way of developing geographical thinking in teacher education. This article builds on the geographical concepts chessboard, an existing framework that connects key and organising geographical concepts and supports systematic geographical inquiry. Drawing on the distinction between the content dimension of geographical thinking (geographical concepts) and its procedural dimension (geographical questioning), we show how the framework visualises the structure of geographical thinking and supports its didactic transformation. The approach is illustrated through the post-industrial Rosice-Oslavany region and the intersection of the concepts of place and interpretation. The article contributes to geography didactics by linking disciplinary concepts with geographical questioning, offers a practical tool for geography teacher education, and concludes by distinguishing different levels of pupil engagement in geographical thinking.

KEY WORDS geographical thinking – thinking geographically – geography education – geography curriculum

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1. Introduction

Initial teacher education in Czechia is undergoing a major shift. At the centre of this change is the newly adopted Competence Framework for Graduates of Teacher Education (KRAAU, Ministry of Education 2021, 2023), which seeks to bring greater coherence to previously fragmented teacher education programmes and respond to long-standing concerns about their relevance and purpose. While the role of academic disciplines has been reduced, subject didactics has gained a slightly stronger position. For geography teacher educators, this creates both an opportunity and a challenge. If geography didactics is to remain a distinctive and indispensable part of initial teacher education, the field must clearly demonstrate how it contributes to teachers' professional preparedness and how its goals can be meaningfully translated into teaching practice.

This challenge coincides with the ongoing curriculum reform in Czechia, which identifies geographical thinking as the central aim of geography education (FEP BE; NPI 2025). Rather than representing a uniquely Czech development, this shift reflects a broader international trend that positions geographical thinking as the overarching purpose of school geography and a unifying principle for curriculum, teaching, and teacher education (Bendl et al. 2025b). Against this background, we present a conceptual study that develops a didactic framework for fostering geographical thinking in initial teacher education by connecting geographical concepts with geographical questioning.

We understand geographical thinking as the ability to use geographical concepts to ask questions, analyse relationships, and make sense of geographical phenomena (Bendl et al. 2025a; see also Jackson 2006; Lambert, Morgan 2010; Maude 2024; Bendl et al. 2025b). This places geographical concepts at the centre of disciplinary inquiry and makes their purposeful use a key challenge for geography teacher education. However, student teachers often struggle to use geographical concepts in this way. Instead of employing geographical concepts as tools for disciplinary inquiry, they tend to treat them as isolated curriculum content, making it difficult to translate geographical thinking into lesson planning and classroom practice.

At the centre of this article is the geographical concepts chessboard (Spurná, Knecht, Bendl 2025), an existing framework that connects geographical concepts with geographical questioning. We elaborate its didactic foundations by explaining how the interaction between geographical concepts and geographical questioning underpins the structure of geographical thinking, making this structure explicit for its didactic recontextualisation in teacher education and school geography. In doing so, the article provides a coherent approach for moving from talking about geographical thinking to deliberately developing it in teaching and teacher education.

The article proceeds from theory to application. It first establishes the need for a stronger focus on geographical thinking in geography teacher education, then conceptualises geographical thinking, and subsequently develops a framework that connects geographical concepts with geographical questioning. Using the Rosice-Oslavany coal basin region as an example, we show how the concepts of place and interpretation can be used to support the development of geographical thinking. The final section extends the discussion to geography teacher education and classroom practice by distinguishing three approaches to developing geographical thinking: teaching through geographical thinking, teaching with geographical thinking, and teaching geographical thinking.

2. Geography didactics as catalyst of geographical content

Graduates of teacher education programmes are expected to know what to teach and how to teach it (Brooks 2016). The Competence Framework (KRAAU) does not yet provide a specific subject knowledge, and even the geographical extension of this framework will function more as a general recommendation than as a list of well-defined thematic units or topics. Similarly, at the primary and secondary level, the Framework Educational Programmes (FEP) do not prescribe a specific subject knowledge but work exclusively with expected learning outcomes.

Geographers have long struggled to define the core, big ideas, or essence of geography (Knecht, Doboš 2024). This challenge reflects enduring debates within the discipline itself. Geography has been described both as something that is “all around us” (Doel 1999) and as a culturally and historically situated way of making sense of the world, shaped by power relations and epistemological assumptions (Lewis, Wigen 1997). Geographers continuously debate which perspectives should be privileged, which remain marginalised (Castree 2005), and where the boundaries of the discipline actually lie (Castree, Fuller, Lambert 2007). As a result, geography offers no straightforward or universally accepted answer to the question of what knowledge is most important to teach.

This creates a particular challenge for initial teacher education. If the discipline itself remains open, diverse, and contested, geography teacher educators must decide which knowledge, concepts, and themes deserve emphasis in the preparation of future teachers. These decisions are rarely self-evident. They are shaped by disciplinary developments (Walford 2001, Lambert et al. 2025), curricular priorities (Krause et al. 2025), powerful knowledge debates (Beneker, Palings 2017; Muller, Young 2019), contemporary issues such as climate change (Dal et al. 2015) or globalisation (Jurek et al. 2022), perceived difficulty for student teachers and pupils (Clausen 2018), the availability of teaching resources (Otieno, Githinji, Mayanja 2025), and the often uneven geographical backgrounds

and expectations of student teachers themselves (Solem 2023; Healy, Hammond 2025). It is therefore unsurprising that geography didactics courses can appear fragmented and difficult to situate within traditional disciplinary structures. Their focus on the transformation of knowledge for educational purposes often makes them less visible and less readily recognised within academic geography, where disciplinary content tends to take precedence. As a result, the contribution of geography didactics may appear difficult to grasp from the outside, despite its central role in connecting geographical knowledge with educational practice.

The role of geography didactics is not simply to transmit academic knowledge, but to transform it into forms that are educationally meaningful. This process has been described as translation, content transformation or recontextualisation (Puttick 2015; Maude 2021; Scholten, Doll 2024; Bendl, Rubáš 2023). It requires deliberate professional judgement about what knowledge is selected, how it is organised, and how it is made accessible to learners while retaining its disciplinary grounding. In this sense, geography teacher educators act as mediators between the discipline and the classroom.

From this perspective, geographical thinking can serve as a content catalyst. Much like a catalyst in a chemical reaction, it does not replace geographical knowledge but helps determine how it is selected, organised, and transformed for educational purposes. Orienting teacher education towards the development of geographical thinking provides a rationale for deciding which concepts, questions, and forms of reasoning deserve emphasis. In this way, geographical thinking acts as a filter through which the vast and often fragmented body of geographical knowledge can be made more coherent, meaningful, and educationally powerful. Throughout this process, the foundational geographical content retains its disciplinary grounding.

3. Geographical thinking: Between concepts and questions

In university-based geography education, the term geographical thinking appears in two principal senses. The first, theoretical, refers to paradigm shifts and the development of scientific thinking in geography (e.g. Daněk 2013; Matlovič, Matlovičová 2015). The second, didactic, understands geographical thinking as a specific mode of disciplinary reasoning that is central to meaningful geography education (Morgan 2017; Bendl et al. 2025b).

The roots of geographical thinking cannot be precisely dated. However, within geography as a discipline, interest in defining geographical thinking has emerged partly in response to the positivist–determinist era of geography (Daněk 2013). New approaches began to emphasise context, subjectivity, interpretation and qualitative methods, and geographical thinking became a central element of

these approaches. Geographers placed greater emphasis on understanding and interpreting space through subjective human perspectives (Massey 1985, 2005), cultural aspects, power relations, and other social factors (Foucault 1977). New paradigms, e.g. radical, humanistic, and cultural geography came to the forefront (Cresswell 2013), each generating and working with established or newly formulated concepts. These paradigmatic and methodological developments also show that, while some geographical concepts persist, the ways in which they are explained and interpreted have evolved (Daněk 2013, Couper 2015). Despite changes in geographical paradigms, the concepts of place and space have remained among the most frequently discussed geographical concepts (Jackson 2006; Lambert, Morgan 2010; Matlovič, Matlovičová 2020), although their meanings vary across cultural and geographical contexts (Doboš, Šerý, Lichter 2023).

This disciplinary development is important for the second, didactic sense of geographical thinking, because geography education has continuously reflected transformations within geography and translated them into curriculum and teaching (Spurná 2024). Alongside place and space, concepts such as scale, distance and interaction are widely used, although their selection varies across traditions and authors (Bustin 2017, Uhlenwinkel 2013). No universally accepted set of geographical concepts exists (Bendl et al. 2025a). In Czech geography didactics, concept-based approaches have been discussed since the 1990s (Vávra 2010) and a significant contribution can be found in the Czech Conception of Geography Education (Marada et al. 2017; see Table 1). The Conception defines seven key concepts: place, region, development, location, interaction, hierarchy (scale) and distribution. Comparable frameworks are found in the Geographical Association (2009, 2022) and the US National Geography Standards (NGS 2012).

Geographical concepts constitute fundamental building blocks of the discipline. They enable the formulation of research questions, theoretical frameworks and models that describe, explain and interpret the world. As paradigms and perspectives have shifted, new theoretical frameworks have emerged, each with its own assumptions, research methodologies, data collection strategies, forms of analysis and interpretations of key concepts (cf. Cresswell 2013, Couper 2015). In essence, two constants appear to endure in geography. First, the discipline consistently raises questions. Second, it relies on a set of key concepts. It can thus be inferred that geographical thinking, as a core aim of geography education, is also a reflection of a deeper, ongoing disciplinary crisis related to the persistent challenge of defining the subject of geography. Regarding the first constant, geography engages with a broad array of questions – often metaphysical, philosophical, existential or methodological in nature: Can geography depict an objective world? To what extent is geographical knowledge socially constructed? How successfully does geography bridge the natural sciences and the humanities? What constitutes geographical knowledge, and what is its use? (examples

taken from Morgan 2013, 2017). These questions show that questioning is not only a methodological procedure in geography, but is philosophically embedded in the discipline itself. Changing paradigms and interpretations of geographical thinking contribute to perceptions of geography as a field with fluid disciplinary boundaries (Lambert 2017).

Both constants – geographical concepts and geographical questions – are deeply rooted in geographical thinking. Geographical concepts thus “summarise what we might call the core of geography as a discipline” (Geographical Association 2022, p. 8). Although geographical thinking has become a target category in curriculum documents in many countries (Bendl et al. 2025b), diverse and often vague conceptualisations of geographical thinking may weaken its potential and reduce its applicability in practice (Bendl et al. 2025a). For the purposes of this study, geographical thinking is understood as the interaction of a content dimension, grounded in geographical concepts, and a procedural dimension, involving reasoning, analysing, interpreting and evaluating geographical questions (Bendl et al. 2025a). In the context of initial teacher education, it is therefore crucial that student teachers learn not only to understand geographical concepts, but also to use them purposefully in geographical questioning and in teaching.

4. The didactic hierarchy of geographical concepts: The content dimension of geographical thinking

Since the concept-based approach is defined as a fundamental principle of contemporary geography education (Lambert, Morgan 2010; Marada et al. 2017), it is logical to assume that geographical thinking and related key geographical concepts should also frame the disciplinary content of geography initial teacher education. Teaching geographical thinking is not straightforward; there is no established and proven method for teaching student teachers to think geographically (Fouberg, Smith, eds., 2023). We argue that the ability to distinguish and interrelate the content and procedural dimensions of geographical thinking enables student teachers to fulfil the aims of geography education and guide pupils towards an informed understanding of the contemporary world.

It is well established that geographical concepts can be organised into hierarchical structures (Maude 2024). In this study, we draw primarily on the Geographical Association’s framework because it provides one of the most developed accounts of geographical thinking in contemporary geography education. Unlike the Czech Conception of Geography Education (Marada et al. 2017), the framework explicitly distinguishes between key and organising concepts (see Table 1). It also provides extensive support for teachers through curriculum guidance, lesson planning resources, and classroom materials available via the Geographical Association

Table 1 – Hierarchical classification of geographical concepts in British and Czech curriculum frameworks (first-order, second-order, third-order)

Orders	Sources	
	British framework for the school geography curriculum (Geographical Association 2022)	Czech conception of geography education (Marada et al. 2017)
Key concepts 1 st order	Place Space Earth systems Environment	Place Region Development Location
Organising concepts 2 nd order	Time Scale Diversity Interconnection Interpretation	Interaction Hierarchy (scale) Distribution
Teaching (substantive) concepts 3 rd order	character, identity, sense of place, home, community, nation, landscape, assemblage, meanings, place narratives, culture, migration, cultural diversity, social, economic and political processes location, distribution, pattern, interaction, interdependence, globalisation, spatial process, distance, flows, spatial dynamics, spatial narratives, spatial possibilities, spatial justice carbon cycle, water cycle, photosynthesis, respiration, decomposition, weathering, erosion, land use change and management, landform processes – fluvial, aeolian, marine, glacial, physical/human interaction, physical and human processes, ecosystems, biodiversity, resources, environmental change, environmental impact, sustainability, environmental stewardship and citizenship	settlements, tertiary and quaternary sectors, geopolitics, integration, population, industry, agriculture, culture and religion, region, planning, administrative division, social conditions, globalisation, global issues, planning, lithosphere, atmosphere, hydrosphere, pedosphere, biosphere, the Earth as a planet, maps and other sources of geographical data, landscape and environment, social-economic conditions, physical conditions

Source: own proposal

website (<https://geography.org.uk/>). Moreover, it functions as a living framework that continues to evolve through professional dialogue, curriculum development, and scholarly debate within the geography education community (Huckle 2024; Warren-Lee, Biddulph 2025). Building on these foundations, Spurná, Knecht and Bendl (2025) have developed a hierarchy for working with concepts in geography subject didactics:

- First-order (key) concepts – the constants of the field: Place, Space, Environment and Earth systems.
- Second-order (organising) concepts – the variable “lenses” for viewing reality: Time, Scale, Diversity, Interconnection, and Interpretation.

- Third-order (teaching) concepts – instructional themes common in school practice (e.g., settlements, globalisation, erosion, but also regions).

In the context of initial teacher education, working with an unstructured set of geographical concepts proves to be ineffective. This may explain why British curriculum documents distinguish between key and organising concepts. Organising concepts offer alternative viewpoints and interpretive angles on key concepts. Together, the conceptual hierarchy allows student teachers and teachers to formulate a wide variety of geographical questions. First- and second-order concepts constitute the foundation of geographical thinking and are typically linked to third-order teaching concepts (Spurná 2024; Spurná, Knecht, Bendl 2025). The following sections discuss their didactic significance in greater detail.

4.1. Key concepts (*first-order concepts*)

Space: Space focuses on the distribution, localisation, networks, relationships, and spatial organisation of geographical phenomena. In geography, it has a distinct meaning from mathematics or physics and serves as an overarching concept that includes location, distribution, interaction, and distance. Spatial patterns and networks can be described and explained through social, economic, environmental, and political theories. Space is not a neutral container but a historically evolving concept shaped by societal and globalisation processes (Wardenga 2024). Geographical inquiry therefore examines where phenomena are located, how they are connected, and what their spatial arrangements imply, using tools such as maps and spatial analysis (Tuan 1977, Massey 2005, Harvey 2006). Because space is often abstract, geography education commonly links it to place, where spatial relationships acquire human meaning.

Place: Place refers to the uniqueness, functions, meanings, and lived experience. It can be understood as a meaningful manifestation of space that connects abstract spatial relationships with human experience (Wardenga 2024). As a central geographical concept, place integrates physical, social, and experiential dimensions (Larsen, Harrington 2018a, 2018b). Freeman and Morgan's (2017) "three lamps" model highlights three perspectives: natural science (geomorphology, landscape, environment), humanistic (meanings, emotions, identities, sense of place), and social science (social, economic, cultural, and political processes). These perspectives show that place extends beyond physical location and provides a key framework for geographical thinking.

Earth systems: Earth systems is a relatively recent geographical concept that emphasises regularities, patterns, cycles, and dynamic processes in both physical and human geography. Although not strongly tied to specific places or spaces,

it is often taught through model regions where such processes are visible. Understanding Earth systems involves recognising that landscapes and result from ongoing physical processes, while socio-economic processes such as population distribution, migration, and locational factors also display recurring patterns. This understanding is essential for explaining and responding to change (Castree 2016; Crane, Kasting, Kump 2010).

Environment: Environment addresses ecological and environmental processes, transformations, and human impacts, particularly in the context of the Anthropocene. It emphasises that landscapes, environments, and societies are continuously shaped by natural and social processes. The concept focuses on relationships between people, nature, resources, and sustainability, highlighting both human dependence on and transformation of the environment. Student teachers should understand environmental risks, sustainability principles, and issues of responsibility, pollution, and human impact (IPCC 2021).

4.2. Organising concepts (second-order concepts)

Time: This concept relates to change, variability, development, evolution, stability, and continuity of geographical phenomena over time, all of which are fundamental to understanding processes in both physical and human geography (see overview in Klapka, Ellegård, Frantál 2020). Time is closely intertwined with space, as geographical phenomena unfold through time-space relations, everyday mobilities, and changing patterns of human activity (Ouředníček 2002; Zévl, Ouředníček, 2025). Understanding these temporal dimensions is essential for explaining how geographical processes develop and why places change.

Scale: This concept enables geographical phenomena to be understood at different scalar levels by placing them in broader contexts and linking global, national, regional and local levels, as well as macro- and micro-scales. Scale influences our perception of phenomena; therefore, the choice of scale for analysis is essential. Student teachers should understand that connections exist between different scales; for example, decisions or events at the local level may have global consequences and vice versa. Scale can therefore be understood as a “zooming lens” (Herod 2011).

Diversity: This concept emphasises diversity, heterogeneity, similarities and differences, and variation in geographical phenomena and regions, such as people, environments and cultures, and highlights their contribution to the dynamic functioning of societies and economies. Diversity exists primarily between and within places and cultures and may result in inequalities and conflicts (Valentine, Sadgrove 2014).

Interconnection: This concept refers to relationships, influences, causes and consequences among geographical phenomena. It helps explain how geographical

phenomena “at the same level” affect one another. It is important to recognise that climate, population, economy and culture are shaped by interconnections occurring at local, regional, national or global levels (Massey 1994).

Interpretation: This concept explains geographical phenomena through values, meanings, representations and narratives, including fake news, and reflects postmodern geographical approaches (Massey 2005). It allows us to understand geographical phenomena as an open system of meanings that is fluid, ambiguous and dependent on perspective.

4.3. Teaching concepts (*third-order concepts*)

Third-order concepts can be understood as geographical teaching topics commonly found in school practise (Table 1). These topics serve as vehicles for demonstrating more abstract first- and second-order concepts, and for conveying the educational content of geography (Spurná, Knecht, Bendl 2025). A similar term, “substantive (geographical) concepts”, has been used in this sense (Mentlík, Slavík, Coufalová 2018, p. 13; Geographical Association 2022). To date, lower-order concepts have been more prominently represented in geography curricula than higher-order concepts such as key and organising concepts (Bagoly-Simó 2021, Kácovský et al. 2022). With the revision of the Framework Educational Programme in Czechia (FEP BE; NPI 2025), and in line with the trends in other English-speaking countries (Cambridge International Education, n.d.; Maude 2024; Fouberg, Smith, eds. 2023), it appears that the first- and second-order concepts will increasingly be prioritised in geography teaching.

Spurná, Knecht and Bendl (2025) also demonstrated how regional geography can be taught through geographical concepts. When regions are approached through selected first- and second-order concepts, they no longer function merely as descriptive territorial units, but become meaningful teaching contexts through which powerful geographical knowledge can be developed. For this reason, regions may also be included among third-order teaching concepts. The three-level hierarchy helps teacher educationists and school teachers guide content selection. Concurrently it supports the comparison and, where needed, the alignment of various national frameworks, including the Czech Conception of Geography Education (Marada et al. 2017).

From the point of view of geography teacher educators, a list of key and organising concepts is not enough, because when different scholars use different concepts without coordination, it can confuse student teachers, cause inconsistency, and lead to misunderstandings. A hierarchical classification of geographical concepts helps avoid fragmented teaching and supports the structured development of student teachers’ geographical thinking and their ability to ask geographical

questions. Developing geographical thinking requires, above all, understanding first-order and second-order concepts, followed by the ability to distinguish between them (Spurná, Knecht, Bendl 2025).

5. Geographical questioning: The procedural dimension of geographical thinking

The previous section established the didactic hierarchy of geographical concepts and showed how the content dimension of geographical thinking can be anchored in key, organising and teaching concepts. While questioning is deeply embedded in geography as a discipline, it is not exclusive to geography as a cognitive procedure.

While these perspectives enrich geographical education, they also risk blurring the boundaries of geographical thinking. For example, Bendl and Marada (2021) explore whether geographical thinking may be regarded as a form of critical thinking, concluding that “geography as a school subject across all educational levels has tremendous potential for fostering one of the most desired competencies of the 21st century – critical thinking” (p. 386). Similar arguments could be made for other forms of thinking, highlighting the need for greater conceptual clarity regarding the procedural dimension of geographical thinking. If we draw on established psychological definitions, however, a clearer delimitation of thinking becomes possible. In cognitive psychology, thinking encompasses higher-order cognitive processes such as problem solving, judgement and decision making, and reasoning (Braisby, Gellatly, eds. 2012). These cognitive processes are not innate skills; rather, they are cultivated through systematic instruction and require sustained intellectual engagement (Lambert 2017, Řezníčková 2003). Their presence enables geography education to move beyond the transmission of facts and towards a deeper understanding of the world.

In Czechia, geography teacher educators have long been interested in geographical questioning and analysing geographical questions (Trahorsch, Knecht 2021). We understand geographical questioning as a key expression of the procedural dimension of geographical thinking. Since geographical questioning is not, and cannot be, part of everyday thinking (Lambert 2017), student teachers need to learn how to formulate geographical questions explicitly. This skill is crucial because they are later expected to foster geographical questioning in their own pupils.

The foundation of geographical questioning lies in general question forms: What? Where? When? Why? Who? How? What could? and What should? Without geographical concepts, these questions remain generic and not specifically geographical. To support purposeful and structured questioning, we use the geographical concepts chessboard (Spurná, Knecht, Bendl 2025). The chessboard

organises geographical concepts into a two-dimensional grid in which each square represents the intersection of one key geographical concept and one organising concept. These intersections provide opportunities for developing geographical thinking through asking questions about teaching topics. Distinguishing between key and organising geographical concepts is essential to the process of geographical enquiry.

We guide student teachers to pose general questions at the level of third-order concepts that is, teaching topics, and to understand:

1. ...that each general question elicits a specific answer. For example, the question How did industry develop in Brno and Ostrava (the second and third largest cities of Czechia)? (place and time) will generate a different answer from How do different groups interpret the industrial heritage of Brno and Ostrava? (place and interpretation).
2. ...that each intersection on the chessboard of concepts focuses the question on a particular area of geography and enables diverse geographical approaches.
3. ...that when working with teaching concepts within the chessboard of geographical concepts, we stay within the boundaries of geography (as opposed to, for example, biology or history).
4. ...that geographical questions that combine concepts of different orders may vary in complexity. Questions focusing on isolated first-order concepts (e.g. What is place? or How does place differ from space?) are often more abstract than questions generated through combinations of concepts from different orders. For example, the question Why do the impacts of migration differ from one place to another? (place, diversity, migration) connects geographical concepts to a specific geographical phenomenon and therefore offers a more concrete basis for inquiry. This skill helps student teachers consider the appropriateness of questioning and evaluate pupils' responses.

In principle, there are no fixed limits to the combination of key and organising concepts. However, student teachers do not need to work with every possible square on the chessboard. Geographical thinking develops when they consider what kinds of questions geographers might ask at the intersection of a selected key concept and a selected organising concept.

6. From the geographical concepts chessboard to lesson planning: An illustrative example from geography ITE

Even in initial teacher education, engagement in everyday routines and fragmented tasks may not explicitly lead to the development of geographical thinking. We therefore use one illustrative application of the geographical concepts chessboard

Table 2 – Adapted geographical concepts chessboard showing all intersections of geographical concepts used in the Rosice-Oslavany region

Organising concepts	Time	Scale	Diversity	Interconnection	Interpretation
Key concepts					
Place	How has the identity of the Rosice-Oslavany region changed from the coal mining period to today?	What role did the Rosice-Oslavany region play in the industrial development of Moravia and the Czech Republic?	What different employment opportunities and economic activities emerged or were available in the Rosice-Oslavany region in connection with coal mining?	How was the development of coal mining related to population growth in the Rosice-Oslavany region?	HOW DO LOCAL PEOPLE INTERPRET THE INDUSTRIAL HERITAGE OF THE ROSICE-OSLAVANY REGION?
	How did the spatial distribution of mines, industry and housing change over time in the Rosice-Oslavany region?	How were industrial sites in the Rosice-Oslavany region connected to wider transport networks?	How did the urban structure of settlements differ across the Rosice-Oslavany region?	What spatial connections existed between mines, railways and settlements in the Rosice-Oslavany region?	How do local people perceive the location of different industrial zones within the Rosice-Oslavany region?
Earth Systems	How has the importance of coal as an energy source changed over time?	What role did regional coal mining play in the Czech energy system?	What different economic and energy-related activities were connected to coal mining?	How did the mining industry affect water management in the region?	What advantages and disadvantages did coal mining bring to local communities?
Environment	How has the landscape of the Rosice-Oslavany region changed over time up to the present day?	How has air quality changed in the Rosice-Oslavany region in relation to industrial development?	What types of post-mining landscapes can be found in the Rosice-Oslavany region today?	What environmental impacts did coal mining have on the landscape of the Rosice-Oslavany region?	How do local people perceive the quality of the landscape in the Rosice-Oslavany region today?

Note: The question at the intersection of place and interpretation (highlighted in capital letters) is the primary focus of this study. It can be translated into more specific questions for student teachers and pupils, such as: What memories and meanings do local people associate with former mining sites in the Rosice-Oslavany coal basin? How do industrial heritage sites and mining features shape people's sense of place? How do inhabitants interpret the region's transformation from a mining to a post-industrial landscape? The remaining cells of the chessboard illustrate questions generated by other combinations of geographical concepts. Any of these questions can be further deepened through follow-up prompts such as Why? or Why do you think so? to encourage explanation, argumentation and reflection.

Source: authors' own proposal

based on the selected intersection of two concepts: the key geographical concept of place and the organising concept of interpretation (Table 2). The concepts of place and interpretation were selected for both theoretical and didactic reasons. Place is among the most established concepts in geographical education and has long been associated with experience, identity, and meaning-making (Larsen, Harrington 2018a). Interpretation offers a means of exploring these dimensions, yet remains a long-neglected and underdeveloped concept in geography didactics in Czechia (Vávra 2010). The selection of concepts is not arbitrary; the key concept anchors what is being examined, while the organising concept determines how the phenomenon is approached and understood.

The example is drawn from a geography ITE master's thesis by one of this study's co-authors (Moos 2025). Building on the geographical concepts chessboard, Moos (2025) used the intersection of the concepts place and interpretation to design lessons for the Rosice-Oslavany coal basin region. Drawing on the geographical "three lamps" model of place (Freeman, Morgan 2017) and humanist and post-positivist theories (Tuan 1977, Massey 1985), Moos (2025) examines how the Rosice-Oslavany coal basin region can be interpreted through the concept of place. In this perspective, attention shifts from the region as a bounded spatial unit to the meanings, experiences, memories, identities, and human-environment relationships associated with it (Kulich, Hájková, Hušková 2022; Marada et al. 2017).

In school geography, the concepts of place and interpretation provide a framework for moving beyond description towards deeper understanding, creating opportunities for place-based learning (Larsen, Harrington 2018a; Kulich, Hájková, Hušková 2022). Rather than focusing only on locational facts, this approach helps pupils understand space as a relational and value-laden phenomenon. Combining the concepts of place and interpretation leads to the notion of sense of place, defined as an emotionally and cognitively mediated relationship with a place (Foote, Azaryahu 2009; Krasny 2020). Sense of place is commonly understood through two dimensions: place attachment and place meaning (Kudryavtsev, Stedman, Krasny 2012; Rubáš, Matějček, Řezníčková 2024). Research also suggests that pupils' sense of place may weaken over time without intentional educational support (Rubáš et al. 2025).

7. Integrated geographical understanding through two concepts: Place and interpretation in the Rosice-Oslavany coal basin region

Using the selected chessboard intersection of the key geographical concept of place and the organising concept of interpretation, this section develops an integrated geographical understanding of the Rosice-Oslavany coal basin region, located

southwest of Brno (Kolejka 2006; <https://www.mikroregionkahan.cz/>). The region has been shaped by a long history of coal mining, which has influenced its landscape, identity, and collective memory. It can be understood as a post-industrial cultural landscape, formed by industrial activity and subsequently transformed by new dominant functions (Kolejka, Klimánek 2012). The combination of place and interpretation provides a lens through which the region can be understood as the product of interactions between material landscape change, mining history, collective memory, changing social functions, and locally constructed meanings. In such landscapes, industrial heritage affects not only landforms and land use but also the social and cultural structures through which places are experienced, interpreted, and remembered. This relationship can be analysed from different perspectives, each highlighting particular meanings that people attach to the region and contributing to their distinctive sense of place.

Given the significant transformation of the region following the end of mining in the second half of the 20th century, it would be possible to include the concepts of time and environment in the analysis. However, we primarily focus on the present state of the place and its perceived significance, without addressing at least two other possible transformations: change over time and change in environmental quality. From the perspective of traditional teaching, the region could be explored as a space with distinct elements such as visible marks of past mining and their spatial distribution. Current approaches in geographical education increasingly recognise sense of place as a foundation for understanding space, as it enables pupils to grasp the complexity of the world through personal and situated experience (Castree, Oakes, Sinclair 2023). Such an understanding allows a shift from place to space, encompassing the spatial distribution not only of geographical phenomena but also of values and meanings, thereby linking the concepts of place, space, and interpretation. The relationship between these concepts is explored in depth in the timeless and still unsurpassed review by Vávra (2010).

In line with this perspective, the concept of interpretation is used to examine the meanings that people assign to place. Meanings are not objectively fixed; rather, they are constructed through personal stories, memories, photographs, and lived experiences. A narrative approach makes it possible to capture these subjective dimensions of place, revealing how individual and collective identities are shaped through spatial engagement. Drawing on this, Moos (2025) collected and analysed narratives from the Rosice-Oslavany coal basin region, illustrating how meanings are continually redefined through experience. As Oliver (1998) argues, stories are not merely records of events, but structures through which people interpret and make sense of reality. To illustrate this complexity, we draw on Freeman and Morgan's (2017) "three lamps" model, introduced earlier in the article.

7.1. Industrial heritage as the basis of the historical identity of place (lamp of natural science approach)

From a historical perspective, sense of place in the Rosice-Oslavany coal basin is shaped primarily by the legacy of coal mining, which influenced both the landscape and the everyday life of local communities for more than two centuries (Plchová 2002; Macholán 2004). The region represents a distinctive post-industrial landscape whose present character remains closely linked to former mining and energy production activities (Svatoňová, Lněnička 2013). Industrial development brought economic growth and urban expansion, but also substantial environmental transformation and the creation of a landscape marked by mining infrastructure. Visible traces of this development include spoil heaps (e.g. Babice, Zbýšov and Oslavany), abandoned mines (e.g. Julius, Ferdinand and Jindřich II), miners' colonies, railway infrastructure, and repurposed industrial buildings such as the Herring, Simson, Františka and Kukla complexes. These features are more than physical remnants of industrial activity. They represent visible traces of the region's industrial development and provide evidence of how coal mining shaped the landscape over time. Spoil heaps, mine shafts, industrial buildings, and transport infrastructure document the spatial extent and intensity of mining activities and reveal their impact on settlement patterns, land use, and environmental conditions. From a natural science perspective, these features can be observed, described, mapped, and compared as material indicators of historical landscape transformation. Their continued presence makes it possible to reconstruct key stages of the region's development and to understand how industrial activity contributed to the distinctive character of the contemporary landscape. These features provide a basis for different interpretations of the region's industrial past. As visible traces of historical landscape transformation, they offer evidence through which the development of the region can be reconstructed and explained from different geographical perspectives.

7.2. Place narratives as expressions of lived history (lamp of the humanistic approach)

The second dimension of place emerges through lived experience, memory, and local narratives. While industrial heritage provides the material foundation of place, narratives connect these physical features with the experiences of individuals and communities. In the Rosice-Oslavany region, stories associated with mining shafts, railway lines, miners' housing, and spoil heaps preserve memories of everyday life in a mining landscape and transmit them across generations. Some of these places are shared with visitors through narratives that portray them as

locations “where the earth whispers of the past” (Moos 2025). From this perspective, former mining sites become more than historical objects. They are interpreted through stories that connect people, experiences, and places. As Oliver (1998) argues, narratives do not simply describe reality; they help people make sense of it. Through storytelling, places acquire meanings that extend beyond their physical characteristics and become part of individual and collective identities. Different narratives may emphasise different aspects of the same place, highlighting that meanings are neither fixed nor universal but depend on perspective and experience (Massey 2005). This understanding resonates with place-based approaches in geography education, which emphasise that learning about place involves not only acquiring knowledge but also developing emotional and experiential connections to it (Israel 2012). Such narratives contribute to place attachment and place meaning (Rubáš, Matějček, Řezníčková 2024), linking contemporary understandings of the region with its industrial past.

7.3. Changing functions of industrial features in place (lamp of the cultural approach)

The third dimension of sense of place concerns the cultural and social relationships through which places are continually transformed and reinterpreted. Following the decline of mining activities in the second half of the twentieth century, the region underwent extensive reclamation and functional transformation, gradually shifting from an industrial landscape towards new cultural, recreational, educational, and tourism-oriented uses (Svatoňová, Lněnička 2013; Jarczewski, Koj 2023). Former industrial sites have acquired new meanings and functions. These meanings are not inherent in the sites themselves but emerge through social, cultural, and political processes. The same industrial feature may be interpreted as a symbol of technological progress, environmental degradation, regional pride, or cultural heritage, depending on the perspective adopted (Massey 2005). Typical examples include the repurposing of the Julius mine, the Zbýšov spoil heap, and the former Oslavany power station, one of the most important industrial monuments in the region (Kyselák 2002). Today, these sites serve as museums, visitor attractions, educational venues, and symbols of regional identity. A living tradition of mining heritage is sustained through regular cultural events (e.g. the Mining Festival, Steam for Miners), thematic exhibitions (e.g. Jewels among the Waste), museum activities, and local toponymy. These transformations demonstrate that places are not static entities but dynamic products of ongoing interactions between people, landscape, memory, and social practice. In the Rosice-Oslavany coal basin, industrial heritage continues to influence how the region is understood and experienced, even though its original economic function has largely disappeared.

8. Further implications for teacher education and classroom practice

The Rosice-Oslavany coal basin region provided the setting for six teaching plans developed through the geographical concepts chessboard. The full lesson plans are available in an open-access master's thesis by one of the study's authors (Moos 2025). Through the selected intersection of place and interpretation, the region is understood not merely as a physical space, but as a place full of meanings, stories, memories and the values of the local community.

This example does not exhaust the full potential of the geographical concepts chessboard. When applied to a region, the chessboard offers a transferable model for interpreting urban, rural or post-industrial regions not only as places, but also as spaces and environments. Other intersections of key and organising concepts can be used, for example, to explain stable processes and patterns, or to examine diversity and transformations in the landscape. Working with the remaining concepts and their intersections can therefore support deeper, more intensive development of geographical thinking and enable student teachers and pupils to understand the world around them in more complex ways. The remaining intersections presented in Table 2 demonstrate how different combinations of key and organising concepts can be used to generate geographical questions and to structure teaching through third-order teaching concepts.

The Rosice-Oslavany coal basin region was used to show how the selected intersection of place and interpretation can guide the transformation of regional content into geographical questions. A further implication for teacher education and classroom practice concerns how the geographical concepts chessboard can be used to incorporate geographical concepts and geographical questioning into classroom activities at different levels of engagement with geographical thinking. Student teachers should therefore consider how intensively pupils are expected to engage with the geographical concepts chessboard within a learning activity. In this respect, we distinguish three levels of pupils' classroom engagement with the chessboard: teaching through geographical thinking, teaching with geographical thinking and teaching geographical thinking.

The first level is *teaching through geographical thinking*. In the Rosice-Oslavany example, the concepts of place and interpretation would guide the teacher in planning and organising questions about the region, while pupils would engage mainly with the prepared questions and tasks. At this level, the geographical concepts chessboard functions as a tool for the teacher: it supports lesson planning, the organisation of learning activities and reflection on the conceptual focus of these activities. The chessboard itself is not introduced to pupils as an explicit classroom tool. During lesson planning, the teacher selects key and organising concepts in advance and uses them to prepare geographical questions. In the lesson, the teacher explicitly introduces these concepts and questions to pupils. However,

pupils do not work with the chessboard, do not generate geographical questions themselves and do not use the concepts to define questions. Their task, and the main aim at this level, is to work with the questions prepared by the teacher, search for answers and formulate responses. The selected concepts help the teacher keep the activity within the intended conceptual line. They also provide feedback for the teacher during and after the activity. If pupils' search for answers or their responses move towards another concept, the teacher can guide their search for answers and responses back to the intended focus. This is not treated as a mistake, but as a shift that the teacher can recognise, frame and reflect on.

The second level is *teaching with geographical thinking*. In the Rosice-Oslavany example, pupils would work explicitly with the intersection of place and interpretation in the geographical concepts chessboard, but the questions about the region would still be prepared and conceptually structured by the teacher. This level includes the teacher's planning, organisation and monitoring of the activity described at the first level, but the geographical concepts chessboard is now also brought into the classroom as an explicit tool for pupils. Key and organising concepts are made visible in the lesson, and pupils work with the chessboard as a structured support for the activity. However, they do not generate geographical questions themselves, do not use the concepts to define new questions, and are not expected to memorise the meanings or definitions of the concepts. Rather, pupils use the chessboard to understand how the prepared questions are conceptually framed. The geographical questions are prepared by the teacher in advance: pupils may either work with questions that have already been placed within the chessboard, or they may assign teacher-prepared questions to the relevant intersections of key and organising concepts. Their task remains to work with these questions, search for answers and formulate responses. As at the first level, the teacher continues to guide and monitor the activity. If pupils' search for answers or their responses move towards another concept, the teacher can guide their work back to the intended focus or reframe the shift conceptually.

The third level is *teaching geographical thinking*. In the Rosice-Oslavany example, pupils would not only learn about a post-industrial region or work with teacher-prepared questions; they would actively use the geographical concepts chessboard to explore how the region can be understood through different intersections of key and organising concepts. At this level, the teacher prepares the activity so that pupils work directly with the chessboard, understand the meanings of the concepts involved and use them to formulate geographical questions themselves. These questions may be created within intersections selected in advance by the teacher, or pupils may choose different intersections and generate their own questions from them. Pupils therefore work not only with answers, but also with the conceptual construction of questions. They search for answers, formulate responses and use these responses to check the precision and adequacy of the

geographical questions they have formulated. They can explore how different combinations of key, organising and teaching concepts lead to different geographical questions, different kinds of answers and different ways of understanding the same region. In this sense, pupils also learn to reflect on their own use of concepts, on the questions they formulate and on the geographical answers they develop. Throughout this process, the teacher continues to supervise the activity and guide pupils' work where needed.

The third level most directly supports the aim of the revised Czech geography curriculum (NPI 2025), because it enables pupils not only to acquire geographical knowledge, but to think geographically. It helps them make sense of places, interpret spatial patterns and meanings, and connect local experience with broader geographical understanding. For geography initial teacher education, this means that the geographical concepts chessboard can function not only as a conceptual framework, but also as a practical tool for preparing student teachers to plan, teach and evaluate geography lessons aimed at the development of geographical thinking.

Regardless of the level at which we work, however, the aim of using the geographical concepts chessboard is not simply to fulfil curriculum requirements. Nor is it merely to ensure that pupils acquire factual knowledge of concepts or learn to generate geographical questions mechanically. The fundamental aim of working with the geographical concepts chessboard is broader: to cultivate a way of noticing, questioning and interpreting the world geographically beyond the classroom. As Roberts (2017) argues, geographical education becomes powerful when it values students' everyday knowledge, enables them to see the world in different ways and has effects on their thinking that endure beyond school. Geographical thinking is developed when pupils begin to use geographical concepts and questions in their own encounters with places, landscapes and everyday environments. A particular success for teachers is when pupils spontaneously notice what is around them and, out of curiosity, begin to ask why it is there, how it has changed, what meanings it carries and how it might be interpreted. In this way, big geographical questions can become pupils' own questions, as Roberts (2010) suggests in relation to geographical enquiry. The geographical concepts chessboard can support this shift by helping student teachers and pupils move from abstract concepts to questions that structure enquiry into real places. Its value lies not only in lesson planning, but in supporting pupils to carry geographical questioning into their everyday lives.

9. Conclusion

The geographical concepts chessboard (Spurná, Knecht, Bendl 2025) offers a coherent way of translating geographical thinking into lesson planning and classroom practice. Using the intersection of the concepts of place and interpretation, we

demonstrated how geographical concepts can be transformed into geographical questions and how the content and procedural dimensions of geographical thinking can be connected in geography education. The Rosice-Oslavany coal basin region served as an illustrative example of this process.

The study forms part of a broader project funded by the Czech Science Foundation that responds to current reforms in both geography education and initial teacher education in Czechia. These reforms raise important questions about coherence, content selection, and the role of subject didactics in teacher preparation. Our findings suggest that a stronger orientation towards geographical thinking can provide a shared conceptual foundation for geography teacher education without prescribing specific content or limiting academic autonomy. Departments and teacher educators may continue to work with different topics, regions, and examples, while sharing a common focus on the development of geographical thinking.

Several questions remain open. While we focused on a single intersection of the geographical concepts chessboard, further work is needed to explore how other combinations of key and organising concepts support the development of geographical thinking. Equally important is research on how student teachers learn to work with geographical concepts and questions over time, and how such learning influences their classroom practice. Given the growing emphasis on geographical thinking in curriculum frameworks internationally (Bendl et al. 2025b), greater attention should be paid to the ways in which this aim is translated into teacher education, lesson planning, and assessment. The geographical concepts chessboard provides one possible framework for such work and a basis for further empirical investigation.

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ORCID

MICHAELA SPURNÁ
<https://orcid.org/0000-0003-1139-6031>

PETR KNECHT
<https://orcid.org/0000-0002-6312-5025>

ALEXANDR MOOS
<https://orcid.org/0009-0001-7259-8764>