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*Research Article*

# Developing Geography Teaching Expertise: Perceived Learning Opportunities Among Expert Teachers in Germany

Lisa Wieczorek <sup>1✉</sup>, Isabel Höyng <sup>2</sup> & Nina Scholten <sup>3</sup>

<sup>1</sup> Institute for Geography Education, University of Münster, Germany

<sup>2</sup> Mariengymnasium Bocholt, Germany

<sup>3</sup> Institute for Geography, Geography Education, Kiel University, Germany

✉ Correspondence: [lisa.wieczorek@uni-muenster.de](mailto:lisa.wieczorek@uni-muenster.de)

**Abstract:** Developing professional expertise in teaching requires more than practical experience or professional knowledge alone; it depends on meaningful enablers or so called learning opportunities. Due to the disciplinary complexity and societal relevance of geography education, geography teachers face specific professional demands. However, systematic insights into the learning opportunities that geography teachers perceive as meaningful remain limited, although such insights could inform geography teacher education and professional development. To address this gap, we conducted an exploratory qualitative and retrospective interview study with seven geography teachers. These teachers were identified as experts based on their experience and qualifications. Semi-structured interviews explored activities, practices, and experiences perceived as crucial for their professional development. Data were analyzed using qualitative content analysis with inductive and deductive coding. The findings indicate four main areas of learning opportunities supporting the development of geography teaching expertise: (1) reflective classroom practice, including lesson planning and lesson enactment; (2) professional exchange, encompassing both horizontal and vertical interactions; (3) the assumption of leadership or specialized roles, which expand perspectives and professional responsibilities; and (4) reflective spatial engagement, including everyday and travel-related experiences that inform subject-specific teaching. The findings support the importance of integrating structured, reflective, and socially embedded learning opportunities into both pre-service and in-service teacher education. Professional competence and teaching expertise in geography can therefore be strengthened through subject-specific practices and mentoring—confirming key approaches already discussed in the literature—while suggesting a need for a sharper emphasis on leadership roles and support for the development of reflective engagement with spatial experiences.

**Keywords:** geography teacher professionalism; enablers for geography teaching; learning opportunities; expert teachers; reflective practitioner

**Highlights:**

- Geography teacher expertise develops through reflexive practice, not just experience.
- Exchange, mentoring, and leadership roles appear to drive professional development.
- Spatial experience is relevant to geography teachers' professional expertise.

## 1. Introduction

In times of profound societal and spatial transformations—characterized by geopolitical shifts, environmental crises, and increasing complexity—geography education is tasked with enabling students to make sense of a rapidly changing world. Central to this endeavor is the professional competence of geography teachers, who must be able to support learners in reflecting on their own positioning within these dynamics (e.g., Lambert et al., 2014). However, less attention has been paid to how geography teachers develop the expertise required to meet these demands in practice. A central concern of research on teacher professionalization is therefore how geography teachers can best be educated and prepared for teaching—understood here as the enactment of classroom instruction, an inherently complex, multidimensional, simultaneous, public, unpredictable, and contingent practice (Doyle, 1986; Grossman et al., 2009). In this regard, this study understands *teacher learning* as a situated and ongoing process of professional development that is shaped through engagement with different enablers, so called *learning opportunities*, such as collegial exchange, classroom practice or the adaption of teaching materials. Against this background, the question arises as to which learning opportunities are effective and helpful for geography teaching.

A common response within this field is that (prospective) teachers require learning opportunities to develop professional knowledge to perform their work effectively (Baumert & Kunter, 2013; Shulman, 1986, 1987). Correspondingly, initial teacher education is expected to provide learning opportunities that foster the acquisition of such knowledge. However, participants themselves often question the extent to which such learning opportunities translate into actual teaching practice (Standish, 2024). Pre-service teachers, for instance, often criticize the fact that the contents of their university studies are of limited usefulness for teaching (Arnold, 2010). Similarly, in-service teachers report that the knowledge acquired at university is not particularly relevant for their decision-making in the classroom or for their actions during instruction (Hemmer & Uphues, 2011). These findings point to persistent ambiguities regarding the learning opportunities offered and their actual usefulness for teaching. Another common response to the question of how teachers develop teaching expertise emphasizes the importance of practical experience (e.g., Blömeke et al., 2015). School-based practice, in particular, is assumed to offer relevant learning opportunities for (prospective) teachers. However, empirical evidence indicates that practical experience alone is insufficient for professionalization (Gröschner & Hascher, 2022; Kraft & Papay, 2014). Both professional knowledge and practical experience are undoubtedly essential for the development of teaching expertise (Smit et al., 2023). At the same time, these categories remain rather broad and need to be differentiated more carefully to understand the specific learning opportunities they entail. This raises the question of which types of learning opportunities are actually productive for teaching and how they are perceived and utilized by geography teachers themselves.

Moreover, existing insights into learning opportunities for teachers are often generic in nature. It seems plausible, however, that geography teachers draw on different, subject-specific learning opportunities than, for example, teachers of other subjects, such as physical education (Artvinli et al., 2022a). This assumption is supported by findings from teacher expertise research, which consistently emphasize that expertise is domain specific and content related; that is, expert teachers excel primarily within their own domain and in particular contexts (Berliner, 2001). Consequently, a subject-specific perspective on learning opportunities for professional development appears indispensable. Geography education is characterized by spatial thinking and the ability to interpret and construct spatial representations as well as by engaging with human-environment relations across multiple scales. Learning opportunities in this field are therefore closely tied to spatially grounded experiences (Jo & Bednarz, 2014). Despite this specificity, empirical insights into how such subject-specific learning opportunities contribute to the professionalization of geography teachers remain limited. Against this background, the present study seeks to provide a more differentiated understanding of these learning opportunities and their role in fostering professional competence in geography teaching. To this end, it is striking that those most directly concerned—expert teachers themselves—have rarely been asked systematically which learning opportunities they perceive as particularly relevant to the development of their teaching expertise. This perspective is particularly important, as only teachers who have attained a level of expertise are in a position to reflect retrospectively on which learning opportunities were actually productive for their professional development. While existing research provides valuable theoretical and empirical insights, systematic empirical studies that explicitly draw on expert teachers' perspectives on meaningful learning opportunities for teaching especially in geography education remain scarce.

Therefore, this study addresses the question of which learning opportunities are perceived as helpful by expert teachers in the development of professional expertise for teaching geography. To investigate this question, we follow a classical empirical structure. The theoretical section situates the study within research on teacher expertise, with a

particular focus on the development of expertise. This is followed by a discussion of subject-specific work in geography education research on teacher professionalization. Before presenting and discussing the empirical findings, the methodological design of the study is justified. The paper concludes with tentative implications for enhancing both pre-service and in-service teacher education, with the aim of strengthening learning opportunities that support the development of professional expertise in geography teaching.

## 2. Theoretical Background

### 2.1. Expertise Research

This study is situated within the field of expertise research. Expertise research focuses on the thinking and knowledge of experts and aims to understand how expert performance differs from novice performance (Krauss & Bruckmaier, 2014). Originally developed in domains such as chess or music, this line of research was taken up and adapted to the field of teaching in the late twentieth century (e.g., Berliner, 1986, 2001; Bromme, 1992) and continues to be highly relevant in contemporary educational research (e.g., Krauss, 2025; Scholten & Sprenger, 2020).

Within expertise research, the development of expertise is closely associated with the concept of deliberate practice (Ericsson, 2018; Stigler & Miller, 2018). A central assumption of this approach is that expertise does not develop automatically through the mere repetition of an activity or through increasing years of experience. Rather, deliberate practice is understood as a highly structured and goal-oriented form of learning. As Ericsson (2006) emphasized, deliberate practice is usually a designed experience—often guided by a teacher, coach, or mentor—rather than something that occurs naturally. It requires sustained and intensive work on one's own abilities, particularly on identified weaknesses, combined with a strong motivation to reflect on and improve performance. Ideally, this process is supported by continuous expert feedback (Krauss, 2025). In this context, coaching is regarded as a crucial resource for making implicit routines explicit, raising awareness of habitual practices, and providing feedback in domains where feedback is otherwise difficult to obtain. At the same time, it must be acknowledged that the deliberate practice approach was originally developed in relatively well-defined domains, and not in relation to teaching—a practice that is inherently less structured, highly contingent, complex, and culturally embedded. Nevertheless, several authors have proposed ways of translating the core principles of deliberate practice into concrete learning opportunities for teacher professionalization (Ericsson, 2006; Krauss, 2025; Krauss & Bruckmaier, 2014). One possible approach is the regular video recording of one's own lessons, followed by systematic reflection with colleagues to identify weaknesses and address them in a targeted manner—provided that teachers are motivated to improve their professional skills (Krauss, 2025).

Another well-established approach from Japan that reflects the key elements of deliberate practice is lesson study. In lesson study, teachers regularly meet in small groups to collaboratively plan, implement, observe, and refine specific lessons. This process involves careful observation and analysis of students' thinking and learning during classroom instruction, the development of cause-effect assumptions linking teaching actions to students' learning processes, the generation and testing of alternative instructional strategies, and the revision of teachers' own theories of classroom teaching (e.g., Stigler & Miller, 2018). A further approach emphasized in expertise research highlights analysis as a key mechanism for developing teaching expertise. Empirical evidence suggests that teachers' analytic skills—particularly their ability to analyze classroom interactions and student learning—are directly related to improvements in instructional quality and student learning outcomes (e.g., Stigler & Miller, 2018).

Taken together, expertise research provides theoretically grounded insights into how learning opportunities should be designed to foster teaching expertise. However, the extent to which such learning opportunities are actually implemented in teacher education remains unclear—particularly given that approaches inspired by deliberate practice are highly resource intensive. Moreover, it is largely unknown whether geography teachers have experienced such learning opportunities or whether they perceive them as helpful for their subject-specific professional development.

### 2.2. Geography Education Research on the Professionalization of Geography Teachers

Within the discourse on geography education, the professional development of geography teachers constitutes an established area of concern. At the same time, research explicitly addressing the professionalization of geography teachers has gained momentum in recent decades and remains a comparatively young field of research in which many

questions remain open (Artvinli et al., 2022b; Catling, 2024). Moreover, research on the professionalization of geography teachers represents a highly dynamic field that is closely linked to broader societal change. Because the content area of geography is constantly changing in ways unlike that of many other disciplines, these changes also affect the professionalization of geography teachers (Artvinli et al., 2022a).

Within this field of research, several studies have identified specific skills, competencies, or dispositions that teachers currently need or are expected to need in the future. Examples include work on professionalization for antiracist teaching (Chihab & Kanwischer, 2023; Finn et al., 2026) or on professional development within a culture of digitality (Jo, 2024; Martínez-Hernández et al., 2023). These are often examined in a rather delimited way. In some cases, such skills or competencies are further subdivided or structured, for example, in articles that differentiate particular subdimensions. Occasionally, these contributions also provide indications of how such specific skills, competencies, or dispositions might be fostered in teacher education. However, these suggestions often either remain at the level of broad orientations rather than elaborated educational approaches or concentrate on isolated competence facets, thereby losing sight of teaching as a holistic practice. Consequently, detailed accounts of concrete learning opportunities that address the enactment of lessons as a whole remain scarce.

Existing studies are often small-scale in nature, such as in terms of the number of participants, and tend to be fragmented, addressing specific phases of professionalization rather than tracing professional development across longer trajectories or phases of teacher development. This is exemplified by Fischer's (2022) dissertation, which focuses on the second phase of teacher education in Germany. This phase is frequently attributed a central role in the professionalization of (prospective) teachers, even though its actual effects on professional development have only rarely been examined empirically (Fischer, 2022). In Germany, this phase constitutes a mandatory stage following university studies. It typically lasts around 18 months and is largely characterized by three subject-specific learning opportunities: Seminars in geography education, the enactment of one's own geography lessons, and lesson observations followed by post-lesson conferences. Fischer (2022), who investigated geography educators' practices in this phase of teacher education, highlighted the particular relevance attributed to post-lesson reflection as an opportunity for reflecting on teaching experiences.

More broadly, the importance of reflection and reflexivity for the development of professional teaching practice is a recurring theme in geography education research, often with reference to Schön's (1983) concept of the teacher as a reflective practitioner. In this sense, professional development involves both reflection-in-action—meaning the capacity to think and respond within the unfolding situation—and reflection-on-action—that is, the retrospective examination of practice to inform future teaching. This perspective is echoed across a range of studies addressing teacher professionalization in geography education (e.g., Artvinli et al., 2022b; Chihab & Kanwischer, 2023; Fischer, 2022; Segbers & Eberth, 2017).

Although many aspects discussed in the literature also apply to teachers of other subjects, field trips are regarded as distinctive learning opportunities for geography teachers, as engagement with real-world spatial contexts makes them particularly relevant to geography (Artvinli et al., 2022b; Ben Israel, 2022; Molin et al., 2023). Segbers and Eberth (2017) explored the potential of excursions as occasions for reflection aimed at fostering pre-service teachers' intercultural and transcultural competence. Their study drew on diary entries and participant observation, among other methods. The authors identified several advantages of excursions as learning settings. In particular, they argued that excursions are especially well suited to professional learning because on-site experiences are immediately grounded in bodily and emotional involvement. Moreover, excursions often entail moments of irritation and disruption of one's own self- and world-understandings, which can serve as powerful triggers for reflection. Their findings further suggest that encounters with unfamiliarity frequently occur outside carefully planned and formally structured programs. Accordingly, reflective processes tend to emerge less through explicitly guided reflection phases and more through informal situations, such as during travel between locations or in spontaneous conversations among participants (Segbers & Eberth, 2017).

Existing studies tend to concentrate primarily on formal and institutionalized learning opportunities, which is understandable, given that these can be more directly shaped and influenced. However, research suggests that formative and professionally meaningful learning processes may also occur outside institutionalized settings (e.g., Molin et al., 2023; Segbers & Eberth, 2017). The boundary between institutionalized professional development and teachers' everyday experiences—particularly their everyday geographies—may not be clearly delineated. This may be particularly true for geography as a subject, since a central object of study is the surrounding space in which people act and interact

(Artvinli et al., 2022b; Golightly, 2022). This suggests that a broader perspective on learning opportunities—encompassing both formal and informal contexts—is required.

Studies that explicitly examine effective learning opportunities contributing to the development of teaching expertise remain limited, particularly with regard to what has concretely supported teachers in mastering the complex task of enacting geography instruction. Building on this gap, the present study asks the following question: Which learning opportunities do geography teachers—who are considered experienced experts in their field and profession—identify in their professional trajectories as particularly relevant to the development of their teaching expertise?

### 3. Materials and Methods

To address this question, a qualitative exploratory interview study was conducted with a sample of seven teachers (T1–T7; Creswell & Guetterman, 2018). These teachers were selected based on prior identification as experts or highly skilled practitioners in their subject, using selected criteria. It should be noted that no readily available “reliable and valid measure of expertise” exists (Krauss & Bruckmaier, 2014, p. 249). To justify expert selection in empirical research, scholars recommend explicitly stating the indicators used to define expert status (Bromme, 1992). In this study, because there are no existing parameters in the geography literature, participant selection followed the expert criteria proposed by Bastian (2024). The criteria included a minimum of seven years of teaching experience, above-average performance in the second state examination (a grade above 2.4), and evidence of advanced expertise in the form of additional qualifications in geography, such as authorship within a publishing context, engagement in pre-service teacher education in geography, and teaching and research responsibilities in geography education at the university level. Participants were recruited through targeted invitations via the authors’ university and professional networks. Participation in the interviews was voluntary. The final sample was characterized by considerable heterogeneity with regard to subject combinations (mostly geography in combination with a language such as German or English), gender (57.1% female; 42.9% male), age (34–52 years), and teaching contexts across different federal states in Germany (e.g., North Rhine-Westphalia, Lower Saxony, and Hamburg).

To elicit the teachers’ subjective interpretations of the factors influencing their professional development, semi-structured, problem-centered interviews were employed. The investigation of complex constructs, such as professional expertise, requires a qualitative and interpretive research approach guided by the core principles of openness, communication, and reflexivity. The interview guide was structured into several sections. Section A introduced an open, introductory prompt. Participants were first invited to reflect broadly on activities and practices during their prior phases of teacher education and professional careers as geography teachers and to discuss how they perceived themselves as having developed into experts in geography teaching. This biographical-narrative approach was intended not only to establish a shared understanding of what constitutes professional competence and expertise but also to elicit key biographical turning points and salient experiences as perceived by the participants. The subsequent sections of the interview were designed to reconstruct professional trajectories that participants considered relevant to their professional development. The focus was exclusively on learning opportunities related to geography teaching, although comparative references to participants’ second subjects were not entirely excluded. Section B focused on various factors influencing the development of expertise that could be conceptualized as learning opportunities. These were explored through a thematic orientation toward theoretical models of professional competence. Questions concerning practices and actions, for instance, addressed performance, with actions understood as expressions of professional competence (Blömeke et al., 2015). In addition, participants were asked about significant people; according to the offer-and-use model by Harms and Riese (2018), colleagues and teacher educators may function as role models whose influence and significance should be captured. Furthermore, participants were asked about sources of information and materials used, which, according to Baumert and Kunter (2006), constitute a foundation of professional knowledge. These were deliberately differentiated in the interviews between subject-educational and subject-matter-related sources and materials, as well as the ways in which they were used. Throughout the interviews, different biographical phases were addressed implicitly to identify potential learning pathways in the development of professional competence, particularly during critical phases of teacher education. The period of university study is considered a central milestone in the development of professional competence (Baumert & Kunter, 2006), although its significance has increasingly been questioned (Hof & Hennemann, 2013). Against this background, and given that personal dispositions and motivation are also important determinants of professional competence, the interviews additionally addressed extracurricular influences, such as further professional activities and personal influences and dispositions (Blömeke et al., 2015; Harms & Riese, 2018). The

interviews were then conducted either face-to-face or online via Zoom and ranged from half an hour to 80 minutes, depending on the teachers' willingness to engage in the conversations. All interviews were audio-recorded, transcribed, and anonymized (e.g., names and cities where the participants lived). Data analysis was based on qualitative content analysis (Kuckartz & Rädiker, 2023; Mayring, 2022; Schreier, 2012).

For this purpose, the entire set of interview data was coded, with coding conducted primarily in an inductive manner based on the data (Kuckartz & Rädiker, 2023). Units of meaning were coded that represented and described concrete learning opportunities in the sense of specific activities. Within the framework of this study, a form of positive coding was applied, in which only statements were coded in which teachers explicitly described an activity as having had a positive influence on the development of their expertise. Statements suggesting that an activity had not contributed positively to the development of their skills and expertise—such as a poorly designed university course—were deliberately excluded from the coding. This decision was made because the aim of the study was to identify the learning opportunities that teachers consciously perceived as contributing to their development into experts in their professional practice. Following the process of inductive coding, from which the four areas of teacher expertise development described in the results section emerged, the resulting categories were related to the existing literature and further refined deductively. This primarily concerned the final labeling of the categories, which was aligned with dominant discourses in geography education and relevant theoretical frameworks, such as Schön's (1983) concept of the reflective practitioner (Mayring, 2022; Schreier, 2012). The coding process was conducted in multiple stages: After an initial round of coding conducted by a master's student as part of her thesis, the data were re-coded by additional researchers in line with a refined research aim and scope. The revised coding was subsequently reviewed by a third researcher in a process of consensual coding, and collaboratively discussed and refined within the whole research team, including an external colleague not directly involved in the study to ensure the reliability of the developed category system. Especially the involvement of an external person was implemented to assess clarity and distinctiveness of the category system (Kuckartz & Rädiker, 2023).

#### 4. Results

The qualitative analysis and the coding process of the expert interviews led to the identification of four central areas of teacher expertise development or learning opportunities/enablers, illustrated in Figure 1. Within these areas (main categories), further activities (sub- or sub-subcategories) can be differentiated and subsumed.

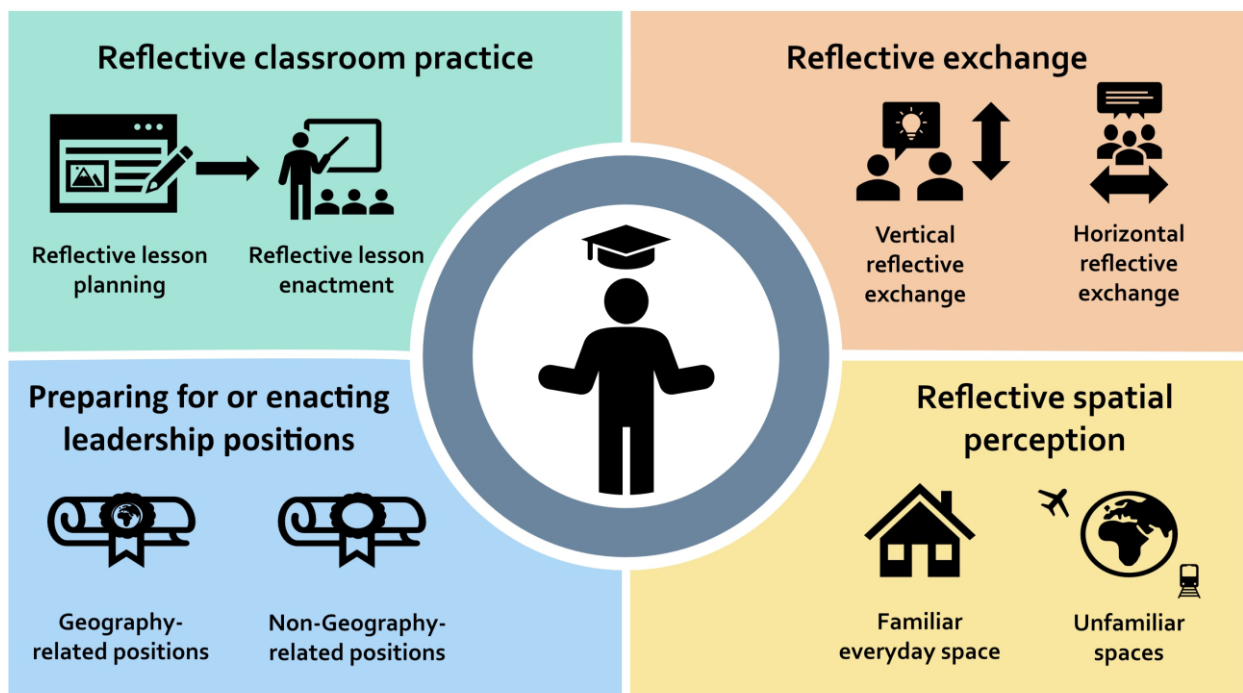


Figure 1. Identified areas of teacher expertise development.

#### 4.1. Area of Teacher Expertise Development 1: Reflective Classroom Practice

The analysis revealed a pronounced focus on learning opportunities associated with classroom practice. Based on the interviewees' accounts, this area of learning opportunities can be structured into two central, related domains: Reflective lesson planning and reflective lesson enactment, including post-lesson reflection.

Lesson planning, as a core component of teachers' professional activity, comprises several meaningful learning opportunities that, from the teachers' perspective, contribute to the development of their professional expertise. Across all seven interviews, lesson planning emerged as the most extensive and complex category. The activities identified in the data can be structured chronologically along the sequence of planning-related actions, as can be seen in Table 1.

**Table 1.** Derived learning opportunities for teacher expertise development through lesson planning.

<b>Learning opportunity: Reflective lesson planning (subcategories)</b>	<b>Occurrences in the interviews</b>
Everyday media consumption with educational and instructional potential: <ul style="list-style-type: none"> <li>• Reading subject-educational and instructional-practical literature in everyday life</li> <li>• Consuming current media in leisure time (e.g., documentaries, news, and social media)</li> </ul>	3
Engagement with subject-specific reference frameworks (e.g., competency frameworks, core concepts/paradigms of geography as ESD, curricula)	6
Intentional consultation and review of media for lesson planning: <ul style="list-style-type: none"> <li>• Reading and studying subject-matter literature and academic journals (articles, foundational works)</li> <li>• Reading and studying subject-educational literature and foundational works</li> <li>• Reading and studying instructional-practical materials and school textbooks</li> <li>• Consuming online materials, podcasts, and lecture recordings</li> </ul>	7
Independent design and compilation of teaching materials	6
Revision and updating of teaching materials	3
Comprehensive lesson planning of best-practice lessons: <ul style="list-style-type: none"> <li>• Planning lessons during the pre-service teaching phase (teacher training)</li> <li>• Planning lessons for colleagues during the in-service teaching phase (shadowing)</li> </ul>	2

Three teachers (T3, T4, T5) reported that in their everyday lives outside school, they consumed media that functioned as impulses for subsequent lesson planning. Some teachers watched documentaries and consumed social media content, which provided inspiration for illustrating lesson content “better with [...] spatial examples in class” (T3, sec. 92). This everyday media consumption was described as an opportunity for engaging with current societal developments and integrating them into teaching, thereby enhancing the perceived topicality and quality of lessons because, as T3 mentioned, social media content “provided a great deal of inspiration” (T3, sec. 74). Another central aspect of lesson planning was intensive engagement with disciplinary reference frameworks. Six teachers (T1-T6) emphasized the importance of working with competence models from geography education, such as systems thinking, as understood by Mehren et al. (2017), or subject-specific core concepts (T5), as well as guiding disciplinary paradigms (e.g., ESD, solution-oriented approaches; T4, T5, T6). These frameworks supported teachers in “structuring subject matter, structuring complexity, and identifying a common thread” (T5, sec. 18). Engagement with the curriculum—that is, the curriculum that teachers in Germany are required to follow—was also highlighted. Beyond structuring lessons (T2), this curricular work led to the identification of teachers' own subject-matter knowledge gaps, which were subsequently addressed through targeted knowledge acquisition to meet curricular requirements, as ongoing changes to curricula required teachers “to respond very flexibly to various developments” (T3, sec. 48) and keep teaching content up to date (T1, T3).

Across the entire dataset and all interviews, the intentional consumption of subject-specific and practice-oriented media (e.g., magazines and textbooks) constituted by far the largest activity within lesson planning and was seen as a

crucial learning opportunity by the teachers. Here, the experts referred to journals specifically aimed at geography teachers in which teaching examples were presented and necessary teaching materials were provided. In particular, teachers relied on up-to-date, practice-oriented journals that combined concise subject-matter introductions (content analyses) with corresponding teaching materials and tasks. These resources were described as one of the few feasible opportunities for professional learning and improvement within the highly time-constrained school context (T4). At the same time, they enabled teachers to address current topics in class and to close subject-matter knowledge gaps because such offerings not only provided materials but also explained “why [and how]” (T1, sec. 20). In addition, teachers referred to continuous professional development offered online, such as short online lectures or tutorials in which “theoretical concepts are presented and complemented with corresponding classroom examples” (T5, sec. 30). The teachers preferred asynchronous formats, which allowed them to engage in professional learning as needed and to “gain a new perspective on certain topics” (T5, sec. 60). Alongside these practice-oriented resources, experts also reported using academic literature to address knowledge gaps, particularly when dealing with complex topics, to “understand it so well that I can explain it properly” (T3, sec. 2). Four teachers (T1, T3, T5, T7) furthermore drew on foundational literature from geography education “to familiarize oneself with new topics” (T7, sec. 28), developments, and trends and to further develop their teaching accordingly.

Interestingly, instead of using ready-made textbooks or the practice-oriented magazines mentioned above with usable materials, teachers emphasized adapting these materials for their classes and developing their own teaching materials that better fit the needs of the learning group as well as the goals of the lessons they wanted to prepare, as quite often “none of these four or five books fully met the requirements” (T3, sec. 35). This process was also perceived as particularly conducive to teacher learning, as “you have thought it through very intensively [...] and then I feel more confident” (T3, sec. 4). The long-term preparation, compilation, and maintenance of such material collections—often in the form of lesson readers—were perceived as structuring teachers’ lesson planning, providing security, and allowing them to focus more strongly on classroom interaction (T3). At the same time, teachers stressed the need to continuously update these materials, as “geography teaching develops content-wise [...] much more strongly than, for example, German teaching does” (T2, sec. 72). Two teachers (T1, T3) described the intensive preparation of so-called best-practice lessons as particularly helpful for their professional development—for instance, in the context of assessed lessons during teacher training (pre-service teaching) or when preparing lessons for visiting colleagues. These situations were opportunities to “figure out what is actually feasible in this lesson” (T1, sec. 10). At the same time, T1 acknowledged that such intensive preparation was only partially feasible within everyday school practice, even though it held considerable potential for high-quality teaching (T1, sec. 10).

In addition to lesson planning, lesson enactment constitutes a central component within the first learning opportunity area and likewise encompasses various activities that contribute to professional development (see Table 2). Across interviews, it became evident that it was primarily through concrete classroom practice that teachers experienced and recognized what was possible in teaching and where optimization of instructional actions was required. Besides guided teaching situations, teachers’ own teaching became central from the induction phase onward. Guided teaching situations, such as internships or lesson observations, were particularly relevant for experiencing role transitions and “helped me to better understand my role [as a teacher]” (T3, sec. 49), developing an initial sense of teaching and learning (T1), and establishing classroom presence, or “standing in front of the class” (T4, sec. 49).

**Table 2.** Derived learning opportunities for teacher expertise development for lesson enactment.

Reflection-in-action		Reflection-on-action	
Learning opportunity	Occurrences in the interviews	Learning opportunity	Occurrences in the interviews
Practicing teaching (practice, application, experimentation, and routinization)	6	Self-reflection on teaching	5
Situational experimentation and real-time adaptation	2	Criteria-based lesson evaluation	3
Challenging classroom situations	1	Student feedback	3

Learning opportunities in this area can be differentiated into reflection-in-action and reflection-on-action (see Table 2), referring to the concept of the reflective practitioner by Schön (.1983). Situations of reflection-in-action—that is, learning opportunities embedded in immediate instructional practice—were addressed by six of the seven teachers, with T5—characterized as more theory-oriented—making no reference to such situations. Central to this category was the repeated enactment of instructional actions, a “learning by doing (...)—or rather, doing and then learning again through doing” (T1, sec. 2), through which teachers developed an understanding of what was needed for teaching (T1) and built experience that could be drawn upon (T4, T6, T7). Teaching was frequently described as a form of learning by doing, leading to the development of routines, such as “how to structure a lesson” (T2, sec. 26). The frequency of teaching over the years was considered a crucial prerequisite for the development of professional expertise (T2, T3), as secure practice could only emerge through “practicing, trying things out, and improving” (T2, sec. 30). Particularly in geography, a subject characterized by high content complexity, teachers initially found it difficult “to break down subject-specific knowledge in a way that everyone could understand” (T4, sec. 61). Therefore, professional expertise and development were perceived to emerge primarily through practical enactment—for instance, when teachers found ways to reduce complex content and make it accessible and comprehensible for learners (T4). Challenging classroom situations in which intended instructional actions did not lead to the expected student responses and required spontaneous adaptation were likewise described as particularly powerful learning opportunities—situations in which teachers “grow” (T3, sec. 106).

Learning opportunities in the sense of reflection-on-action, by contrast, focus more strongly on deliberate reflection after teaching. Teachers drew on various forms of feedback to further develop their instruction, as “this intensive reflection on teaching was very helpful to me” (T3, sec. 4). In addition to active self-reflection, in which specific classroom situations are retrospectively analyzed and alternative actions are developed, as reported by five teachers (T1, T3, T5, T6, T7), three teachers explicitly referred to criteria-based lesson evaluations using structured evaluation instruments (T4, T6, T7). Student feedback also played a role, either through assessments indicating “what worked well and what didn’t” (T3, sec. 4) or through direct interactions with students, through which learners’ curiosity or critical feedback raised teachers’ own standards and led them to design more demanding and higher-quality instruction (T3, sec. 8–14).

#### 4.2. Area of Teacher Expertise Development 2: Reflective Exchange

The second identified learning area comprises various forms of exchange. In addition to dominant conversational situations with others, from which teachers derive new impulses and knowledge resources because they open a “multidimensional perspective on a [certain] topic” (T7, sec. 14) for their own teaching, the exchange of teaching materials was also described as effective for their learning (e.g., T3). This exchange was generally understood as a reciprocal process: Teachers do not merely acquire new knowledge from the person they are interacting with. By sharing their own experiences with others, they also reflect on their own knowledge and make it usable through sharing. The data allowed for a distinction between two central forms of exchange structured according to the perceived expertise of the respective exchange partners: Horizontal and vertical exchange (see Table 3).

Horizontal exchange refers to interactions with individuals at a comparable level of experience and knowledge. Colleagues at the teachers’ own schools were identified as the most central exchange group (T1, T2, T3, T5, T7). Teachers particularly emphasized discussions about “what good geography teaching actually is” (T5, sec. 4), as well as the reciprocal exchange of materials and the joint development of teaching resources. Sharing materials with colleagues was accompanied by an implicit expectation to demonstrate “that [the material] meets a certain standard” (T3, sec. 14). This led to more intensive preparation of the materials—“Rather, I also sit down again and refine it properly” (T3, sec. 16)—which, in turn, positively affected teachers’ confidence in using them in their own classrooms. In addition, T5 highlighted the importance of sharing lessons “that did not go so well” (T5, sec. 52) in collegial exchanges to deliberately initiate reflective processes.

Beyond the school context, exchanges with (former) fellow students or colleagues from teacher education were described as valuable. During the pre-service phase, these contacts functioned as important support networks in periods of high workload and limited teaching experience. Mutual support, such as, “We exchanged everything. We talked on the phone every day” (T5, sec. 32), was described as having helped “incredibly” (T5, sec. 32). Even beyond initial teacher education, these individuals continued to provide impulses regarding teaching materials and approaches that

differed from the routines established within teachers’ own school contexts (T5, sec. 32). Comparable learning opportunities arose through exchanges with teachers from other schools—for example, in the context of continuous professional development events, which offer “different perspectives where you can pick things up from others” (T1, sec. 72). In addition, exchanges in private contexts with friends, acquaintances, or family members were perceived as enriching, as they tended to be more informal and low-threshold. Even though one does not “directly talk about geography teaching” (T2, sec. 72), such conversations and a “great deal of discussion” (T5, sec. 4) nevertheless generated valuable impulses for classroom practice.

**Table 3.** Derived exchange partners for the learning opportunity reflective exchange.

Horizontal exchange		Vertical exchange	
Exchange partners	Occurrences in the interviews	Exchange partners	Occurrences in the interviews
Colleagues (at one’s own school)	5	Subject coordinators (pre-service teaching)	4
Personal (private) acquaintances	3	Mentors at the training school (pre-service teaching)	3
Peers from teacher education (university, pre-service time)	2	Professional development facilitators	3
Network of (international) teachers	2	Researchers in geography education at university	2
		Parents who are themselves geography teachers	1
		Trainee teachers (in a downward mentoring role)	3

Vertical exchange situations were addressed even more frequently in all interviews. These were characterized by interactions with individuals who, from the teachers’ perspective, possessed a higher level of expertise and whom one “looks up to” (T6, sec. 12). Particularly during the training phase (pre-service teaching), subject mentors (four teachers, T1, T2, T6, T7) and school-based mentors (three teachers, T1, T3, T4) were identified as central reference persons. Subject mentors occupy a distinctive role in German teacher education, particularly in the second phase of training (pre-service teaching). They observe teachers during their preparatory phase, conduct seminars, and are ultimately responsible for evaluating them. In teacher education, subject mentors not only establish meaningful connections between university studies and school practice during post-lesson reflections (T1) but also provide premises that have remained guiding principles for teachers’ professional practice—a “premise I continue to follow, which I constantly reflect on” (T6, sec. 6). School-based mentors—who observe lessons, review them, and reflect on the teaching of pre-service teachers—similarly provide valuable impulses for the further development of teaching through reflective conversations in everyday school practice (T1, T3, T4). In addition, they function as role models because “it helped me tremendously to engage in reflective discussions with her (...) because, in my view, she was an excellent teacher and provided me with valuable impulses for reflection, from whom I was also able to learn a great deal by observing her practice” (T3, sec. 4). Due to their ongoing presence in everyday school life, mentors—unlike subject advisors—serve even more strongly as continuous sources of guidance and reflection.

Vertical exchange opportunities were also described as effective for learning in later stages of professional practice. For instance, in-service teacher trainers/ facilitators in continuous professional development functioned as important sources of content-related impulses, particularly by offering subject-specific input and insights into current geographical issues that opened up “new approaches” (T4, sec. 41) for contemporary geography teaching. Teachers who had the opportunity to be seconded to university departments of geography education also described exchanges with researchers as highly beneficial. T5 said, “We jointly designed teaching, and through that I learned a great deal. This is, of course, a privilege that most teachers do not have—namely, the opportunity to work very closely with excellent researchers”

(sec. 8). Engagement with current research in geography education and theoretical concepts contributed to their own professional development and positively influenced their instructional practice (T4, T5).

Vertical exchanges are not limited to learning from more experienced teachers to less experienced teachers. Interestingly, three experts (T4, T6, T7) reported situations in which they held higher positions—such as mentors or subject advisors for pre-service teachers—and described these situations as learning opportunities for themselves. In particular, lesson observation and reflective discussions with pre-service teachers enabled teachers to analyze instructional situations from an observational and reflective perspective, as T4 described:

*“I was very often able to replay different situations. I was able to consider to a much greater extent which alternative courses of action might have been possible. I also engaged in discussions with the trainee teachers and exchanged views on specific classroom situations that would likely not have arisen in my own teaching in the same way, either because no one would have observed me or because I would have been in my own classroom and thus only had my subjective perspective on the lesson. In this way, this shift in perspective between teaching and observing became possible” (sec. 9)*

These situations, therefore, can be seen as valuable for both sides and are not framed as negative examples but rather as enriching opportunities for joint reflection and the further development of instructional practice.

#### 4.3. Area of Teacher Expertise Development 3: Taking on or Enacting Specific (Leadership) Positions

Taking on leadership positions with specific extended responsibilities constitutes a central field of activity that contributes to the development of teachers' instructional practices. Familiarizing oneself with a position and carrying it out is associated with an expansion of knowledge bases (e.g., T7, sec. 56–58), perspectives, and professional dispositions, which, from the experts' perspective, also affected their geography teaching “and thus [led to] a certain broadening of horizons” (T4, sec. 31).

In general, a distinction can be made between functions that have an explicit geographical or geography education reference and those that do not have a direct subject-specific focus. Furthermore, the positions vary with regard to their institutional location, ranging from those within the school context to activities outside school. However, an examination of the positions mentioned reveals that this does not refer to a single specific position but encompasses a range of positions. Almost every interviewee mentioned one or, at most, two roles they had taken on, which covered a broad range of functions. This suggests that it is less the specific position itself that is decisive and more the fact of assuming responsibility, engaging with new tasks, and developing further in a domain-specific yet profession-related manner.

The majority of the reported positions had at least some geographical reference and were closely embedded in the school context. Examples included leading extracurricular geography-related working groups and organizing project weeks with external partners, “which allowed for other formats” (T1, sec. 42) of teaching and learning.

Likewise, serving as head of the geography department at one's school (T5) or of a special domain, such as education for sustainable development (ESD) (T4), or participating in other school-based committees to develop, for example, new curricula (T5), was described as effective for learning, as these activities required engagement with the structural development of the subject and with subject-related reform needs. In this regard, T4 pointed out, “I further familiarized myself with ESD and thereby also experienced a certain broadening of perspectives” (sec. 31). This, in turn, led experts to address such issues more consciously in their own instructional practice because “it is about developing a critical perspective on one's own teaching and, at a more micro level—regarding individual questions or teaching materials—reconsidering certain aspects. (...) Yes, this also helps one to progress professionally” (T5, sec. 54). In addition, the supervision of pre-service teachers helped T4 and T7 to “gain new insights and reflect again” (T4, sec. 69) regarding their teaching practices. Activities outside school were likewise described as conducive to the development of expertise. These contributed particularly to the development of an expanded understanding of the professional role, such as through tutoring activities during university studies, where “we went through the content of the lectures again together with the student groups in order to check whether there were any gaps or whether certain aspects had not been sufficiently well explained by the lecturer, and whether some adjustments were necessary” (T7, sec. 56–58), or work in adult education (T3). Research and teaching activities in higher education contexts at universities additionally provided targeted subject-educational impulses (T4, sec. 31–33) and were perceived as forms of professional development and

continuing education (T4, T5). Similar effects were associated with participation in textbook author teams or comparable projects, as these offered opportunities for exchange and the development of contemporary instructional approaches (T1, T7).

Finally, it is noteworthy that positions without an explicit geographical reference were also identified as relevant to teachers' professional development. These included working as an integration support staff member (T1) or as a counseling teacher (T7), as well as participation in teachers' representative bodies (T5). From the experts' perspective, such functions had a formative effect on personality development. In this context, T6 stated, "This is what has had an extremely strong influence on my entire school-related practice" (sec. 25), and such roles foster cross-disciplinary competencies, such as communication and counseling skills, which also indirectly influence instructional practice in geography education (T7, sec. 44).

#### 4.4. Area of Teacher Expertise Development 4: Reflective Spatial Perception

The fourth identified activity area concerns teachers' spatial perceptions. The interviews indicated that physical space constitutes a central reference point in the professional practice of geography teachers. A conscious engagement with spatial conditions functioned as a source of inspiration for instructional decision-making and contributed to the further development of teachers' professional expertise. In this regard, T2 stated, "My professional competence was also further developed by the fact that I had already visited many of the spatial examples addressed in class. It makes a considerable difference whether one deals with [country] in the classroom using standard teaching materials, or whether one develops a certain stance towards the abundance of materials because one has already experienced the place first-hand" (sec. 48).

From an analytical perspective, two forms of spatial perception can be distinguished within the dataset: the perception of familiar everyday spaces and the perception of unfamiliar spaces, which teachers primarily encounter through travel-related activities. Three experts (T2, T4, T6) described everyday situations in which they became consciously aware of their spatial perceptions and directly linked these to their lessons. Current spatial and societal developments in their immediate environment prompted reflection on "where [the teacher] sets the focus in [their] lesson planning" (T4, sec. 77). The deliberate observation of phenomena in real-world spaces also served as a source of inspiration, as T6 stated, "When traveling through an area, one constantly reflects on what could be done there with students" (sec. 16). Consequently, aspects of the surrounding environment are incorporated into classroom instruction, thereby enhancing its authenticity (T6).

Even more commonly, the experts referred to traveling and exploring unfamiliar spaces, as described in six of the seven interviews. These experiences included either study-related or professional development-related excursions (T1, T2, T4, T5, T7) with a focus on geographical phenomena (e.g., glacier development; T1). The experts also discussed private travel experiences in other countries and cultural contexts. From the teachers' perspective, such experiences led to an expansion of perspectives and to "a new way of looking at the world and at society" (T4, sec. 83). Consequently, geographical content was conveyed in a more differentiated, vivid, and reality-oriented manner in the classroom. For teachers, it mattered in teaching whether places were represented only through media sources or whether they had personal experiences of them, "because I had already had the opportunity to visit and observe it in person" (T2, sec. 48).

## 5. Discussion

The analysis of the seven interviews indicates that from the perspectives of the interviewed teachers, four areas of teacher expertise development can be identified that seem to contribute substantially to geography teaching expertise. The findings resonate with the central ideas of established theories, including the concept of deliberate practice (Ericsson, 2018) and Schön's (1983) notion of the reflective practitioner. Given the exploratory nature of this study, the findings should be understood as tentative theses that point to possible patterns in the emergence and development of geography teachers' professional expertise.

### 5.1. Thesis 1: Expertise Develops Through Reflexively Framed Practices, Not Merely Through Experience

The findings of this exploratory study support the idea that the professional expertise of geography teachers cannot primarily be understood as the result of increasing years of experience, formal qualifications, or a mere accumulation of teaching materials. Rather, expertise develops through an interplay of reflexively framed practices, particularly lesson planning (T1–T7), lesson enactment (T1–T7), moments of disruption (T3), and the deliberate development of professional practices within a reflective framework in the sense of acting as a reflective practitioner (Schön, 1983). Reflection did not function as a *post hoc* supplement to teaching practice but as a structuring and guiding principle of classroom practice and lesson preparation for the interviewed teachers. This understanding cuts across the domains of professional learning and is particularly evident in reflective teaching practice (Jo & Huh, 2022; Molin et al., 2023). It aligns with the concept of deliberate practice (Ericsson, 2018), which emphasizes that learning emerges not from mere repetition but from purposeful reflection and the systematic refinement of action sequences embedded in everyday teaching. This is also reflected in the data and in the strong dominance of reflective activities, which is evident not only in the teachers' own statements but also in the derived categories, or learning opportunities. The data point to reflective lesson planning as a central domain of professional learning, as this constituted the dominant category to which the teachers referred in detail across all interviews, requiring intensive subject-specific and educational engagement with instructional content, in line with the model of educational reconstruction (Duit et al., 2012). Given the high disciplinary dynamics of geography (Artvinli et al., 2022a) and the societal relevance of geographic content, lesson planning is not only a routine task but also functions as a driver of professional development. This is reflected, for example, in continuous engagement with current issues and topics (e.g., T3), spatial developments (e.g., T6), new teaching materials (e.g., T5), and educational guidelines (e.g., T3). In contrast to certain discourses on lesson preparation and professional development, expert teachers are not merely material collectors who seek to ease their workloads by stockpiling resources (Meurel, 2023). Instead, the interviewed experts drew strategically on teaching magazines, material repositories, and digital tools as accessible, low-threshold resources (e.g., Gueudet & Trouche, 2010) for professional learning—supporting the continuous updating of subject knowledge, methodological diversity, critical reflection, and the deconstruction and further development of their teaching practice. It seems that adapting the material ultimately leads to one's own teaching practice or style, in which one recognizes oneself, which the experts considered relatively important, because, as one teacher noted, "When it is not me anymore, I am no longer effective" (T6, sec. 14). Engagement with these materials thus constitutes not merely an instrumental acquisition of tools but a central, reflexively framed professional development practice. At the same time, the data also indicate that lesson enactment and experience remain important sources of expertise, although they are insufficient on their own for professionalization. Rather, learning occurs in numerous small moments within daily lesson preparation, teaching, and practice, particularly where existing patterns are questioned or disrupted, such as in unforeseen classroom situations (T3) or in response to new curricular requirements (e.g., T1, T2, T4). Overall, the data indicate that the development of expertise emerges as a continuous, dynamic, and reflexive process, with teaching practice consistently linked to targeted occasions for reflection.

## 5.2. Thesis 2: Leadership Positions and Professional Exchange Act as Potential Drivers of Professional Development

Building on Thesis 1, the findings of this exploratory study indicate that the development of expertise extends beyond individual reflective practice and is strongly supported by feedback from others and by professional exchange that fosters perspective taking on one's own teaching. From the perspective of the study participants, a central driver of their professional development was interaction with people who had higher levels of expertise or expertise in different areas, as well as the assumption of leadership roles within the school context. Exchange opportunities were seen as relevant throughout all phases of teacher education and as continuing into professional practice. They professionalize practice by enabling shared discussion of classroom experiences (e.g., T5) and reflection on them. Within the discourse on teacher professionalization, approaches such as "communities of practice" highlight the importance of exchange opportunities among in-service teachers (Clarke & Pike, 2023). The participating teachers likewise described exchange as particularly beneficial to their professional development. Feedback structures, especially in pre-service teaching on lesson design, decision-making, and teaching resources, are created and evaluated as enriching (Krauss, 2025), which is reflected in the high importance and focus attributed to the roles of mentors and subject coordinators in the data. Professional knowledge thus remains negotiable and can be further developed. Exchanges with individuals who possess outstanding expertise—such as friends, teachers from other countries and networks—are particularly fruitful for the

experts, as they offer new perspectives and prompt conscious reassessment of one's own actions. Mentoring and support structures, especially in the phase of teacher training, play an important role here (Ericsson, 2018), as do coaching formats (Krauss, 2025), which aim to make implicit routines visible and modifiable. In this sense, such exchanges can be understood as socially framed forms of deliberate practice, in which learning and reflection are stimulated through targeted feedback, dialog, and the development of professional practices. While vertical exchanges with more qualified partners are well established in the literature as beneficial, this study goes beyond existing accounts by showing that some expert teachers also draw on exchanges with less experienced partners to further develop their expertise. These experts benefit from critically engaging with others' practices, using these moments as triggers for self-reflection or thinking through alternatives (e.g., T4, T6, T7). Furthermore, the findings point to a less commonly discussed domain of learning opportunities: The assumption of leadership roles. Notably, such roles need not be subject specific to foster professional learning. Nevertheless, roles with explicit geographic or subject-educational relevance seem to offer particular potential, as they involve intensive engagement with disciplinary discourses (T4), the acquisition of specialized knowledge (T7), and the development of role-specific routines (Taylor et al., 2011). Interestingly, the data indicate that these experiences also feed back into classroom practice. Moreover, they suggest that it is not so much the specific role itself but the process of acquiring this role—including the substantive preparation and acceptance of inherent responsibilities—that is particularly conducive to learning and the development of expertise. Overall, our findings tentatively suggest that exchange processes and leadership roles do not merely accompany professional development but actively drive it. Professionalization can thus be described not only as an individual process of development and accumulation but also as a socially organized, responsibility-bound developmental context.

### *5.3. Thesis 3: Experiential (Spatial) Engagement Outside Formal Teaching Represents a Potential Geography-Specific Resource for Professionalization*

Finally, the results indicate that the active spatial awareness of expert geography teachers represents a focused, discipline-defining element in the development of professional expertise. Both conscious and everyday, often implicit engagement with local and distant spaces, as well as personal experiences of space, serve as potential sources of subject-specific expertise. Although the concept is not clearly defined in the geography education literature, parallels can be drawn with the construct of geographical thinking (e.g., Bendl et al., 2025; Jackson, 2006). The participants described experiences in which they applied geographical perspectives—such as key concepts—to phenomena in their immediate surroundings, thereby contributing to their own professional learning and development. The integration of such experiences into teacher education, as well as the creation of opportunities for experiencing space within the teaching profession, could also contribute to enhancing the authenticity of geography teaching, as content is conveyed in a more contextualized, real-world, and socially embedded manner. The findings of this study aligns with previous empirical results (Molin et al., 2023; Segbers & Eberth, 2017), showing that travel experiences and excursions—such as visits to foreign countries and cultures—stimulate multiple reflective opportunities, induce a changed sense of being-in-the-world, and contribute to the development of geography-specific professional expertise. Beyond these explicit and previously discussed experiences, the data reveal that geography expertise also arises from everyday, often informal learning opportunities outside school and classroom contexts. These include everyday spatial experiences (T2, T4, T6), informal conversations (T2, T4, T5), and media consumption (T3, T5) that teachers engaged with in relation to lesson planning and teaching. Such informal learning is highly significant (Röhl et al., 2023), as it is situational, often unintentionally pursued, and closely tied to the teacher's life-world practices. Interestingly, teachers do not necessarily classify these experiences as explicit professional learning, yet the data suggest their continuous influence on perception, interpretation, and practice, which is reflected in the educational decisions, thematic priorities, and lesson design of the interviewed teachers. Spatial experience, therefore, should be understood not only as a teaching object within geography at universities but also as a constitutive learning and experiential framework for further professional development. Geography expertise seems to emerge not solely through formalized practices and contexts—such as institutionalized training settings at universities—but through the complex interplay of everyday spatial experiences, informal learning processes, and their reflexive integration into professional practice.

## 6. Limitations and Implications of the Study

The data is consistent with trends that have long been discussed in subject-specific discourse. At the same time, initial and tentative additional insights can be identified regarding the identification of new learning opportunities, some of which seem specific to geography education (e.g., the field of spatial perception and spatial interaction). However, due to the sample size and case selection, these findings must be regarded as exploratory and indicative and require further investigation and refinement in larger-scale research projects. Study limitations therefore include the small sample size ( $n = 7$ ), which restricts the generalizability of the findings. Participant selection may have been influenced by access to existing networks and by the definitions and criteria of “expertise.” In addition, the interview structure was highly guided to elicit and organize learning opportunities, which may have implicitly influenced responses. Future research should expand the sample to validate the findings and include additional perspectives. Furthermore, the study is limited to identifying learning opportunities retrospectively reported by expert teachers and thus primarily captures past and present experiences. Learning opportunities that may be required for future professional demands can only be inferred, to a limited extent, from retrospective accounts of expertise developed under different contextual conditions. Consequently, further research is required to investigate how evolving educational contexts shape new professional demands and to identify corresponding learning opportunities. Nevertheless, the study provides important exploratory insights into the development of geography teachers’ professional expertise, confirming trends in the theoretical literature while highlighting further nuances regarding sources of learning and the identified geography-specific learning opportunities.

The study’s findings highlight that professional expertise of geography teachers emerges from the complex interplay of multiple learning opportunities. However, preliminary implications for the improvement of teacher education and professional development can be derived from the data.

In the pre-service phase, early and guided teaching experiences can be seen as crucial. Regular lesson observations, theory-practice seminars at university, and supervised teaching may contribute to the development of an initial conception of the professional role. Early and strongly guided teaching experiences are considered beneficial. In Germany, this has already been implemented at some universities in the form of teaching-learning laboratories within seminars (e.g., experimental work in geography lessons; Rosendahl, 2025). In addition, school-based internships are a required component of teacher education. However, these are often offered as elective courses, and internships in particular tend to involve limited guidance. Mentoring and coaching programs appear to serve as important reference points, supporting prospective teachers and providing orientation. Such programs should be expanded. As the study showed, spatial experiences appeared to be particularly important for (prospective) geography teachers. In Germany, field trips are offered within subject-specific university studies and, depending on the university, may also include educational components. However, this provision should be expanded to encompass not only distant locations but also the immediate local environment. At the same time, field trips and other opportunities for experiencing space should be offered not only during teacher education but also throughout the later professional career, such as in the form of professional development, or even mandated through educational policy.

In the in-service phase, professional development seems to be strongly linked to social resonance, which can be strengthened through the establishment of more exchange opportunities. Horizontal and vertical exchange formats on concrete topics, materials, teaching experiences, team teaching, coaching, and cross-school networks create opportunities for reflection, feedback, and perspective taking (Krauss, 2025; Stigler & Miller, 2018). They allow teachers to critically examine and develop their practice. Professional development structures that facilitate exchange should be further developed and expanded. The assumption of leadership roles appears to constitute another particularly effective lever for professional development, fostering in-depth engagement with disciplinary discourses, the acquisition of specialized knowledge, and the development of role-specific routines. Schools could support these opportunities by providing more time and incentives for teachers to take on such responsibilities. At the same time, the findings of this study suggest that a willingness to further develop one’s practice constitutes a fundamental prerequisite, reflected both in the logic of deliberate practice and in expert teachers’ accounts. In this regard, personal motivation, interest, and engagement appear to function as important drivers of professional learning. Taken together, these findings return to the initial premise that geography education is tasked with responding to profound societal and spatial transformations by enabling teachers’ professional learning through strengthening such learning opportunities.

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Teaching Geography  
for a World in Transition

**Contribution to the Special Issue Topics:** This paper contributes to the special issue by focusing on an important condition for preparing young people to navigate an increasingly complex world: the development of geography teachers' professional expertise. Drawing on interviews with expert geography teachers, it identifies learning opportunities perceived as particularly meaningful for professional development and highlights how reflective, social, and spatially grounded experiences can support the development of geography teaching expertise.

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