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Supporting Preservice Teachers' Ability to Connect Professional Knowledge with Lesson Planning

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If you educate a student,

you educate an individual;

if you educate a teacher,

you educate an entire community.

(adapted from an African proverb)

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I dedicate this work to my aunt, Sister Luisina.

Abstract

A major objective of teacher education is the development of professional knowledge, which may be described as conceptual knowledge stemming from research findings and theories. The integration of professional knowledge and teaching practice is a central component of teacher education. To date, little is known about how preservice teachers may connect professional knowledge with an important aspect of practice: lesson planning. Furthermore, there is limited research on the relationships between lesson planning and another aspect of practice—observation of teaching—specifically with regard to the ability to use professional knowledge in these tasks. The present dissertation aimed to bridge these research gaps by conducting two studies.

The first study investigated how preservice teachers may be supported in connecting professional knowledge with lesson planning. An educational approach to lesson planning was created by drawing on the frameworks of teachers' professional vision and analysis of teaching. The approach shows what kinds of connections may be developed between professional knowledge and lesson planning decisions. These connections require the ability to reason about possible effects of instruction on student learning, according to principles of teaching and learning. To support this ability, a scaffolded progression was created on the basis of research literature on teacher education. This progression suggests engaging preservice teachers in the gradual application of professional knowledge to iterative cycles of lesson plan analysis and lesson planning. Furthermore, a tool for the implementation of this approach in preparation programs, the Lesson Analysis and Plan template (LAP), was developed through a research-practice partnership. This collaboration involved designing the LAP on the basis of research literature and implementing this tool in a preparation program. Preservice teachers used the LAP for lesson planning, enactment, and reflection during their initial preparation. The template design was optimized based on field observations and the perceptions of the preservice teachers, faculty, and directors of the preparation program. Recommendations for future implementers of the LAP were provided based on this field experience.

The second study had two goals. The first goal was to determine whether the LAP can detect preservice teachers' connections between theory and lesson planning. Participants in the study, who were preservice teachers (N = 18) at the end of their first year of preparation, planned a lesson with the LAP. Qualitative and quantitative content analyses of the lesson plans showed

that, even though their preparation offered opportunities to connect theory with several aspects of practice, most preservice teachers showed a developing ability to connect professional knowledge with lesson planning. More precisely, the majority were able to predict the effects of their activities on student learning but were unable to justify these predictions with professional knowledge. The findings suggest that the development of this ability requires specific support. Moreover, the LAP can help identify how aspects of professional knowledge are connected with lesson planning so that additional support can be provided when needed. A second goal of the study was to explore the extent to which the ability to connect professional knowledge with lesson planning is similar to the ability to connect such knowledge with observation of teaching. Preservice teachers' observations were assessed with a professional vision test and compared with their lesson plans. The findings showed that the planning and observation abilities are not identical; most preservice teachers were more successful at observing than at planning. As such, preservice teachers might benefit from applying the theories and concepts they use during observations of teaching to their own lesson plans.

Overall, this dissertation might contribute to developing curricula that support preservice teachers in planning lessons and connecting theory with practice.

Zusammenfassung (Abstract in German)

Dissertationstitel: "Die Förderung der Fähigkeit angehender Lehrkräfte, Professionswissen mit der Unterrichtsplanung zu verbinden"

Ein Hauptziel der Lehrerbildung ist die Entwicklung von Professionswissen, was als konzeptionelles Wissen beschrieben werden kann, das sich aus Forschungsergebnissen und Theorien ergibt. Die Integration von Professionswissen und Unterrichtspraxis ist ein zentraler Bestandteil der Lehrerbildung. Bisher ist wenig darüber bekannt, wie Lehramtsstudierende Professionswissen mit einem wichtigen Aspekt der Praxis verbinden können: der Unterrichtsplanung. Darüber hinaus gibt es wenig Forschung zu den Beziehungen zwischen der Unterrichtsplanung und einem anderen Aspekt der Praxis—der Unterrichtsbeobachtung—insbesondere im Hinblick auf die Fähigkeit, Professionswissen bei diesen Aufgaben einzusetzen. Die vorliegende Dissertation zielt darauf ab, diese Forschungslücken durch die Durchführung von zwei Studien zu schließen.

Die erste Studie untersuchte, wie Lehramtsstudierende dabei unterstützt werden können, Professionswissen mit der Unterrichtsplanung zu verbinden. Ein pädagogischer Ansatz zur Unterrichtsplanung wurde entwickelt, der sich auf die Handlungsmodelle der professionellen Unterrichtswahrnehmung und Unterrichtsanalyse stützt. Der Ansatz zeigt, welche Arten von Verbindungen zwischen Professionswissen und Planungsentscheidungen entwickelt werden können. Diese Verbindungen erfordern die Fähigkeit, über mögliche Auswirkungen des Unterrichts auf das Schülerlernen gemäß Lehr-Lernprinzipien zu überlegen. Um diese Fähigkeit zu unterstützen, wurde eine didaktische Progression auf der Grundlage von Forschungsliteratur zur Lehrerbildung erstellt. Diese Progression legt nahe, Lehramtsstudierende in die schrittweise Anwendung von Professionswissen auf iterative Zyklen der Analyse von Unterrichtsplänen und der Unterrichtsplanung einzubeziehen. Darüber hinaus wurde im Rahmen einer „Forschungs-Praxis-Partnerschaft“ ein Tool zur Umsetzung dieses Ansatzes in Studiengängen entwickelt, das sogenannte LAP (aus dem Englischen „Lesson Analysis and Plan template“, d.h. Vorlage zur Unterrichtsanalyse und -planung). Durch diese Zusammenarbeit wurde das LAP auf der Grundlage von Forschungsliteratur entworfen und in einen Lehramtsstudiengang umgesetzt. Die Studierenden nutzten das LAP für die Unterrichtsplanung, -durchführung und -reflexion während einer frühen Phase ihres Studiums. Das Tool wurde auf Grundlage der Wahrnehmungen von Studierenden, Lehrkräften

und Vorständen des Studiengangs optimiert. Basierend auf dieser Felderfahrung wurden Empfehlungen für zukünftige Umsetzer des LAPs gegeben.

Die zweite Studie hatte zwei Ziele. Das erste Ziel bestand darin, festzustellen, ob sich Verbindungen zwischen Theorie und Unterrichtsplanung angehender Lehrkräfte durch das LAP erkennen lassen. Die Untersuchungsteilnehmer, die Lehramtsstudierende am Ende ihres ersten Ausbildungsjahres (N = 18) waren, planten eine Unterrichtsstunde mit dem LAP. Obwohl ihr Studium Möglichkeiten bot, Theorie mit mehreren Aspekten der Praxis zu verbinden, zeigte die qualitative und quantitative Inhaltsanalyse der Unterrichtspläne bei den meisten Studierenden eine sich entwickelnde Fähigkeit, Professionswissen mit Unterrichtsplanung zu verbinden. Genauer gesagt war die Mehrheit in der Lage, Auswirkungen ihrer Aktivitäten auf das Schülerlernen vorherzusagen, war sie jedoch nicht in der Lage, diese Vorhersagen mit Professionswissen zu begründen. Die Ergebnisse deuten darauf hin, dass die Entwicklung dieser Fähigkeit eine gezielte Unterstützung erfordert. Darüber hinaus kann das LAP verwendet werden, um festzustellen, wie Aspekte des Professionswissens mit der Unterrichtsplanung verbunden werden, sodass bei Bedarf zusätzliche Unterstützung angeboten werden kann. Ein zweites Ziel der Studie bestand darin, zu untersuchen, inwieweit die Fähigkeit, Professionswissen mit Planung zu verbinden, ähnlich ist wie die Fähigkeit, Professionswissen mit Beobachtung zu verbinden. Die Beobachtungen der Lehramtsstudierenden wurden mit einem Test zur professionellen Unterrichtswahrnehmung bewertet und mit ihren Unterrichtsplänen verglichen. Die Ergebnisse zeigten, dass die Planungs- und Beobachtungsfähigkeiten nicht identisch sind; die meisten Studierenden waren erfolgreicher beim Beobachten als beim Planen. Daher könnten angehende Lehrkräfte davon profitieren, die Theorien und Konzepte, die sie während der Unterrichtsbeobachtung verwenden, auf ihre eigenen Unterrichtspläne anzuwenden.

Insgesamt könnte diese Dissertation einen Beitrag zur Lehrplanentwicklung leisten, die angehende Lehrkräfte bei der Unterrichtsplanung und der Verknüpfung von Theorie und Praxis unterstützt.

Resumen (Abstract in Spanish)

Título de la tesis doctoral: “Conectar el conocimiento profesional con la planificación de las clases: un apoyo al desarrollo de esta competencia en los futuros docentes”

Un objetivo fundamental de la formación docente es el desarrollo del conocimiento profesional, que puede describirse como el saber conceptual basado en las teorías y los hallazgos de la investigación. La integración del conocimiento profesional y la práctica docente es un componente central de la formación docente. Hasta la fecha, se sabe poco acerca de cómo los futuros docentes pueden conectar el saber profesional con un aspecto importante de la práctica docente: la planificación de las clases. Además, hay poca investigación sobre las relaciones entre la planificación y otro aspecto de la práctica docente, la observación de la enseñanza, concretamente con respecto a la capacidad de utilizar el conocimiento profesional en estas tareas. La presente tesis doctoral tuvo como objetivo cerrar estas brechas de investigación mediante la realización de dos estudios.

El primer estudio investigó cómo se puede ayudar a los futuros docentes a conectar el conocimiento profesional con la planificación de las clases. Se creó un planteamiento educativo para la planificación docente en base a los marcos teóricos de la visión profesional docente y el análisis de la enseñanza. El planteamiento muestra qué tipos de conexiones pueden desarrollarse entre el conocimiento profesional y las decisiones de la planificación. Estas conexiones requieren la habilidad de razonar sobre los posibles efectos de la enseñanza en el aprendizaje del alumnado de acuerdo con los principios de la didáctica. Para favorecer el desarrollo de esta habilidad, una progresión didáctica fue desarrollada en base a la bibliografía de investigación sobre la formación docente. Esta progresión sugiere involucrar a los futuros docentes en la aplicación gradual del saber profesional en ciclos iterativos de análisis y planificación. Además, una herramienta para la aplicación de este planteamiento en programas de formación, llamada LAP (siglas inglesas de “Lesson Analysis and Plan template”, herramienta para el análisis y planificación de clases), fue desarrollada a través de una “colaboración de investigación y práctica”. Esta colaboración permitió el diseño del LAP en base a la bibliografía de investigación y la aplicación de esta herramienta en un programa de formación docente. Los estudiantes usaron el LAP para planificar, implementar y reflexionar sobre las clases durante su formación inicial. El diseño de la herramienta fue optimizado en base a las percepciones de los estudiantes, profesores y directores del programa de estudios. A

partir de esta experiencia de campo se proporcionaron recomendaciones para los futuros usuarios del LAP.

El segundo estudio tuvo dos objetivos. El primer objetivo fue determinar si el LAP puede detectar cómo los docentes en formación conectan la teoría con la planificación de sus clases. Los participantes en el estudio, que eran estudiantes de magisterio ($N = 18$) al final de su primer año de formación, planificaron una clase usando el LAP. El análisis cualitativo y cuantitativo de las planificaciones indicó que, aunque su formación ofrecía oportunidades para conectar la teoría con varios aspectos de la práctica, la mayoría de los estudiantes demostraron una capacidad incipiente para conectar el saber profesional con la planificación. Concretamente, la mayoría fue capaz de predecir los efectos de sus actividades en el aprendizaje del alumnado pero no pudo justificar estas predicciones con un conocimiento profesional. Los hallazgos sugieren que el desarrollo de esta habilidad precisa de un apoyo específico. Además, el LAP puede ayudar a identificar de qué manera se conectan los aspectos del conocimiento profesional con la planificación, permitiendo un apoyo adicional cuando sea necesario. El segundo objetivo del estudio fue explorar hasta qué punto la habilidad de conectar el conocimiento profesional con la planificación docente es similar a la habilidad de conectar dicho conocimiento con la observación de la enseñanza. Las observaciones de los futuros docentes fueron evaluadas con un test de visión profesional y comparadas con sus planificaciones. Los hallazgos mostraron que las habilidades de planificación y observación no son idénticas; la mayoría de los docentes en formación tuvieron más éxito en la observación que en la planificación. Por consiguiente, los docentes en formación podrían beneficiarse de aplicar las teorías y los conceptos que usan en las observaciones de enseñanza a la planificación de sus propias clases.

En conclusión, esta tesis doctoral podría contribuir al desarrollo de currículos que ayuden a los futuros docentes a planificar sus clases y conectar la teoría con la práctica.

Riassunto (Abstract in Italian)

Titolo della tesi di dottorato: “Collegare la conoscenza professionale alla programmazione delle lezioni: un supporto allo sviluppo di questa competenza nei futuri insegnanti”

Un obiettivo fondamentale della formazione degli insegnanti è lo sviluppo di una conoscenza professionale, che può essere descritta come un sapere di tipo concettuale basato sulle teorie e i risultati della ricerca scientifica. L’integrazione tra conoscenze professionali e pratica dell’insegnamento è una componente centrale della formazione degli insegnanti. Ad oggi, si sa poco su come i futuri insegnanti possano collegare le conoscenze professionali con un aspetto importante della pratica dell’insegnamento: la programmazione delle lezioni. Inoltre, poca ricerca scientifica si è dedicata alle relazioni tra la programmazione delle lezioni e un altro aspetto della pratica dell’insegnamento, l’osservazione dell’insegnamento, in particolare per quanto riguarda la capacità di utilizzare le conoscenze professionali in questi compiti. L’obiettivo di questa tesi di dottorato è stato quello di colmare queste lacune attraverso due studi.

Il primo studio ha indagato come i futuri insegnanti possono essere aiutati a collegare le conoscenze professionali con la programmazione delle lezioni. Un approccio educativo alla programmazione delle lezioni è stato creato a partire dagli inquadramenti teorici della visione professionale degli insegnanti e dell’analisi dell’insegnamento. L’approccio mostra quali tipi di collegamenti possono essere sviluppati tra le conoscenze professionali e le decisioni riguardanti la programmazione delle lezioni. Questi collegamenti richiedono la capacità di ragionare sui possibili effetti dell’insegnamento sull’apprendimento degli studenti in accordo con i principi della didattica. Per incoraggiare lo sviluppo di questa abilità, è stata creata una progressione didattica a partire da letteratura scientifica sulla formazione degli insegnanti. Questa progressione suggerisce di coinvolgere i futuri insegnanti nell’applicazione graduale delle conoscenze professionali in cicli iterativi di programmazione e analisi. Inoltre, attraverso una “collaborazione tra ricerca e pratica”, è stato sviluppato uno strumento per l’implementazione di questo approccio nei programmi di formazione, il cosiddetto LAP (dall’inglese “Lesson Analysis and Plan template”, cioè strumento per l’analisi e programmazione delle lezioni). Questa collaborazione ha consentito di progettare il LAP sulla base della letteratura scientifica e di implementarlo in un programma di formazione per insegnanti. Gli studenti hanno utilizzato il LAP per programmare, implementare e riflettere

sulle lezioni durante la loro formazione iniziale. Lo strumento è stato ottimizzato sulla base delle valutazioni degli studenti, docenti e direttori del corso di studi. Basandosi su questa esperienza sul campo sono state fornite raccomandazioni ai futuri utilizzatori del LAP.

Il secondo studio aveva due obiettivi. Il primo obiettivo era determinare se il LAP fosse in grado di rilevare in che modo i futuri insegnanti collegano la teoria con la programmazione delle loro lezioni. I partecipanti allo studio, che erano studenti di scienze della formazione (N = 18) alla fine del loro primo anno di formazione, hanno programmato una lezione utilizzando il LAP. Un'analisi qualitativa e quantitativa delle programmazioni ha mostrato che sebbene la loro formazione offrisse l'opportunità di collegare la teoria con vari aspetti della pratica, la maggior parte degli studenti ha mostrato una competenza non ancora matura nel collegare la conoscenza professionale con la programmazione delle lezioni. Concretamente, la maggior parte era in grado di prevedere gli effetti delle proprie attività sull'apprendimento degli alunni, ma non era in grado di giustificare queste previsioni con conoscenze professionali. I risultati suggeriscono che lo sviluppo di questa abilità richiede un supporto specifico. Inoltre, il LAP può aiutare a identificare in che modo gli aspetti della conoscenza professionale sono collegati alla programmazione delle lezioni al fine di fornire ulteriore supporto quando necessario. Il secondo obiettivo dello studio era esplorare in che misura la capacità di collegare la conoscenza professionale con la programmazione delle lezioni è simile alla capacità di collegare questa conoscenza con l'osservazione dell'insegnamento. Le osservazioni dei futuri insegnanti sono state valutate con un test della visione professionale e confrontate con le loro programmazioni. I risultati hanno mostrato che le capacità di programmazione e osservazione non sono identiche; la maggior parte dei futuri insegnanti aveva più successo nell'osservazione che nella programmazione. Pertanto, i futuri insegnanti potrebbero trarre vantaggio dall'applicazione delle teorie e dei concetti che usano durante le osservazioni dell'insegnamento alle programmazioni delle proprie lezioni.

In conclusione, questa tesi di dottorato potrebbe contribuire allo sviluppo di curricula che aiutino i futuri insegnanti a programmare lezioni e collegare la teoria alla pratica.

Included Publications

The present dissertation was written cumulatively and consists of two articles (Journal Article I and Journal Article II) that were published in high-impact peer-reviewed international journals. The author of this dissertation is the first author of both articles. In the thesis overview that follows, the articles are not discussed in the chronological order of their publication date, but rather in the order that best supports the reader's comprehension.

Journal Article I

This article was submitted to the *Journal of Curriculum Studies* (online ISSN: 1366-5839) in April 2022 and was accepted for publication in February 2023 (see Appendix A).

> Zaragoza, A., Seidel, T., & Santagata, R. (2023). Lesson Analysis and Plan template: Scaffolding preservice teachers' application of professional knowledge to lesson planning. *Journal of Curriculum Studies*, *55*(2), 138-152. http://dx.doi.org/10.1080/00220272.2023.2182650

The first author was primarily responsible for the conceptualization, data collection and analysis, writing the original and revised drafts, preparing the manuscript for publication, and pursuing publication at the journal (85% workload). The co-authors, Prof. Dr. Tina Seidel (10% workload) and Dr. Rossella Santagata, from the University of California, Irvine (5% workload), guided the development of the manuscript with critical and helpful reviews.

Journal Article II

This article was submitted to the *European Journal of Teacher Education* (online ISSN: 1469-5928) in May 2021 and was accepted for publication in October 2021 (see Appendix B).

> Zaragoza, A., Seidel, T., & Hiebert, J. (2021). Exploring preservice teachers' abilities to connect professional knowledge with lesson planning and observation. *European Journal of Teacher Education*. Advance online publication. https://doi.org/10.1080/02619768.2021.1996558

The first author was primarily responsible for the conceptualization, data collection and analysis, writing the original and revised drafts, preparing the manuscript for publication, and pursuing publication at the journal (80% workload). The co-authors, Dr. Tina Seidel (10% workload) and Dr. James Hiebert, from the University of Delaware (10% workload), guided the development of the manuscript with critical and helpful reviews.

Table of Contents

1. Introduction

While I was writing this thesis overview, I came across a captivating movie called "Lunana: A yak in the classroom". The powerful phrase "teachers touch the future" was voiced by several characters in the story, highlighting the influence teachers can have on shaping the future of their students' lives and their communities. I had never heard of this idea before and it got me thinking about how this dissertation could contribute to teachers' ability to impact the future. At first, I believed it could help teacher educators influence the future practice of prospective teachers, shaping their decisions and ultimately the lives of their future students. Then, I realized that this dissertation addressed the future in a more particular way. As readers may have noticed in the abstract, this research aimed to help preservice teachers envision their near future: what might happen in the classroom as they implement their lesson plans. Yet, they are encouraged to anticipate the effects of their actions on student learning. In some ways, this might be similar to the sports world, in which athletes undergo visualizations before their competitions. They are to envision specific feelings, those that will help them give a great performance.

This dissertation highlights the relevance of teachers' lesson planning or, in other words, the ability to anticipate events and prepare for teaching. Research shows that teachers' lesson planning is fundamental to the teaching profession (Morris & Hiebert, 2011). Lesson planning, along with lesson enactment and reflection, is part of teachers' everyday practice (Shavelson & Stern, 1981; Shulman, 1987). The relevance of lesson planning is widely recognized in teacher education (European Commission, 2013). In fact, the development of this ability is a major goal of teacher preparation programs across Europe (Eurydice, 2002).

Lesson planning research is a young research field. Most findings date back to the '70s through to the '90s (Kang, 2017) and are part of a larger group of studies in research on teaching that constitute the decision-making paradigm (Shavelson & Borko, 1979). Today, lesson planning research is rarely discussed at educational research conferences. Few studies were featured in the last conferences of the European Association for Research on Learning and Instruction (EARLI, 2019, 2021) and the American Educational Research Association (AERA, 2021, 2022). To date, there are no empirically validated models that describe how teachers plan lessons (König et al., 2020; Shavelson & Stern, 1981), and there is little evidence on how teachers learn to plan (Clark & Peterson, 1986; Mutton et al., 2011). Consequently, the

knowledge base for preparing preservice teachers to plan lessons effectively is limited (Kang, 2017). For example, some educational approaches to lesson planning are grounded in the work of Tyler (2013), a theoretical model that dates back to the late ‘40s (Zazkis et al., 2009). It describes the planning process as a linear progression of decision-making, starting with the specification of objectives and ending with the evaluation of their achievement. This model has become popular in some countries, even though empirical research demonstrated decades ago that it does not reflect the lesson planning practices of teachers (Clark & Peterson, 1986; John, 2006; Shavelson & Stern, 1981).

Learning to plan lessons is typically associated with the opportunity to engage in an authentic aspect of teaching practice (Grossman et al., 2009). Another potential for lesson planning is less well known. Some researchers argue that lesson planning can help overcome an “old” educational problem, that of connecting theory with practice (Stender et al., 2017). A major goal of teacher education is to provide access to the knowledge base of the teaching profession, which is continually growing and improving (Bromme & Tillema, 1995; Hiebert et al., 2002). University coursework supports the acquisition of professional knowledge (Stender, 2014), which may be described as conceptual knowledge (de Jong & Ferguson-Hessler, 1996) stemming from research findings and theories (Cochran-Smith & Lytle, 1999). Based on Shulman's (1986) classification, preservice teachers typically acquire professional knowledge in three domains, including content knowledge, pedagogical content knowledge and general pedagogical knowledge (Schmidt et al., 2011). There is evidence that professional knowledge can influence student learning (Kunter et al., 2013; Voss et al., 2011). For example, Kunter et al. (2013) showed that experienced mathematics teachers with high pedagogical content knowledge provided cognitive activation tasks and learning support, resulting in higher student achievement and motivation respectively.

Teacher education research shows that the accumulation of professional knowledge is not sufficient to become a competent teacher (e.g., Smagorinsky et al., 2003; Veenman, 1984); also necessary is the ability to apply this knowledge to interpretation, perception and decision-making situations (Blömeke et al., 2015). Some researchers argue that preservice teachers may develop this ability in the context of lesson planning (McCutcheon, 1980; Stender, 2014; Stender et al., 2017). However, little is known about how exactly this can be achieved. How should professional knowledge be applied to lesson planning decisions? The present dissertation aimed to bridge this research gap by conducting two studies. The first study developed an educational approach to lesson planning that supports the use of professional

knowledge and a tool for its implementation in teacher preparation programs. The second study examined whether the tool can detect preservice teachers' ability to use professional knowledge in lesson planning so that additional support can be provided when needed. In addition, the second study explored possible relationships between lesson planning and another aspect of practice, observation of teaching, particularly with regard to the ability to use professional knowledge in these tasks. Knowing more about the relationships between these abilities would be beneficial for bringing theory closer to practice in teacher education programs (Darling-Hammond et al., 2005).

What follows is an overview of the dissertation. The opening chapter (Chapter 2) provides the theoretical background for the research and is divided into several sections. First, the concept of lesson planning and how preservice teachers can be prepared for this task is discussed. Second, the theory-practice divide in teacher education and the educational relevance of lesson planning to bring theory closer to practice are explained. Finally, a theoretical interpretation of the relationship between lesson planning and observation is presented. After the theoretical background, the aims of the research are described, including the research questions (and conjectures) of the studies conducted as part of the dissertation (Chapter 3). The following chapter introduces the research context and the methodological approach used in each study (Chapter 4). Subsequently, both studies are summarized, addressing all major aspects of the research (Chapter 5). The last chapter discusses the main findings and their practical implications for teacher education, along with the limitations of the findings, and suggestions about how these limitations may be overcome in future research (Chapter 6). This chapter ends with the conclusions of the research. Additional information regarding the two studies conducted within the scope of the dissertation is available in their respective publications—Zaragoza et al. (2023) and Zaragoza et al. (2021)—which are referred to here as *Journal Article I* and *Journal Article II* respectively. Appendices A and B contain the full text of the articles; for copyright reasons, they are not included in the public version of this thesis overview. In Appendix C, a sample lesson plan illustrates how lesson plans might look according to the educational approach proposed in this research work.

2. Theoretical Background

2.1. Lesson planning and lesson plan writing

Previous research has described teachers' lesson planning as "an endeavor in structuring opportunities for learning" (Pang, 2016a, p. 445). When teachers plan lessons, they engage in two actions: lesson planning and lesson plan writing (McCutcheon, 1980). *Lesson planning* refers to decision-making; *lesson plan writing* has to do with recording lesson planning decisions. These actions may be considered as two steps, where *lesson plans* are the product of the lesson planning process (John, 2006; Pang, 2016a; Ruys et al., 2012).

Planning lessons and writing lesson plans are essential to the work of teaching (John, 2006; McCutcheon, 1980; Pang, 2016a). Firstly, lesson planning is assumed to influence student learning (Ruys et al., 2012; Shavelson & Borko, 1979). When teachers plan lessons, the curriculum is transformed to fit the unique circumstances of particular classroom situations (Clark & Peterson, 1986; Shulman, 1987). Teachers make additions, deletions, changes of sequence or emphasis to the curriculum based on their knowledge and beliefs (Clark & Peterson, 1986). As such, the kind of learning activities students engage in is notably related to teachers' decisions during the preparation of lessons (Clark & Peterson, 1986; Kang, 2017; Shavelson & Borko, 1979).

Secondly, lesson plans are instruments with multiple functions for teaching practice (Clark & Peterson, 1986). The lesson plans of experienced teachers often resemble "memory joggers"; they facilitate the implementation of lesson planning decisions (McCutcheon, 1980, p. 7). Lesson plans may serve to keep track of the lesson as it unfolds and to support retrospective reflection for further improvement (Pang, 2016b). They are useful to record what has been done during the lesson (John, 2006). In sum, lesson plans can support all phases of the teaching cycle, from preparation through implementation to reflection. Furthermore, the functions of lesson plans go beyond assisting in one's own teaching practice. For example, they may contribute to normal school functioning by facilitating the work of substitute teachers (McCutcheon, 1980) and providing information for external evaluations (Pang, 2016a). Lesson plans can also be used to share knowledge about teaching and learning and improve the quality of instruction across classroom settings (Morris & Hiebert, 2011).

2.2. Teacher preparation for lesson planning

2.2.1. How to help preservice teachers plan lessons and write lesson plans?

To support the development of the abilities to plan lessons and write lesson plans, a number of strategies may be considered based on research evidence. In their literature review, Shavelson and Stern (1981) described the nature of teachers' lesson planning decisions across subject matter domains and grade levels. When planning a lesson, teachers focus on the tasks that will be carried out during the lesson. In planning a task, a number of elements are considered: *content*, the subject matter to be taught; *goals*, the general aim for the tasks; *activities*, the actions of teachers and students; *timing*, including the allocation of time, sequencing and pacing of content and materials; the *social cultural context* of instruction, including teachers' groupings of students for specific purposes; and the *materials* used by teachers and students (Shavelson & Stern, 1981).

Beyond instructional aspects, teachers consider a great deal of information about the lesson context (McCutcheon, 1980; Shavelson & Stern, 1981). Many aspects of students—their abilities, needs, and interests—influence teachers' decisions (Shavelson & Stern, 1981). The needs of students may differ widely depending on their cognitive and emotional development, as well as their linguistic and sociocultural backgrounds (Corno, 2008). Also, teachers' decisions are influenced by curriculum mandates, educational standards, school policies, and the like (Bernstein, 1990). Put simply, teachers' lesson planning decisions need to meet the conditions of the lesson context (John, 2006; Jones & Vesilind, 1996; König et al., 2020; Krause et al., 2017).

Research shows that lesson planning decisions are highly interrelated (Tillema, 1984). John (2006) argued that teachers' decisions do not follow a particular order but occur almost simultaneously and influence one another. In McCutcheon (1980) words, lesson planning "involves a complex, simultaneous juggling of much information" (p. 20).

Furthermore, preservice teachers may learn how to write lesson plans with the help of lesson plan templates. Templates serve to pull together the creative thinking process occurring earlier (i.e., during lesson planning) into the creation of practical lesson plans (John, 2006). John (2006) emphasized that templates should be adapted and personalized to one's own needs.

Based on these studies, lesson planning preparation should provide preservice teachers with opportunities to focus on the design of activities and their components and to take into account aspects of the lesson context. Preservice teachers should be encouraged to use and adapt lesson plan templates for lesson plan writing.

2.2.2. How to help preservice teachers consider the lesson context when planning lessons?

Empirical research provides hints to help preservice teachers consider aspects of the lesson context when planning lessons. Longitudinal studies have shown how lesson planning skills develop during student teaching and the first years of in-service teaching (Jones & Vesilind, 1996; Mutton et al., 2011). Initially, novices aim to plan for the overall coherence of lessons (Mutton et al., 2011). Their attention is mainly focused on preparing materials, and choosing and sequencing activities that cover a certain amount of content in the time available (Jones & Vesilind, 1996; Mutton et al., 2011). In other words, they make rather "superficial" decisions related to writing or creating lesson plans (Jones & Vesilind, 1996). When implementing lesson plans, these are perceived as scripts that need to be adhered to (Jones & Vesilind, 1996; Mutton et al., 2011).

As novices become familiar with their classes, further aspects of the lesson context (e.g., regarding their students and the school) are taken into account (Mutton et al., 2011). Over time, knowledge about these aspects accumulate and abstract ideas are built (e.g., about typical students' behavior and how certain activities typically work out) (Mutton et al., 2011). Generalizations and their adjustments to unexpected experiences inform further lesson planning decisions (Mutton et al., 2011; Shavelson & Stern, 1981). Ideas about the lesson context enable novices to visualize lessons and anticipate students' responses (Mutton et al., 2011). When lesson plans are enacted, novices often show a developing awareness of the need to be flexible—the flexibility necessary to meet students' needs (Jones & Vesilind, 1996; Mutton et al., 2011).

These studies suggest that preservice teachers might benefit from opportunities to plan, enact, and reflect on lesson plans for periods of time that enable them to become familiar with their classes. The relevance of being flexible and responsive to students' needs should be stressed as preservice teachers enact their lesson plans.

2.2.3. How to help preservice teachers address problems of practice when planning lessons?

Taking into account the lesson context when planning lessons is, however, a difficult task (Shavelson & Borko, 1979). Instructional decisions must account for a variety of constraints while promoting student learning (Penso & Shoham, 2003). The complexity of lesson planning is comparable to that of the teaching process in that decisions aim at structuring the relationships between the teacher, the students, and the content (Lampert, 2001).

Preservice teachers are confronted with a myriad of lesson planning decisions in their first teaching experiences (Kang, 2017; Mutton et al., 2011). In a qualitative study with eight preservice teachers, Kang (2017) showed that the kinds of tasks preservice teachers incorporated into their lesson plans were related to a large variety of aspects, ranging from their attributions of students' behavioral problems and their beliefs about teaching and learning, through their interactions with teacher mentors, to their ability to attend to students' thinking. Kang (2017) concluded that preservice teachers need explicit guidance on how to deal effectively with problem-solving demands of practice (Kang, 2017). Collaborative lesson planning is a pedagogy common to successful teacher education systems (Darling-Hammond, 2017) that facilitates access to experienced teachers' problem-solving strategies (John, 2006; Mutton et al., 2011). Through this collaboration, preservice teachers can be encouraged to consider progressively more contextual and instructional aspects and in greater detail (John, 2006). A study conducted by Willegems et al. (2017) revealed that preservice teachers who examined problems of practice in non-hierarchical teams showed greater professional development than in traditional one-to-one mentorships.

In brief, research suggests that lesson planning preparation should include opportunities for lesson planning in teams, ideally with expert teachers, and preservice teachers should be introduced to the complexity of lesson-planning situations gradually.

2.3. The educational relevance of lesson planning to connect professional knowledge with teaching practice

Lesson planning preparation should provide opportunities to connect theory with practice. The following section provides a brief explanation of why this might be relevant in teacher education.

2.3.1. The theory-practice divide in teacher education

As noted earlier, teachers' professional knowledge can be described as the theoretical, research-based knowledge typically acquired by preservice teachers in university-based preparation programs. Professional knowledge has traditionally consisted of research-based knowledge, as this knowledge is assumed to be trustworthy (Hiebert et al., 2002). Its value is attributed to its validity across a wide range of contexts. However, this knowledge is relatively abstract and does not provide direct guidance in specific situations (Bromme & Tillema, 1995; Hiebert et al., 2002). Consequently, teacher's expertise requires more than the simple accumulation of professional knowledge; it requires tuning and restructuring professional knowledge to the demands and constraints of practical situations (Blömeke et al., 2015; Bromme & Tillema, 1995).

Professional schools that require intensive academic preparation face the challenge of preparing students for professional practice (Bromme & Tillema, 1995; Grossman et al., 2009). In teacher education, the theory-practice divide refers to the difficulty of connecting professional knowledge with teaching decisions (Grossman et al., 2009; Hiebert et al., 2002; Santagata et al., 2018; Veenman, 1984). Research shows that preservice teachers find it difficult to apply the theories and concepts acquired at university to cope with daily challenges in school (Friedman, 2000; Hammerness et al., 2002). They rather draw on their own past experiences as students (Lampert & Ball, 1998) or emulate their supervising teachers (Kocher et al., 2010). Research shows that the inability to apply theories and concepts to practice can lead to a "reality shock" or the feeling of unpreparedness to teach in real classrooms (Bromme & Tillema, 1995, p. 261; Huberman, 1989, p. 33). Such unpreparedness is associated with high levels of stress and symptoms of burn-out (Dicke et al., 2015; Friedman, 2000). The theory-practice divide affects teacher education systems around the world, including those in Germany (Dicke et al., 2016), the USA (Smagorinsky et al., 2003), the Netherlands (Stokking et al., 2003), and Australia (Black & Halliwell, 2000).

Stender (2014) attributed the theory-practice divide to the phenomenon of "inert knowledge" (Whitehead, 1959, p. 197), or knowledge that is acquired in one context and not applied in other related contexts. Professional knowledge might be considered inert knowledge if preservice teachers do not apply it to their teaching practice. Inertness might result from the fact that professional knowledge (a) is in the form of declarative knowledge rather than a form easily applied to teaching practice (procedural knowledge), (b) is acquired in a learning context

(e.g., lecture) that differs from the application context (e.g., classroom teaching), and (c) is perceived as irrelevant for making decisions in everyday teaching (Renkl et al., 1996; Stender, 2014).

2.3.2. The potential benefits of lesson planning for preventing inert knowledge

The fact that preservice teachers have trouble applying professional knowledge to their own teaching does not mean that it is useless. Rather than abandoning professional knowledge, it is worth considering that preservice teachers may simply need support to develop the ability to use professional knowledge in classroom situations. What if professional knowledge was acquired through a process that made its connections with practice more apparent (Darling-Hammond et al., 2005)? Lesson planning may be an adequate context because it is an authentic instructional activity that puts novice teachers in touch with many of the issues that must be considered in order to teach high-quality lessons (Grossman et al., 2009).

The benefits of lesson planning activities for preventing inert knowledge may be discussed from three perspectives. According to the first perspective, lesson planning is considered an opportunity to link professional knowledge to concrete classroom situations. Central to this idea is the pedagogical reasoning involved in lesson planning (Penso & Shoham, 2003; Shulman, 1987). McCutcheon (1980) argued that lesson planning is a decision-making process that can be used to help preservice teachers consider how theories and concepts relate to specific classroom situations and translate into making instructional decisions and weighing alternatives. This kind of analysis would help preservice teachers utilize professional knowledge, over intuition or memories from their own school days, in making lesson planning decisions.

According to the second perspective, lesson planning is viewed as an opportunity to recognize the practical relevance of professional knowledge. This perspective is built on research on case writing and analysis (Darling-Hammond et al., 2005), a pedagogy that involves analyzing particular cases of teaching and writing about these cases. Case-writing and analysis is a similar context to the theory-based analysis described previously because it asks participants to analyze teaching in a purposeful and explicit way. Previous research (Hammerness et al., 2002) has shown that using professional knowledge to analyze cases of classroom situations helped preservice teachers recognize the value of their professional knowledge and apply it to plan future lessons. Likewise, when preservice teachers use professional knowledge to inform their own lesson planning decisions, they can recognize the

practical relevance of this knowledge and are more likely to apply it in the future (Stender, 2014).

The third perspective views lesson planning as an opportunity to transform professional knowledge into teaching practice. This idea is grounded in the Transformation Model of Lesson Planning (Stender, 2014; Stender et al., 2017), which argues that preservice teachers can transform their (declarative) professional knowledge into more applicable procedural knowledge by engaging in iterative cycles of planning, enactment and reflection. As professional knowledge is applied to lesson planning deliberately, conceptual knowledge about successful lesson plans is likely to transform into automatized teaching routines over time. Therefore, the application of professional knowledge to lesson planning is a crucial step towards its potential transformation into teaching practice.

Based on this research, teacher preparation programmes should support the deliberate application of professional knowledge to lesson planning. At present, however, there is limited understanding of how this can be accomplished. Which kinds of connections may preservice teachers develop between the theories and concepts acquired in coursework and their own lesson planning decisions? Where should teacher educators focus their attention?

2.4. The use of professional knowledge in lesson planning and observation: similarities and differences

This section provides a theoretical interpretation of the interrelationship of lesson planning and another aspect of practice, observation of teaching. Teachers' observations during classroom instruction are crucial to successful lesson planning. While planning helps to manage the complexity of classroom situations by making these situations more predictable, observing students' responses enables the adjustment of lesson plans to unexpected events (Shavelson & Stern, 1981). This flexible implementation of lesson plans is essential to meet students' needs (Jones & Vesilind, 1996; Mutton et al., 2011). An interesting point of question is whether the ability to use professional knowledge is similar across lesson planning and observation. Is the ability to connect professional knowledge with *observed* classroom situations similar to the ability to connect such knowledge with *planned* classroom situations?

Teachers' professional vision may be described as the ability to interpret classroom teaching situations (Seidel & Stürmer, 2014; van Es & Sherin, 2002). It is a well-established

indicator of integrated knowledge structures in early university-based teacher education (Stürmer, Seidel, & Kunina-Habenicht, 2015; Wiens et al., 2013). High professional vision indicates "differentiated and integrated knowledge with a flexible application to various teaching situations"; low professional vision entails "fragmented and rather sparse knowledge structures without the ability to use this knowledge flexibly" (Seidel & Stürmer, 2014, p. 2). So far, research on professional vision has focused on teachers observing complex classroom situations (Gaudin & Chaliès, 2015); however, professional vision can also be examined in the context of lesson planning (Nückles, 2021).

There are a number of arguments in favor of, and against, a relationship between planning and observation. First, an important similarity is that both abilities require professional knowledge to identify relevant teaching and learning events from an observed (or planned) classroom situation (e.g., the way a teacher starts a lesson). This cognitive process is known in professional vision as noticing (Blomberg, Stürmer, and Seidel 2011). Second, both abilities require professional knowledge to reason about the previously identified events in three ways: *describing* (observed or planned) teaching actions (e.g., the teacher states the learning goals at the beginning of the lesson); *explaining* how (observed or planned) teaching actions are related to specific didactical concepts (e.g., that stating the learning goals of the lesson is linked to the principle of clarifying learning goals, which refers to the idea of helping students identify the relevance of the learning content); and *predicting* possible consequences of the (planned or observed) teaching actions for learning processes on the student side (e.g., that clarifying learning goals is an important prerequisite for students to be intrinsically motivated to learn). Description, explanation, and prediction are three interrelated aspects of knowledge-based reasoning in professional vision (Blomberg et al., 2011).

On the other hand, planning and observing may be very different abilities; planning involves mentally simulating actions, whereas observing involves continuously processing external information. These situations may require different cognitive abilities. This difference has important implications for teacher education. In lesson planning, preservice teachers are engaged as "actors" (e.g., when they mentally simulate tasks that may support their students' cognitive activation) (Grossman et al., 2009, p. 2091). In classroom observations, preservice teachers analyze others' actions (e.g., whether the observed tasks in a classroom situation support students' cognitive activation) (Grossman et al., 2009). In the first case, they analyze what they can anticipate or envision; in the second case, they analyze what they see occurring.

Based on the previous considerations, it seems that planning and observation require similar applications of professional knowledge across different situations. To date, there is limited research on the relationships between planning and observation. A greater understanding of their similarities and differences would be useful for the development of teacher education curricula that bring theory closer to practice (Darling-Hammond et al., 2005). For instance, does acquiring the ability to apply professional knowledge to observations of teaching benefit the ability to apply this knowledge to lesson planning? Does one of these abilities need to be developed first?

3. The Present Research

As discussed in the previous chapter, research argues for the educational relevance of lesson planning to connect theory with practice. To date, however, little is known about how to utilize this potential in teacher education. If lesson planning is to become a pedagogy for helping preservice teachers connect professional knowledge with teaching practice, then professional knowledge must be connected to the process of planning in a deliberate and thoughtful manner. That said, what kinds of connections should preservice teachers focus on exactly? To bridge this research gap, the present dissertation aimed to develop an educational approach to lesson planning that shows what kinds of connections can be made between professional knowledge and lesson planning, and how to support preservice teachers in making these connections. A better understanding of how to support the development of this ability would help preservice teachers develop the most professional side of lesson planning (McCutcheon, 1980). In addition, this dissertation attempted to develop a tool for the implementation of the proposed lesson planning approach in teacher preparation programs. A pedagogical tool was deemed crucial for facilitating the adoption of the proposed lesson planning approach in teacher education practice (Putnam & Borko, 2000). Another purpose of the dissertation was to examine the potential of this tool for detecting preservice teachers' connections between professional knowledge and lesson planning. Ultimately, this would help to determine whether the tool can be used by teacher educators to identify how the theories and concepts taught in their courses are applied to preservice teachers' own practice and where to provide additional support.

Furthermore, this dissertation sought to explore possible relationships between lesson planning and another aspect of practice—observation of teaching—particularly with regard to preservice teachers' ability to use professional knowledge in these tasks. In other words, is the ability to connect professional knowledge with lesson *planning* similar to the ability to connect such knowledge with *observation* of teaching? Knowing more about possible relationships between these abilities would be beneficial for teacher education, particularly with respect to the development of curriculum that supports preservice teachers in connecting professional knowledge with teaching practice (Darling-Hammond et al., 2005). To be specific, can we assume that helping preservice teachers apply certain theories to reason about observations of teaching will benefit their ability to apply these theories to reason about their own lesson plans? Does the order in which these abilities are targeted matter? The construct of teachers'

professional vision might provide a lens for analyzing and understanding the relationships between planning and observation. Because professional vision has been used to examine the ability to observe complex classroom situations (Gaudin & Chaliès, 2015), this dissertation would broaden the range of professional situations in which this indicator may be applied (Nückles, 2021).

Two studies were conducted in the context of this dissertation and were reported in the form of journal articles—Journal Article I and Journal Article II. The aims and research questions of these studies as well as the conjectures of the second study are discussed below.

3.1. Journal Article I

Journal Article I reports a conceptual inquiry that investigated how to support preservice teachers in connecting professional knowledge with lesson planning. This research aimed to develop an educational approach to lesson planning and a pedagogical tool for the implementation of the approach in preparation programs. In addition, it sought to provide recommendations for future implementers of the tool. Specifically, the research question addressed in this article was: How can preservice teachers be supported in connecting professional knowledge with lesson planning?

3.2. Journal Article II

Journal Article II reports an empirical inquiry with two research questions. First, it aimed to examine whether the tool developed in the previous study—the Lesson Analysis and Plan template (LAP)—can reveal the nature and variation of preservice teachers' connections between professional knowledge and lesson planning (Research Question 1). In other words, it was investigated whether the LAP may provide a window into how aspects of professional knowledge are connected with lesson planning decisions, and how these connections vary among preservice teachers. The second goal of the study was to unveil possible relationships between lesson planning and observation of teaching (Research Question 2). More precisely, it was investigated the extent to which the ability to reason about observations of classroom situations is similar to the ability to reason about lesson plans. Altogether, this study included two research questions and conjectures as follows:

1- Can the Lesson Analysis and Plan template (LAP) detect the nature of preservice teachers' connections between professional knowledge and lesson planning and the variation of these connections among preservice teachers?

Participants in the study were preservice teachers after one year of preparation. Their preparation had provided opportunities to acquire and apply professional knowledge to various aspects of teaching practice, including observation, lesson planning, enactment, and reflection. Therefore, the LAP was expected to reveal some connections between professional knowledge and lesson planning.

2- Are there any relationships between the ability to connect professional knowledge with *lesson planning* and the ability to connect such knowledge with *observation of teaching*?

Some relationships between planning and observation were expected because, as explained in the theoretical background, these abilities seem to require similar applications of professional knowledge, even if they occur in different situations. If planning and observation are similar abilities, the participants with higher planning skills would show higher observation skills, and the opposite would be true for the participants with lower planning skills.

4. Methodology

4.1. Context of the research

4.1.1. Project description

This research was part of Teach@TUM, a project conducted at the Department of Educational Sciences of the Technical University of Munich. Teach@TUM is one of the 91 research projects funded by the Quality Campaign for Teacher Education ("Qualitätsoffensive Lehrerbildung") of the Federal Ministry of Education and Research, Germany (grant number 01JA1801). The funding program, which runs for a total of 10 years until 2023, seeks to improve teacher education and raise the attractiveness of the teaching profession throughout the country (Bundesministerium für Bildung und Forschung, n.d.). Part of the dissertation was supported by this program[1].

The Teach@TUM project shows four research divisions. One of the divisions aims at the development, implementation, and continuous evaluation of the new study program "Master Berufliche Bildung Integriert" (MBBI). This master's degree offers teacher education for vocational education. The MBBI was created to address the long-standing shortage of vocational teachers in Germany in two ways, by enabling a new target group to enter the teaching profession—bachelor's graduates in engineering—and reducing preparation time by one year (Gruber et al., 2020). The seventh cohort of the program started in the fall of 2022.

4.1.2. The evaluation study of the MBBI teacher education program

A major feature of the MBBI is the strong focus on the integration of theory and practice throughout the three-year preparation. Semesters 1 and 2 are devoted to university coursework and include an internship and micro-teaching activities; Semesters 3 through 6 consist of fieldwork experience in vocational schools supported by university coursework (see Figure 1). This curriculum design is quite innovative in Germany. In conventional programs, fieldwork experience (known as "Referendariat") begins after the completion of university coursework.

[1] The content of this dissertation is not the responsibility of the funding institution.

Such an approach results in frequent inconsistencies between the theoretical and practical components of the preparation (Alles et al., 2018).

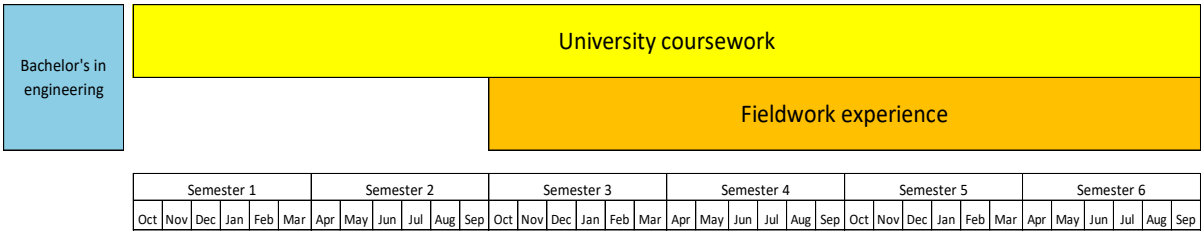

Figure 1. Overview of the theoretical and practical preparation components in the MBBI master's program.

The MBBI program was evaluated from the fall of 2016 until the fall of 2019 by means of a multi-cohort longitudinal study. This study included a comparison with conventional preparation programs. The evaluation study had three areas of interest related to preservice teachers: their professional development (including aspects such as professional knowledge and lesson planning), characteristics (e.g., motivation, stress) and perceptions regarding the preparation program (e.g., coherence between the courses and the preparation components of the program). Data from three cohorts of preservice teachers were examined (each cohort starting in consecutive winter semesters). Prior to every data collection, preservice teachers were informed about the purpose of the evaluation study, data collection procedure and data anonymization. Only data from participants who gave their voluntary consent to participate were used in this study.

The present dissertation was embedded in this evaluation study in the following ways. The tool developed in the dissertation was used as a data collection instrument in the evaluation study. Conversely, the evaluation study provided valuable data for the dissertation. In the first study of the dissertation, data helped to optimize the design of the tool and identify possible challenges associated with its use in teacher education. The second study analyzed some of the lesson plans and observations of preservice teachers collected for the evaluation study, in particular, those from the first cohort after one year of preparation (Semester 2). This was an interesting time point for several reasons. Up to that point, most of the theoretical input of the study program had been delivered, and preservice teachers had received opportunities to apply professional knowledge to a variety of aspects of practice, including planning and observation. In addition, it was possible to provide preservice teachers with sufficient time to work on their

lesson plans (one semester) and have this work recognized as part of their university coursework. The results of the second study were used in the evaluation study as indicators of the extent to which the MBBI was successful in supporting the integration of theory and practice. They were communicated to the faculty and directors of the program and led to additional support strategies being incorporated into the program.

The methodological approach used in the two studies conducted as part of the dissertation is explained below.

4.2. Journal Article I

The research question addressed in the first study was: "How can preservice teachers be supported in connecting professional knowledge with lesson planning?". To answer this question, a conceptual inquiry was conducted on the basis of research literature. First, an educational approach to lesson planning was created by drawing on the frameworks of teachers' professional vision (Seidel & Stürmer, 2014) and analysis of teaching (Hiebert et al., 2007; Santagata et al., 2018). The purpose of this approach was to show what kinds of connections may be developed by preservice teachers between professional knowledge and lesson planning decisions. To support the ability to make such connections, a progression was designed on the basis of several areas of teacher education research: case methods (Hammerness et al., 2002), pedagogies of practice (Grossman et al., 2009), analysis of classroom artifacts (Darling-Hammond et al., 2005) and lesson planning (John, 2006; Jones & Vesilind, 1996; Mutton et al., 2011). The purpose of this progression was to show how teacher educators may scaffold the application of professional knowledge to lesson planning.

To facilitate the implementation of the approach in preparation programs, a tool was developed through a research-practice partnership. The first draft of the template was designed on the basis of research literature on lesson planning (Shavelson & Stern, 1981), teachers' professional vision (Seidel & Stürmer, 2014), and analysis of teaching (Hiebert et al., 2007; Santagata et al., 2018). The tool was designed to encourage the deliberate use of professional knowledge in decision making. Subsequently, the draft was implemented from the fall of 2016 until the winter of 2018 in a teacher education program (the MBBI, as described earlier in Section 4.1.2.). Preservice teachers from two cohorts (with ca. 20 preservice teachers each, starting in consecutive winter semesters) completed the template as part of their university

coursework assignments at three time points of their preparation (Semesters 1, 2 and 3; see Figure 1).

The tool was used for lesson planning, enactment, and reflection as follows. In Semester 1, preservice teachers planned a 45-minute lesson. In Semester 2, they were asked to plan a 90-minute lesson, enact part of the lesson plan in a microteaching situation, reflect on the lesson plan and propose alternatives for improvement. In Semester 3, preservice teachers engaged in a similar cycle involving the enactment and reflection of the revised lesson plan. Preservice teachers were then required to implement their lesson plans in a school as part of their fieldwork experiences.

The template design was optimized through iterative revisions throughout its implementation. The revisions were made based on field observations and the perceptions of the preservice teachers, faculty, and directors of the program. Faculty and directors from both the university setting and the field placements were involved. Perception data were collected in two ways. Meetings of faculty and directors that discussed the template design and its implementation were recorded at two time points (before and after the tool was used for the first time). Interviews on task comprehension and task difficulty were conducted with preservice teachers of the first cohort at two time points (after the tool was used for the first and third times). The design of the tool was improved in terms of prompt clarity and template usability (general layout and response format). The resulting template was translated into English with the help of a group of native-speaker educational researchers and was named the Lesson Analysis and Plan template (LAP). In addition, field observations and perception data were used to evaluate the LAP implementation. Recommendations for future LAP implementers were provided based on the challenges identified in this field experience.

4.3. Journal Article II

4.3.1. Participants

Participants were preservice teachers (N = 18) from a cohort in a university vocational teacher program in Germany (the MBBI, as described in Section 4.1.2). They had two teaching subjects: one vocational subject [either metal technology (61.1% of participants) or electrical and information technology (38.9%)] and one STEM subject [either physics (66.7%) or mathematics (33.3%)]. The age (M_{age} = 29.72, SD = 3.71) and sex composition (1 female) of the sample were representative of the vocational preservice teacher population with STEM

subjects. As mentioned earlier, participants had completed one year of preparation that included opportunities to acquire professional knowledge and apply it to a variety of aspects of practice, including lesson planning and observation.

4.3.2. Research Question 1: Can the LAP tool detect the nature and variation of connections between professional knowledge and lesson planning?

Data collection instrument and procedure. The participants were asked to complete the Lesson Analysis and Plan template (LAP) to plan a 90-minute lesson in their vocational teaching subject as a requirement to pass a course. The LAP is a template with two types of tasks, namely the lesson plan writing tasks and reasoning tasks. *Lesson plan writing tasks* require preservice teachers to write lesson plans. They include seven tasks: content, learning goals, activities, social configuration, materials, and timing tasks (see an overview in Figure 2 and the upper row in Figure 3).

Lesson plan writing tasks	
Content	Subject matter addressed in the activities
Learning goals	Aims for the activities in terms of student learning

Figure 2. The lesson plan writing tasks of the Lesson Analysis and Plan template (LAP).

Reasoning tasks require preservice teachers to connect professional knowledge with lesson planning decisions. These tasks include four tasks: description, prediction, justification, and explanation tasks (see Figure 3, lower row). They require selecting instructional aspects relevant to the lesson goals and creating hypotheses about the possible impact of these instructional aspects on student learning. Every hypothesis must contain a description, prediction, justification, and complementary explanation.

Because the LAP was under development when this study was conducted (see Journal Article I), participants used a version similar to the final draft of the LAP. Participants were given instructions on how to complete the tasks and were provided with a sample hypothesis. They had one-semester time to work on their lesson plans and were encouraged to develop as many hypotheses as possible.

	Activities	Social configuration	Materials	Timing
Lesson plan writing tasks	Teacher's and students' actions	Whole class or students' groupings	Teacher's and students' materials	Duration of the activities
Reasoning tasks	**Description:** Select an instructional aspect relevant to the learning goals and describe it briefly here • **Prediction:** Based on research findings or theories, predict or anticipate the effect of the instructional aspect on student learning. • **Justification:** Justify your prediction or support it with arguments based on research findings or theories, and cite the source (e.g., a particular university course, textbook, or scientific publication). **Complementary explanation:** Include a complementary explanation based on research findings or theories.			

Figure 3. The lesson plan writing tasks and the reasoning tasks of the Lesson Analysis and Plan template (LAP).

Data coding. Qualitative analyses of participants' hypotheses were conducted with a coding scheme (Saldaña, 2016) that was developed based on the construct of teachers' professional vision (Seidel & Stürmer, 2014; van Es & Sherin, 2002) and some aspects of the Framework for Analyzing Teaching (Hiebert et al., 2007). Hypotheses related to learning activities and teacher support strategies were parsed into meaning units (i.e., statements referring to the same idea). Meaning units were rated on a 3-point Likert scale using the anchors 1 (*does not apply*), 2 (*somewhat applies*) and 3 (*fully applies*) with regard to four categories (C): the ability to predict (C1), the ability to justify predictions (C2), the ability to justify predictions with professional knowledge (C3) and the ability to justify predictions with professional knowledge in detail (C4). The highest rating level (*fully applies*) in C3 required citing the source of information used in the justification; this indicated that aspects of professional knowledge were referenced explicitly.

To assess inter-rater reliability, four lesson plans (20% of the total) were coded by a second rater with no prior knowledge of educational research or the aim of the study. Agreement entailed making the same distinction between the four categories and choosing the same rating level within each category. Because the probability of randomly occurring coding matches

between the raters was insignificant, the percent agreement was calculated (McHugh, 2012). The results showed an acceptable inter-rater reliability (overall: 68.2%; C1: 64.3%; C2: 57.1%; C3: 80.0%; C4: 100.0%) (Stemler, 2004). Any disagreement between raters was discussed until a consensus was reached.

Data analysis. Frequencies of meaning units in each category and rating level were calculated for each participant and were used to build a ranking of individual lesson planning profiles. Percentages of the participants showing the highest rating level in each category were calculated.

4.3.3. Research Question 2: Are there any relationships between lesson planning and observation?

Data collection instrument and procedure. The participants' ability to connect professional knowledge with observations of teaching was assessed by means of the Observer Tool (Seidel & Stürmer, 2014). The Observer Tool is a standardized computer-based test that includes six video clips featuring secondary education classrooms. Every video clip represents two of the following three principles of teaching and learning (Seidel & Shavelson, 2007): (a) goal clarity and orientation, (b) teacher support and guidance and (c) learning climate. Participants analyzed every video clip by means of a rating scale. They were asked the extent to which they agreed with the items using a 4-point Likert scale: 1 (*disagree*), 2 (*somewhat disagree*), 3 (*somewhat agree*), and 4 (*agree*). The items tapped into the three aspects of knowledge-based reasoning: (a) ability to *describe* (sample item regarding goal clarity and orientation: "In the excerpt that you saw, the teacher clarifies what the students are supposed to learn"; three items), (b) ability to *explain* ("In the excerpt that you saw, the students have the opportunity to see the significance of the topic to them personally"; three items), and (c) ability to *predict* ("Based on what you saw, the students will be able to align their learning process to the learning objective"; three items). This test has shown good reliability with the vocational preservice teacher population (α = .93, N = 171) (Jahn et al., 2014). The Observer Tool was administered in one of the courses of the study program, and the participants took 90–120 minutes to complete it.

Data coding. Participants' responses were compared to the responses of experts analyzing the same videos. Experts were researchers with extensive experience in observing and interpreting classroom situations (Seidel & Stürmer, 2014). Every participant's rating was

coded according to whether it matched (hit = 1) or did not match (miss = 0) the corresponding rating of experts.

Data analysis. Based on the observation scores, a percentage of agreement with experts' judgements was calculated for each participant. To compare planning and observation, observation abilities were described in each group of participants sharing a similar planning profile. Observation and planning abilities were compared between and within groups using their median and range of extreme values.

5. Summary of Publications

5.1. Journal Article I

The following is a brief summary of the article "Lesson Analysis and Plan template: Scaffolding preservice teachers' application of professional knowledge to lesson planning" (Zaragoza et al., 2023), published in the Journal of Curriculum Studies. A copy of the full article is included in Appendix A.

Despite previous research arguing for the educational relevance of lesson planning to connect professional knowledge with teaching practice (McCutcheon, 1980; Stender, 2014), little is known about how these connections may be developed by preservice teachers and where teacher educators may focus their attention. To bridge this research gap, a conceptual inquiry was conducted on the basis of research literature to develop an educational approach to lesson planning and a tool for its implementation. The proposed approach was grounded in the frameworks of teachers' professional vision (Seidel & Stürmer, 2014) and analysis of teaching (Hiebert et al., 2007; Santagata et al., 2018). It showed what kinds of connections may be developed between professional knowledge and lesson planning decisions. These connections require the ability to reason or create hypotheses about possible effects of instruction on student learning, according to principles of teaching and learning. To support this ability, a progression for scaffolding the application of professional knowledge to lesson planning was designed. It was built upon several areas of teacher education research: case methods (Hammerness et al., 2002), pedagogies of practice (Grossman et al., 2009), analysis of classroom artifacts (Darling-Hammond et al., 2005) and lesson planning (John, 2006; Jones & Vesilind, 1996; Mutton et al., 2011). The progression suggests engaging preservice teachers in the gradual application of professional knowledge to iterative cycles that combine lesson plan analysis and lesson planning. Lesson plan analysis involves analyzing lesson plans and hypotheses about expected learning effects; lesson planning involves planning lessons and reasoning about possible learning effects.

A pedagogical tool that encourages the deliberate use of professional knowledge, the Lesson Analysis and Plan template (LAP), was designed through a research-practice partnership. The initial draft was built on research literature on lesson planning (Shavelson & Stern, 1981), teachers' observation (Seidel & Stürmer, 2014) and analysis of teaching (Hiebert

et al., 2007; Santagata et al., 2018). Subsequently, it was implemented in a preparation program. Preservice teachers from two consecutive cohorts used the LAP for lesson planning, implementation, and reflection at three time points of their initial preparation. The template design was optimized through iterative revisions based on field observations and the perceptions of the preservice teachers, faculty, and directors of the program. Perception data were collected by interviewing preservice teachers and recording faculty and director meetings. Detailed explanations of the resulting template and a sample lesson plan were made available. Furthermore, field observations and perception data were used to evaluate the LAP implementation. Based on the challenges identified, recommendations for future LAP implementations were provided. Specifically, it may be necessary to adapt the LAP to the local preparation context; support preservice teachers in developing hypotheses; and take measures that ensure the acceptance and sustainable implementation of the tool.

Overall, this research showed how the most professional side of lesson planning may be supported in preparation programs.

5.2. Journal Article II

The following is a brief summary of the article "Exploring preservice teachers' abilities to connect professional knowledge with lesson planning and observation" (Zaragoza et al., 2021), published in the European Journal of Teacher Education. A copy of the full article is included in Appendix B.

Journal Article II reports an empirical inquiry that aimed to expand the research conducted in the previous study. Two research questions were addressed. First, it was investigated whether the lesson plan template developed in the previous study, the Lesson Analysis and Plan template (LAP), can detect the nature and variation of preservice teachers' connections between professional knowledge and lesson planning (Research Question 1). Preservice teachers ($N = 18$) from a cohort in a university-based program planned a lesson with the LAP after one year of preparation. Because their preparation provided opportunities to connect theory with aspects of practice, such as lesson planning, the LAP was expected to show some connections between professional knowledge and lesson planning. Qualitative and quantitative content analyses of the lesson plans were conducted using an ad hoc coding scheme. Most preservice teachers showed a developing ability to connect professional knowledge with lesson planning. More precisely, the majority were able to predict the effects of their activities on student learning but were unable to justify these predictions with professional knowledge. The findings suggest that the development of this ability requires specific support. Moreover, the LAP can help to identify how preservice teachers develop connections between the theories imparted in coursework and their own lesson planning, and which connections would benefit from further support.

As part of Research Question 2, possible relationships between lesson planning and another aspect of practice, observation of teaching, were explored. Planning and observation seem to require similar applications of professional knowledge, even if they occur in different situations. Either when planning or observing, professional knowledge can be used to describe teachers' actions, explain how they are related to specific concepts, and predict their effects on student learning. This study examined whether the ability to connect professional knowledge with lesson planning is similar to the ability to connect such knowledge with observation of teaching. Knowing more about possible relationships between these abilities would be beneficial for the development of curriculum that supports the integration of theory and practice (Darling-Hammond et al., 2005). Preservice teachers' observations were assessed with a

professional vision test (Seidel & Stürmer, 2014) and compared with the lesson plans that were assessed previously in Research Question 1. The differences found between planning and observation suggest that these abilities are not identical. Therefore, teacher educators should support the development of each ability individually. Furthermore, most participants were more successful at observing than at planning. A possible explanation is that more cognitive abilities mediate the application of professional knowledge to lesson planning (Blömeke et al., 2015). As such, a reasonable approach to bringing theory to practice might be to apply theories and concepts to observation before these are applied to lesson planning.

Taken together, these findings can contribute to providing targeted support in connecting professional knowledge with lesson planning and developing curriculum that supports the integration of theory and practice.

6. General Discussion

This dissertation aimed to develop a pedagogy that supports preservice teachers in connecting professional knowledge with lesson planning decisions. It also aimed to explore possible relationships between lesson planning and observation. More precisely, two research studies were conducted as part of the dissertation. The first study investigated what kinds of connections may be developed by preservice teachers, and how teacher educators may support this ability in preparation programs (Journal Article I). The second study showed two goals, first, to examine the potential of a novel lesson plan template to reveal connections between theory and lesson planning decisions, and second, to explore whether there are any relationships between lesson planning and observation, particularly with regard to the ability to use professional knowledge in these tasks (Journal Article II). In what follows, the main findings are presented.

This chapter is structured as follows. It first summarizes two findings of the first study (Findings I and II) and three findings of the second study (Findings III, IV and V). It discusses their link to previous research and open questions that might be addressed in future research. This is followed by a section on the practical implications of the findings for teacher education. Subsequently, critical limitations of the findings and suggestions to overcome them in future research are described. The last section presents the conclusions of this research.

6.1. Discussion of the Main Findings

6.1.1. Finding I: The development and analysis of hypotheses about teaching and learning may support the application of professional knowledge to lesson planning

To investigate how to support preservice teachers in connecting professional knowledge with lesson planning, a conceptual inquiry was conducted in the first study (Journal Article I). An educational approach to lesson planning was developed on the basis of research literature on teacher education. The frameworks of teachers' professional vision (Seidel & Stürmer, 2014) and analysis of teaching (Hiebert et al., 2007; Santagata et al., 2018) were used to determine which kinds of connections may be developed between theory and decision making. These connections require reasoning or creating hypotheses about possible effects of instruction on student learning, according to principles of teaching and learning. To support preservice teachers in making these kinds of connections, a scaffolded progression was developed by

drawing on several areas of research literature—lesson planning (John, 2006; Jones & Vesilind, 1996; Mutton et al., 2011), case methods (Hammerness et al., 2002), pedagogies of practice (Grossman et al., 2009), and analysis of classroom artifacts (Darling-Hammond et al., 2005). The progression suggests engaging preservice teachers in the gradual application of professional knowledge to iterative cycles that combine lesson plan analysis and lesson planning. Lesson plan analysis involves analyzing lesson plans and hypotheses about expected learning effects; lesson planning involves planning lessons and reasoning about possible learning effects.

Previous research has pointed out the educational relevance of teachers' lesson planning to connect theory with practice (McCutcheon, 1980; Stender, 2014; Stender et al., 2017). This research expands previous research by showing how to utilize this potential in teacher education. It goes beyond previous models on lesson planning (John, 2006; Klafki, 1995; Tyler, 2013) by including a reasoning dimension that supports the application of professional knowledge to both decision-making and the continuous improvement of lesson plans. This reasoning dimension emphasizes the most professional side of lesson planning (McCutcheon, 1980).

Future studies should examine the impact of the proposed approach on the quality of preservice teachers' lesson planning decisions (König et al., 2020; Seidel et al., 2013; Werner et al., 2017) in comparison to other lesson planning approaches that do not support the deliberate application of professional knowledge. Its impact on student learning (including cognitive and motivational-affective processes) should be also examined. Further research might benefit from integrating subject-specific perspectives into this approach (Tillema, 1984).

6.1.2. Finding II: The Lesson Analysis and Plan template encourages the use of professional knowledge in lesson planning

A pedagogical tool for preparation programs was also developed in the first study (Journal Article I). This tool, called the Lesson Analysis and Plan template (LAP), encourages the use of professional knowledge in lesson planning. More precisely, it requires reasoning or developing hypotheses about possible effects of instruction on student learning. The LAP was developed through a research-practice partnership, involving the design of the tool on the basis of research literature—lesson planning (Shavelson & Stern, 1981), teachers' professional vision (Seidel & Stürmer, 2014), and analysis of teaching (Hiebert et al., 2007; Santagata et al.,

2018)—and its refinement on the basis of a field experience in a preparation program. Preservice teachers used the LAP for lesson planning, enactment, and reflection. Field observations and the perceptions of preservice teachers, faculty, and directors of the program were used to optimize the template. Perception data were collected by interviewing preservice teachers and recording faculty and director meetings. Detailed explanations of the resulting template (see Section 4.3.2.) and a sample lesson plan (see Appendix C) were made available.

In addition, field observations and perception data were used to explore challenges associated with the LAP implementation. Based on the challenges identified, recommendations for future implementations were provided. LAP implementers may need to (1) adapt the LAP to the local preparation context (e.g., the requirements of the curriculum), (2) support preservice teachers in hypothesis development (e.g., in the ways proposed in this research, see Finding I) and (3) take measures that ensure the acceptance and sustainable implementation of the tool among preservice teachers and faculty (e.g., clarifying the educational relevance of developing hypotheses in lesson planning; involving faculty in implementation evaluations).

Finding II builds upon Finding I by showing a pedagogical tool (Putnam & Borko, 2000) that may help teacher educators implement the proposed approach in preparation programs and by providing practical recommendations for future LAP implementers. Further research should examine the use of the LAP in a broader spectrum of preparation programs to further develop this tool and gain further and more differentiated recommendations for practice.

6.1.3. Finding III: The Lesson Analysis and Plan template can detect connections between professional knowledge and lesson planning decisions

The second study (Journal Article II) investigated whether the LAP can detect preservice teachers' connections between professional knowledge and lesson planning, and how these connections vary among preservice teachers (Research Question 1). Preservice teachers from a masters' cohort were asked to plan a lesson with the LAP. The LAP tasks required writing a lesson plan, *predicting* possible effects of instruction on student learning and *justifying* these predictions based on principles of teaching and learning. Qualitative and quantitative content analyses of participants' predictions and justifications showed that most participants (94%) were able to make predictions (*Mdn* = 3 predictions, range = 1–14), however, less than the half of the participants (39%) justified their predictions (*Mdn* = 1 justification, range: 1–7). Regarding the quality of participants' justifications, less than a quarter of the participants (22%)

referenced aspects of their professional knowledge explicitly and a tenth of the participants (11%) included complementary explanations. In other words, most participants showed abilities to predict possible effects of instruction on student learning but had difficulty justifying these predictions with knowledge acquired in their study program. These results suggest that the LAP can detect the nature of preservice teachers' connections between professional knowledge and lesson planning. Furthermore, individual lesson planning profiles showed large differences among participants. For example, the strongest profile showed 14 predictions, seven justifications, six references to professional knowledge and five complementary explanations. In contrast, the weakest profile did not show any correct prediction or justification. These findings indicate that the LAP can detect variation among preservice teachers' connections.

Previous research on the application of professional knowledge has mainly focused on the interpretation of video-taped classroom situations (Stürmer et al., 2013), reflection through video-based observation (Chung & van Es, 2014; Santagata et al., 2018) and reflection through case writing and analysis (Hammerness et al., 2002). To date, few studies have investigated this ability in relation to the lesson planning task. König et al. (2020) investigated the application of knowledge about a single principle of teaching and learning, adaptive teaching. Seidel et al. (2013) examined the effects of different instructional approaches of video-based observation upon the ability to apply knowledge about principles of teaching and learning to lesson planning. The present study expands this literature by using the construct of professional vision with two purposes, (1) to develop a coding schema that assesses the use of knowledge about principles of teaching and learning in lesson planning and (2) to design a lesson plan template that provides a research lens into this ability. Moreover, this study responds to a call for research on professional vision in the lesson planning context (Nückles, 2021). It demonstrated how the application of professional vision can be broadened to include a wider range of professional situations, carving a unique place in the professional vision literature.

Further research might benefit from using the LAP to assess the application of professional knowledge in the context of retrospective reflection. The template tasks might guide reflection in similar ways as proposed in analysis of teaching (Hiebert et al., 2007; Santagata et al., 2018). After lesson planning and enactment, preservice teachers may examine whether their predictions were fulfilled based on students' responses. If predictions were not fulfilled (or partially fulfilled), preservice teachers should use professional knowledge to explain why and suggest alternatives.

At present, instruments that assess lesson planning abilities in a standardized yet contextualized way are scarce (König et al., 2015). Further research might benefit from transforming the LAP into an instrument that enable to collect data from large samples and compute statistical analyses. The Observer Tool (Seidel & Stürmer, 2014) could be a starting point for the design of this instrument by replacing video clips of teaching situations with excerpts from lesson plans.

6.1.4. Finding IV: Connecting professional knowledge with lesson planning decisions is a difficult task

Another finding was reported as part of Research Question 1 in the second study. Interpreting Finding IV requires taking a closer look at the research context. A cohort of preservice teachers after one year of preparation participated in this study. Their preparation offered many opportunities to connect theory with practice. Four courses supported the acquisition of knowledge about principles of teaching and learning and its application to various aspects of practice, including lesson planning. As such, participants' lesson plans were expected to show some connections with theory. However, most lesson plans showed few to no connections with theory. This means that resources other than professional knowledge were used. Perhaps intuition, folklore and memories from school days were involved (Lampert & Ball, 1998). This finding suggests that using professional knowledge to reason about possible effects of instruction is a difficult task.

Finding IV is consistent with previous research showing preservice teachers' difficulty applying professional knowledge to their own teaching practice (e.g., Hammerness et al., 2002; Penso & Shoham, 2003). This dissertation expands this research by focusing on the under-researched task of lesson planning. Further research is needed to determine exactly what makes it difficult for preservice teachers to plan lessons with the LAP, in particular when it comes to developing hypotheses (predictions and justifications). A variety of methods—such as think-aloud protocols, interviews (including stimulated recall through one's own lesson plans) and focus groups—may grant access to the nature of their difficulties. Further research might also examine which resources are commonly used by preservice teachers when planning lessons. Information about these resources might be useful in the design of powerful support strategies in teacher education.

This study captured preservice teachers' lesson planning skills at the end of their first year of preparation and just before they began a 2-year period of fieldwork experiences supported by university courses. An open question remains as to how lesson planning skills would have evolved a posteriori (Hammerness et al., 2002; Mutton et al., 2011) and what aspects of preparation might have contributed to that growth (König et al., 2020). Curriculum that supports the development of lesson planning skills might benefit from this research.

The results revealed large differences among participants after one year of preparation. It seems that particular students' characteristics moderated the development of lesson planning skills. Therefore, additional research is needed to identify such students' characteristics. The more advanced state of research on teacher observation might be used for this purpose. To be specific, it could be investigated whether preservice teachers' interest in teaching and learning might also a predictor for the development of lesson planning skills (Stürmer, Könings, & Seidel, 2015; Stürmer, Seidel, & Kunina-Habenicht, 2015).

6.1.5. Finding V: Lesson planning and observation are distinct abilities

Another purpose of the second study was to explore possible relationships between lesson planning and another aspect of practice, observation of teaching (Journal Article II, Research Question 2). Planning and observation seem to require similar applications of professional knowledge, even if they occur in different situations. Either when planning or observing, it is possible to describe teachers' actions, explain how they are related to specific didactical concepts, and predict their effects on student learning. This interpretation of the relationship between planning and observing was examined by comparing preservice teachers' lesson plans (as assessed previously in Research Question 1) with their observations of teaching. It was expected that, if planning and observing are similar abilities, preservice teachers with higher planning skills would show higher observation skills, and the opposite would be true for the participants with lower planning skills.

Observation skills were assessed with a professional vision test (Seidel & Stürmer, 2014) and described in each participant using a percentage of agreement with experts. A median and range of extreme values were used to compare planning with observation abilities among groups of participants with similar lesson planning profiles. The results showed large differences between planning and observation. The participants who showed no connections between professional knowledge and lesson planning (61% of participants) were successful in

connecting their professional knowledge with observation (*Mdn* = 37% expert agreement; range: 17%–84%). The observation skills in some of these participants were, compared to previous observation studies, very advanced (Jahn et al., 2014; Stürmer, Seidel, & Kunina-Habenicht, 2015). Most of the participants who showed connections between professional knowledge and lesson planning (33% of participants) showed a developing level of planning skills (median of explicit references to professional knowledge: *Mdn* = 0,5; range = 0–1), in contrast to a moderate to very high level of observation skills (*Mdn* = 64% expert agreement, range = 52%–90%). The strongest planning profile of the cohort outperformed their peers' planning skills considerably (frequency of references to professional knowledge: *n* = 6), whereas this participant displayed average observation skills (61% expert agreement). In sum, participants were more successful at either planning or observing. This finding suggests that these abilities are not identical.

Furthermore, the results showed that most participants were more successful at reasoning about observations of teaching. This trend might be due to coursework emphases. Another reason could be that planning lessons is more difficult than interpreting videotaped classroom teaching. Perhaps additional perception, interpretation and decision-making abilities mediate the application of professional knowledge to lesson planning (Blömeke et al., 2015).

Previous research has highlighted the need of providing preservice teachers with opportunities to observe and interpret classroom situations (e.g., Santagata et al., 2018; Seidel et al., 2013; van Es & Sherin, 2002). This study expands previous research by showing that acquiring the ability to apply professional knowledge to observations of teaching does not ensure the ability to apply such knowledge to lesson planning. This study addressed a research gap by providing insights into the interrelationships of the planning and observation pedagogies (Darling-Hammond et al., 2005). Further qualitative research is needed to gain a deeper understanding of the similarities and differences between planning and observation. For example, preservice teachers may be asked to apply the exact same principles of teaching and learning across observation and planning situations, so that their hypotheses (predictions and justifications) may be compared.

6.2. Implications for Teacher Education Practice

The main findings of this dissertation have practical implications for teacher education. Concerning the first study (Journal Article I), an educational approach was developed to support

preservice teachers in connecting professional knowledge with planning decisions. This model may shape curriculum development in teacher education in several ways. Educational courses (on pedagogical content knowledge or general pedagogical knowledge) may incorporate activities that support the development of hypotheses in lesson planning, based on principles of teaching and learning. Lesson planning courses may provide opportunities that help preservice teachers progress from analyzing lesson plans to lesson planning, enactment, and reflection.

Another aim of the first study was to develop a tool that encouraged the use of professional knowledge in lesson planning. The LAP may help teacher educators implement the proposed approach to lesson planning. The lessons learned from its first implementation in teacher education may be helpful to provide powerful learning opportunities in the future. They emphasize that the LAP should not be implemented in preparation programs as is.

The second study (Journal Article II) showed that the LAP can detect the nature and variation of connections between professional knowledge and lesson planning. As such, the LAP might enable teacher educators to identify how their students make use of the theories addressed in their courses. This feedback would guide teacher educators to those connections that require further attention and support. The LAP might also be a useful tool to gain insight into preservice teachers' reasoning behind their lesson plans (and teaching performance) and to understand which theories are viewed as relevant (and less relevant) to their own teaching practice.

Participants in the second study were at the end of their first year of preparation. Despite the many opportunities provided during their preparation to connect theory with practice, most participants showed difficulty connecting professional knowledge with lesson planning. Therefore, it seems that the use of professional knowledge in lesson planning is a difficult task for which preservice teachers need specific support (Penso & Shoham, 2003). Novas (2020) showed positive effects of some aspects of the scaffolded progression proposed in this dissertation on preservice teachers' ability to use professional knowledge in lesson planning (the gradual application of professional knowledge to planning activities and developing hypotheses, followed by lesson plan analysis through reciprocal peer feedback and subsequent revisions of lesson plans).

Another aim of the second study was to examine possible relationships between lesson planning and observation of teaching. The relationships found between planning and

observation suggest ways to bring professional knowledge closer to practice. Their differences suggest that planning and observation are distinct abilities. As such, it cannot be assumed that helping preservice teachers apply specific theories to reason about observations of lessons will ensure their ability to apply such theories to reason about their own lesson plans. Teacher educators must target each ability individually.

In addition, the results showed that, for most participants, planning was more difficult than observing. If planning lessons is more difficult than observing teaching, then a reasonable approach might be to use observations of teaching as preparation for planning (Grossman et al., 2009; Gruber et al., 2020, p. 298). This might occur by helping preservice teachers apply the theories and concepts they use during observation to their own lesson plans. To be specific, preservice teachers could initially observe positive and critical examples of videotaped classroom teaching and interpret them based on a particular principle of teaching and learning (e.g., whether and how the observed teacher clarifies the learning goals at the beginning of the lesson). Subsequently, they could use this principle in planning their own lessons (e.g., how to start the lesson by clarifying the learning goals). Further research is needed to understand how the observation and planning pedagogies can be combined in teacher education, so that preservice teachers benefit from their relationships. This research would be useful to design curriculum that helps preservice teachers progress from the acquisition of professional knowledge to its application to professional practice.

6.3. Limitations and Further Research

A few limitations should be considered when interpreting the findings of this dissertation.

6.3.1. Journal Article I

Regarding the first study, the proposed approach to lesson planning shows a limitation. Because the educational approach is focused on preservice teachers' ability to connect professional knowledge with lesson planning, only some aspects of the lesson planning process were addressed. To date, the body of empirical research on how teachers plan lessons (König et al., 2020; Shavelson & Stern, 1981) and how teachers learn to plan is limited (Clark & Peterson, 1986; Mutton et al., 2011). In fact, educational approaches to lesson planning are often grounded in models that lack empirical validation (Clark & Peterson, 1986; John, 2006; Scholl, 2018; Zahorik, 1975). Therefore, empirical research is urgently needed to develop models that

describe teachers' lesson planning and may serve as the basis for the development of lesson planning pedagogies.

An issue with the design of the LAP needs to be borne in mind. This lesson plan template include tasks that provide support in lesson plan writing. Even though the lesson plan writing tasks draw attention to areas relevant to teachers' lesson planning and their design was refined based on field experience, it is questionable whether templates with these tasks provide greater support for lesson plan writing than other templates. It is possible that further tasks are necessary for specific educational purposes (e.g., tasks that require specifying which teaching methods are used in the lesson). Also, alternative template layouts might be more advantageous. For example, the timing task (i.e., the task asking about the duration of each activity) could be located in the leftmost column instead of in the rightmost column. Comparative studies are also needed to determine whether lesson plans created with the LAP are more helpful in the implementation of lesson planning decisions than other lesson plans.

The recommendations provided to future implementers of the LAP are limited for several reasons. These recommendations are related to the challenges encountered in the implementation of the LAP in a preparation program. The challenges were identified based on preservice teachers', faculty's and directors' perceptions. Although perception data were collected in a systematic way (interviews and meeting recordings), data were not analyzed systematically. Further research might benefit from survey studies that enable to draw robust conclusions about aspects critical to the successful implementation of the LAP. Furthermore, because perception data were gained from stakeholders of a vocational teacher program, they might not be representative of what may happen in any teacher education program. Therefore, implementing the LAP in a broader spectrum of preparation programs would enable to gain field experience under different conditions and provide further and more differentiated recommendations.

6.3.2. Journal Article II

Regarding the second study, the external validity of the findings is limited for several reasons. This study involved German vocational preservice teachers with STEM teaching subjects from a master's program cohort. The sample was selected based on the fact that preservice teachers in this study program had received opportunities for the application of professional knowledge to lesson planning and observation (purposive sampling; see more about the research context

in Section 4.1.2). However, because of the small sample size ($N = 18$), further research is needed to replicate these findings with a larger sample. Future researchers should note that, because participants held a bachelor's degree in Engineering, their abilities are comparable to bachelor's students.

Furthermore, the findings are not generalizable to the preservice teacher population because the sample was not representative of this population. Future research might benefit from replicating these findings with preservice teachers showing a broader range of subject domains (both STEM and social sciences/humanities) for various school types (elementary, secondary, and vocational education). Preservice teachers of social sciences/humanities subjects are likely to outperform preservice teachers of STEM subjects across the planning and observation situations (Blomberg et al., 2011). Furthermore, a crucial methodological aspect should be considered in the assessment of observation abilities. The observation test used in this dissertation, the Observer Tool (Seidel & Stürmer, 2014), does not allow for comparisons across school types. The observation skills of preservice teachers in secondary education are expected to be higher than in elementary or vocational education because of the test design (all video clips feature secondary education lessons) (Jahn et al., 2014). Therefore, comparative studies would require controlling for the participants' school type.

Qualitative and quantitative content analyses of participants' lesson plans were conducted to investigate Research Question I. Because participants had not labeled many of their predictions and justifications, the participants' intentions behind their responses were often unknown. Yet, the importance of this qualification is mitigated in this study due to the acceptable inter-rater agreement shown by the raters who analyzed the lesson plans. Future studies with the LAP are advised to ensure that predictions and justifications are clearly differentiated and grouped by analytic chunks.

Possible relationships between observation and planning were explored in Research Question 2. These abilities were assessed with different instruments. The observation test included closed-ended questions whereas planning skills were assessed with open-ended questions. The use of a different question format may have compromised the comparison between planning and observation. It is possible that developing hypotheses is more demanding than rating them on a Likert scale. To avoid this threat to validity, future comparative studies should use the same question format. One possibility is to keep the closed-ended format for both assessments. An instrument similar to the observation test could be developed for lesson

planning by replacing video clips with excerpts from lesson plans. Another possibility is to assess observation through the same open-ended questions used in the lesson planning tool.

6.4. Conclusions

This dissertation tackles the challenge of supporting the integration of professional knowledge with teaching practice in initial teacher education. In light of previous research arguing for the educational relevance of lesson planning to connect theory with practice (McCutcheon, 1980; Stender, 2014), a pedagogy was developed that shows what kinds of connections may be developed by preservice teachers and which scaffolds may be provided by teacher educators to support this ability. This work draws upon more advanced research in other areas of teacher education—observation and reflection (Hammerness et al., 2002; Hiebert et al., 2007; Santagata et al., 2018; Seidel & Stürmer, 2014)—and goes beyond previous models on lesson planning (John, 2006; Klafki, 1995; Tyler, 2004) by adding a reasoning dimension that supports the application of professional knowledge to decision-making and the continuous improvement of lesson plans. This dissertation expands previous research on professional vision (Seidel & Stürmer, 2014; van Es & Sherin, 2002) by broadening the application of this indicator to a wider range of professional situations, carving a unique place in the research literature. Further, this research work has great practical relevance because it provides teacher educators with a tool for the implementation of the proposed pedagogy and shares recommendations to facilitate powerful learning experiences. This dissertation expands previous research on the pedagogies of teacher education by providing insights into the interrelationships of the lesson planning and observation pedagogies. Empirical evidence showed that being successful in analyzing videotaped classroom situations does not ensure the same proficient level in planning lessons. Finally, this dissertation targets the under-researched field of lesson planning and might be the basis for starting a research program and promoting this topic in teacher education research. Taken together, these findings might contribute to developing curricula that support preservice teachers in planning lessons and connecting theory with practice.

7. References

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8. Appendices

8.1. Appendix A: Journal Article I

Note: Appendix A contains the full text of Journal Article I (see below); for copyright reasons, it is not included in the public version of the thesis overview.

> Zaragoza, A., Seidel, T., & Santagata, R. (2023). Lesson Analysis and Plan template: Scaffolding preservice teachers' application of professional knowledge to lesson planning. *Journal of Curriculum Studies*, *55*(2), 138-152. http://dx.doi.org/10.1080/00220272.2023.2182650

8.2. Appendix B: Journal Article II

Note: Appendix B contains the full text of Journal Article II (see below); for copyright reasons, it is not included in the public version of the thesis overview.

> Zaragoza, A., Seidel, T., & Hiebert, J. (2021). Exploring preservice teachers' abilities to connect professional knowledge with lesson planning and observation. *European Journal of Teacher Education*. Advance online publication. https://doi.org/10.1080/02619768.2021.1996558

8.3. Appendix C: Sample lesson plan

Lesson plan writing tasks		
Content	(1) Apprenticeship	Electrical Engineering and Information Technology
	(2) Subject	System and Device Technology (analysis of analogue and digital signal interfaces, documentation of circuits, analysis of the transmission behaviour of active components, sensors and actuators and creation of electronic circuit block diagrams)
	(3) Unit	Development and simulation of an industrial temperature sensor circuit
	(4) Content of the lesson	Analog and digital signal interfaces, customer meeting and scope statement document
Learning goals	(5) Learning goals of the unit	Technical skills: - Selecting transmission and implementation components according to measurement circuit parameters - Developing, simulating and evaluating data logging circuits Social skills: - Team problem-solving - Providing fair peer feedback Methodological skills: - Complying with customers' requirements and scope statement guidelines Personal skills: - Self-reliant problem-solving
	(6) Professional product(s) of the unit	- Simulation of a temperature measurement circuit with the MultiSIM BLUE freeware - PowerPoint presentation of the circuit for the customer (i.e., audience with technical background knowledge)
	(7) Lesson phase	This lesson belongs to the orientation or introductory phase.
	(8) Learning goals of the lesson	At the end of this lesson, students are able to formulate in their own words the main aspects of the customer order: (1) field of application and functions (2) of the ordered product (the temperature measurement system), (3) time frame for the completion of the order and (4) desired results.

	Activities	Social configuration	Materials	Timing
Lesson plan writing tasks	Presentation and video: I present a situation in which students receive the order of a fictitious customer who works in the mashing process of a brewery. I play a video to show a brewery, the mashing process and the role of the temperature measurement system.	Whole class	Projector, computer, video	10 min
	Customer meeting: Students need to take the minutes of a customer meeting, during which the customer orders a temperature measurement system for the mashing process of the brewery. I play the role of the customer and the students write down the main aspects of the customer's order in their scope statement documents. The aspects are: (1) field of application and (2) functions of the temperature measurement system, (3) time frame for the completion of the order and (4) desired results.	Individual work	Students' scope statement documents	10 min
	Whole class discussion: I inform the students that I would like to get an impression of whether everyone was able to obtain the relevant information from the customer meeting but that their responses are not being assessed at this moment. I ask them questions about the four main aspects of the customer's order, making sure that I wait at least three seconds after every question and after the students' responses. I react to the students' responses with phrases, such as 'say more about that', 'who can put that in their own words?', 'why do you think that?', 'does anyone see it a different way?' and 'who can add on to that?'	Whole class		15 min
	Reading time and students' questions: I hand out some complementary documents to the students, including a short project description and the necessary technical data and I announce when the customer order is due. Students read the documents and may ask questions to clarify what they need to do in the assignment. The text in the handouts was carefully selected and adapted to students with language difficulties. I walk around the classroom, approaching students individually and paying more attention to students with learning difficulties.	Individual work	Handouts	10 min

Reasoning tasks	1- <u>Regarding the learning situation</u> • I expect the learning situation to foster students' self-determined learning motivation. • Because the learning situation shows an authentic problem-solving situation that may occur in any company, students identify with it and perceive the relevance of the learning content. Prenzel et al. (2001) show that the perceived relevance of the learning content fosters students' self-determined learning motivation. A current meta-study (Knogler et al., 2017) shows evidence of the positive effect of contextual teaching (given by the authentic problem-solving situation) on students' motivation, interest and learning achievement. 2- <u>Regarding the media used for the presentation of the problem-solving situation</u> • The use of different media for the presentation of the problem-solving situation (roleplay, video and handouts) is expected to foster students' ability to memorize the information about the problem-solving situation, so that they can retrieve it easily in the rest of lesson phases to follow. • The problem-solving situation is presented in different ways (multimedia), each providing a different representation of the information (multicoding) (Weidenmann, 2002). The roleplay shows spoken information, the video shows both spoken information and images and the handouts show both written information and images. This information is perceived through several senses (multimodality): the sense of sight and the sense of hearing (Weidenmann, 2002). Because the information is perceived through several senses, it is stored with several representations of knowledge so that the information is better memorized and can be retrieved more easily (Eder, 2009). 3- <u>Regarding the preparation of minutes as individual work</u> • I expect the individual preparation of the minutes to lead to higher learning motivation than if it was completed in a group setting. • Research shows that only 'true group tasks' may be set as group work. True group tasks require the cooperation of all group members to be carried out (Cohen, 1994; Kunter & Trautwein, 2013). Because the preparation of minutes is a task that one person can perform alone, it would not be adequate to set it as group work. If it were a group task, there would be a likely loss of motivation due to, for example, 'free-rider' and 'social-loafing' effects (Kunter & Trautwein, 2013).

Reasoning tasks	4- Regarding the teacher's reactions to the students' responses during the whole class discussion • I expect the teacher's reactions to the students' responses to foster students' reasoning and understanding, resulting in a productive classroom discussion. • I expect this because research shows that the mentioned teacher's reactions are 'talk moves' that encourage students to contribute ('say more about that'), listen to one another ('who can put that in their own words?'), dig deeper into their own reasoning ('why do you think that?') and work with each other's ideas ('does anyone see it a different way?') (Michaels & O'Connor, 2015). O'Connor et al. (2016) showed that student learning in productive classroom discussions does not necessarily depend on the number of students' vocal contributions. Both students making vocal contributions and those actively listening benefit from the discussion. 5- Regarding the teacher's announcement that there is no assessment • I expect the teacher's announcement that there is no assessment to foster motivation in students with learning difficulties. • I expect this because, with the announcement that there is no assessment, the teacher is separating the present learning situation from a performance situation, so that students who are unsure whether they correctly gathered the information of the customer meeting are not afraid of giving a wrong answer (Weinert, 1999). This contributes to a supportive learning climate in which student errors are used as opportunities to learn (Helmke, 2009). 6- Regarding the waiting time after the teacher's questions and students' responses • I expect the teacher's prolonged waiting time (of at least three seconds) after posing every question and after students' responses to foster students' engagement. • The waiting time after the teacher's questions ensures that all students have enough time to think about the question and organize their thoughts (particularly students with a weak learning profile); the waiting time after students' responses signals the teacher's high expectations and trust, which lead students to give longer answers and speculate more (Helmke, 2009). The waiting time technique contributes to good timing in classroom teaching, which is an important aspect of supportive learning climates (Helmke, 2009). 7- Regarding the selection and adaptation of the text in the handouts • I expect the text selection and adaptation in the handouts to foster reading comprehension in students with language difficulties. • I expect this because the selected and adapted text (1) is appealing and addresses students as 'dialogue partners', (2) is challenging and impressive with its level of language and content, (3) is not confusing or discouraging because of its length and level of detail and (4) is not written in an artificial style of language (Leisen, 2012). Texts that are too demanding in terms of content and language may lead to experiences of failure and, in turn, to negative effects on the perceived competence. In the long run, this may lead students with learning difficulties into a negative spiral, leading them to avoid reading technical texts (Leisen, 2012).

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