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Facilitating academic text-based discussions in initial teacher education: Evaluating specialized knowledge

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HIGHLIGHTS

- Decomposition of text-based discussion into tasks to assess specialized knowledge.
- Differences were observed in pre-service teachers within courses on decision-making.
- Performance on decision-making and noticing a discussion varied across courses.
- Curriculum design is crucial to support the learning of text-based discussions.

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1. Introduction

Ensuring that students comprehend complex texts that explain abstract themes with academic language is one of the goals that schools must achieve if they want their students to be able to access crucial information in today's world (Levy & Murnane, 2013). Text-based discussions have been proposed as an effective reading activity to facilitate comprehension of academic texts since productive dialogue serves as a mechanism to engage students in reasoning and encourage participation. Likewise, this activity offers students the scaffolding they need to construct coherent representations of the texts they read (Kucan & Palincsar, 2013; Kucan, Palincsar et al., 2011; McKeown, Beck, & Blake, 2009; Murphy, Wilkinson, Soter, Hennessey, & Alexander, 2009; Nystrand, Gamoran, Kachur, & Prendergast, 1997). Although research has been conducted regarding the effectiveness of interventions in school contexts, less has been done to understand the expertise that in-service teachers require in order to put this dialogue-based approach into action (Kucan, Hapgood, & Palincsar, 2011; Kucan, Palincsar et al., 2011).

Furthermore, teacher education has shifted towards practice-based teacher preparation (Ball & Forzani, 2009, 2010; Darling-Hammond & Hammerness, 2005; Grossman & McDonald, 2008; Grossman, Compton, Igra, Ronfeldt, Shahan, & Williamson, 2009; Grossman, Hammerness, & McDonald, 2009). Two principal changes are behind this pivot from theory to practice. First, a repertoire of core practices has been defined, including among others, developing explanations using models, facilitating productive discussions. These core practices are defined as activities essential to fostering ambitious teaching (Ball & Forzani, 2009, 2010; Grossman, Compton et al., 2009; Grossman, Hammerness et al., 2009). Second, core practices are learned through the pedagogies of practice. Accordingly, teachers are more likely to acquire practices relevant to their careers if they do so through modeling, rehearsing, and enacting (McDonald, Kazemi, & Kavanagh, 2013). And, although the core practices are described free of context, learning them requires making them specific to a subject matter (Ball & Forzani, 2010; Kucan, Hapgood et al., 2011).

Within subject-specific core practices, the activity of facilitating text-based discussions of academic texts has already been decomposed to determine the specialized knowledge necessary to effectively enact the practice, especially for in-service teachers (Kucan & Palincsar, 2013; Kucan, Hapgood et al., 2011; Kucan, Palincsar et al., 2011). However, the specialized knowledge needed to enact this subject-specific practice in a teacher education program has been decomposed but not evaluated, much less in the context of teacher preparation in Latin America, a region characterized by severe educational inequalities. Thus, the purposes of this study are: (1) to decompose the subject-specific practice of facilitating text-based discussions of academic texts into the key

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types of knowledge and skills needed to enact this core practice; (2) to propose four tasks to evaluate the specialized knowledge that pre-service teachers learn in teacher education; and (3) to compare the performance of pre-service teachers in courses at different levels.

2. Text-based discussions to comprehend academic texts

Currently a consensus exists that reading comprehension, alongside other skills such as writing, is one of the key goals for school learning. However, not all students will learn this expected skill (Biancarosa & Snow, 2006; RAND, 2002). Although more research has focused on understanding the challenges related to decoding skills across languages (Ziegler & Goswami, 2005; Ziegler et al., 2010), recent years have seen the emergence of studies exploring predictors of reading comprehension beyond decoding and vocabulary (LaRusso et al., 2016; Language and Reading Research Consortium, 2015; Meneses et al., 2017; Uccelli, Barr et al., 2015; Uccelli, Phillips Galloway, Barr, Meneses, & Dobbs, 2015). This research illuminates the point that not all texts pose the same reading comprehension challenges to students. For example, expository texts turn out to be more difficult than narrative texts (Graesser, McNamara, & Louwerse, 2003; McNamara, Ozuru, & Floyd, 2011), which are moreover, the predominant genre from which students learn across content areas.

As such, the texts and their characteristics—in particular, those that students read in various subject areas—have become a relevant focus of study in recent decades (Shanahan & Shanahan, 2008). Academic texts are very different from everyday conversations (Schleppegrell, 2001, 2004; Snow & Uccelli, 2009; Meneses et al., 2017; Uccelli, Barr et al., 2015; Uccelli, Phillips Galloway et al., 2015). They are frequently described as complex and abstract, because their language often contains a lot of conjunctions, discourse markers, extended noun groups with modifiers, nominalizations, extended and embedded clauses, high lexical density, cross-discipline, and discipline-specific vocabulary. Academic texts display complex discourse organization, as the majority use expository or argumentative structures (Schleppegrell, 2004; Snow & Uccelli, 2009) that place a higher cognitive demand on readers and require extensive background knowledge.

The complexity of academic texts is not the only reason students earn low scores. Texts used for learning at school are often poorly written, offer inadequate explanations, fail to display causal connections between different events, or are not well-structured (Beck, McKeown, Hamilton, & Kucan, 1997; Snow & Sweet, 2003).

At the same time, in many countries, text complexity is back in debate thanks to curricular reforms, as is the case in the United States. The Common Core State Standards (CCSS) note that, "all students must be able to comprehend texts of steadily increasing complexity as they progress through school" (NGA & CCSSO, 2010, p. 2). The definition of text complexity suggested in the CCSS has undergone many revisions. It has thus become clear that it is necessary to continue studying the different aspects involved in text complexity, including both qualitative and quantitative features, as well as those concerning the reader (Fang, 2016; Gamson, Lu, & Eckert, 2013; Hiebert & Mesmer, 2013; Moore, Zancanella, & Ávila, 2014; Newhouse, 2016; Pearson & Hiebert, 2014; Williamson, Fitzgerald, & Stenner, 2014). However, in Latin America, a region facing a relevant educational gap in reading comprehension, the debate about text complexity and reading comprehension performance by genre, topic, and type of lexical-grammatical resource is still emerging.

Perhaps even more nascent than the matter of text complexity is the question of how to support students comprehend complex academic texts. In the Latin American region, comprehension is frequently addressed from a standpoint emphasizing reading strategies, rather than with discussion-based instruction centered on the content itself of the texts. A study in the United States comparing these two approaches (McKeown et al., 2009) found that the discussion-based approach had a greater effect than the reading strategy-based approach. This research reveals the importance of discussions in providing the scaffolding necessary for readers to confront the surface-level challenges of the texts, internalize the information and, therefore, comprehend it.

Consequently, in recent decades, proposals centered on interaction, dialogue, and discussion for learning in these various subject-matters have proliferated (Applebee, Langer, Nystrand, & Gamoran, 2003; Beck, McKeown, Sandora, Kucan, & Worthy, 1996; Chinn & Anderson, 1998; Nystrand et al., 1997; Wilkinson, Soter, & Murphy, 2010; Wolf, Crosson, & Resnick, 2005). The meta-analyses conducted by Soter et al. (2008), and Murphy et al. (2009) delved into new proposals for small group discussions to comprehend texts and concluded that quality discussions foster authentic questions with high-level reasoning and comprehension, spur students to come up with explanations that contain a high density of words to signal reasoning, and have follow-up cycles to develop critical thinking. In these proposals, we find a sociocultural (Vygotsky, 1979; Wertsch, 1993) and dialogue-based (Alexander, 2003; Bajtin, 1982; Cazden, 2001; Mercer, 2000) vision of learning and language development relying on interaction and the joint construction of meanings among subjects.

Such discussion-based approaches have proved effective in supporting students not only in reading comprehension but also in boosting students' verbal participation and helping them formulate questions to monitor comprehension (Beck et al., 1996; McKeown et al., 2009). Indeed, text-based discussion methods to buttress reading comprehension demonstrate the relevance of using questions designed to direct students' attention towards key ideas in the text. Similarly, they indicate that it is important for teachers to use specific talk moves to extend student reasoning and redirect their attention to the central ideas in the text to engage students in building a coherent representation of what they have read (Kucan, Hapgood et al., 2011; Kucan, Palincsar et al., 2011).

Kucan and Palincsar (2013) posit that text-based discussion as an activity to promote reading comprehension is underpinned by two theoretical models of text comprehension: The Construction-Integration Model (Kintsch, 1998) and the Landscape Model of Reading (van den Broek, Young, Tzeng, & Linderhold, 1998). Kintsch (1998) explains the processes involved in reading comprehension (*construction* and *integration*), as well as the multiple levels of text representation (surface representation, text-base, and situation model) constructed during the meaning-building process. Van den Broek et al. (1998) set forth a computational model to highlight that the construction of coherent mental representations during reading involved online and offline processes in which memory is a key element of the uptake cycle. The Landscape Model of Reading (van den Broek et al., 1998), which is widely accepted, postulates that comprehension is achieved when the reader manages to construct a coherent mental representation of the text. The reader constructs this representation by drawing significant connections between different elements of the text itself, and between the text and the reader's own prior knowledge. Based on this model, not only are the readers' skills important, the text itself is fundamental to reading comprehension.

The text-based discussions structure and explicitly scaffold students in the reading process through dialogue. The active engagement of readers in constructing understanding from the text with their own background knowledge is an even more complex task for academic texts about which students possess less background knowledge and whose textual surface contains more

complex, dense, and abstract written language (Fisher & Frey, 2016; Kucan & Palincsar, 2013). The aim of productive discussion is for students to, through their own contributions, process information in order to jointly construct a coherent representation of what they have read.

Although the positive benefits and effects of productive discussions for text comprehension are known (Beck et al., 1996; Murphy et al., 2009; Soter et al., 2008; Wilkinson et al., 2010), less research has been conducted about which types of specialized knowledge and skills teachers need to effectively facilitate reading comprehension through discussion, which we know is required for a practice with high and multiple demands taking place in an ever-changing scenario (Kucan, Hapgood et al., 2011). Even less research has been done about which types of knowledge pre-service teachers need to learn in order to enact the core practice of facilitating a productive discussion (Kucan, Palincsar et al., 2011; Meneses, Müller, Hugo, & García, 2016). This practice entails interaction, which though highly planned, still takes place in what Kucan, Palincsar et al. (2011) is characterized for being an "ill structured space" (p. 2900), one with multiple simultaneous demands and highly complex.

3. Facilitating text-based discussions in initial preparation: specialized knowledge and skills

In recent years, the field of teacher preparation has called into question the types of specialized knowledge that teachers need to perform their profession. The concept of pedagogical content knowledge (PCK) proposed by Shulman (1986) has gained acceptance. The field has made strides in describing and measuring this knowledge in teacher preparation (Carlisle, Kelcey, Berebitsky, & Phelps, 2011; Phelps, 2009). PCK refers to the body of teachers' professional knowledge and it is defined specifically as type of knowledge that is the integration of subject-matter and pedagogical knowledge (Phelps, 2009). PCK consists in "the ways of representing and formulating the subject that make it comprehensible to others" (Shulman, 1986, p. 9). This includes representations, analogies, explanations, examples, and demonstrations, among other strategies. Moreover, PCK is specific for different disciplines, like mathematics (Ball, Thames, & Phelps, 2008) and language (Phelps & Schilling, 2004; Phelps, 2009). Research has shown that PCK has a positive influence on the amount of effective classroom instructional time (Carlisle et al., 2011).

Although PCK is teaching-oriented and varies by subject matter, it focuses on the knowledge that teachers need to master to make a specific content understandable to others. This could stay at a conceptual level in the teacher preparation. The development of core practices, on the other hand, shift from a focus on knowledge to a greater focus on teacher's enactment (Ball & Forzani, 2009). The execution of core practices involves the development of specialized knowledge related to the tasks and activities involved in teaching a specific content, like providing pedagogical explanations or facilitating text-based discussions. The goal is for teachers to perform these practices to engage all students in ambitious learning (Lampert & Graziani, 2009; Thompson, Windschitl, & Braaten, 2013). Therefore, when a core practice is enacted, the teacher relies on both the pedagogical content knowledge and a more specialized subject-specific knowledge of the core practice.

In this sense, the question of how to systematically approach and evaluate this specialized knowledge of core practices starting in initial preparation is central to research in this field. However, it has been studied little in the Latin American context, which at the moment is in great need of highly-trained teachers to reverse educational inequalities (Ávalos, 2010; Cox, Meckes, & Bascopé, 2010; Eyzaguirre & Le Foulon, 2001; Guerra & Montenegro, 2017). While research on teacher preparation has advanced in identifying the core practices that a novice teacher needs to achieve quality learning (Ball & Forzani, 2009; Grossman, Hammerness et al., 2009), little research has focused on evaluating knowledge and performance of core practices in teacher education.

These practices are argued as being fundamental to instruction, and can be taught and evaluated in an intentional way in teacher preparation. Although they are generally described as context-free, they can be updated and described in terms of the learning of a specific subject matter (Charalombos, Hill, & Ball, 2011; Kucan, Hapgood et al., 2011; Ross & Kessler, 2014; Windschitl, Thompson, Braaten, & Stroupe, 2012).

One such core practice is text-based discussion, which is an activity that favors the collaborative and dialogue-driven comprehension of complex texts in the classroom. Accordingly, learning to enact this core practice is a highly complex challenge, which involves not only PCK, but also the specialized knowledge, it is necessary to go deeper in learning and evaluating it (Ball et al., 2008; Kucan, Palincsar et al., 2011).

Learning to facilitate text-based discussions in a way that promotes reading comprehension calls for creating opportunities to learn specialized knowledge and skills. Pursuant to Grossman, Hammerness et al.'s (2009) professional learning framework, specific teaching practices are learned through precise teacher education pedagogies. These pedagogies of practice include representations, decomposition and different levels of approximation to practice. The *representation* refers to what is relevant to make visible for novices, the *decomposition* involves breaking down a complex practice in its constituent parts and *approximation* refers to the different levels of complexity and authenticity of the opportunities to enact teaching that are offered to student teachers. Ultimately pre-service teachers must be afforded the chance to approximate practice at a representational level (for example, analyzing cases, videos, transcriptions), which entails identifying the relevant features of any given core practice, and then increasing the number of opportunities afforded to pre-service teachers to rehearse the core practice before trying to enact it in the field.

The representational level of pedagogies of practice points to pre-service teachers developing the capacity to notice key elements (Gotwals & Birmingham, 2015; van Es & Sherin, 2002), which in this case, are productive text-based discussions (Kucan, 2007). This process entails decomposing a complex practice its constituent factors in order to facilitate structured opportunities for pre-service teachers to learn them in across their teacher education program. Based on this framework, Kucan, Palincsar et al. (2011) developed modules to form teacher educators to prepare teachers to guide text-based discussions. This study decomposed the practice of guiding productive discussions into three key factors: (1) text analysis and the challenges of text comprehension, (2) evidence of student comprehension and conceptual errors that interfere with the construction of meaning in what is read, and (3) specific ways of responding to student interventions through mastery of pedagogical discourse moves. Although Kucan, Hapgood et al. (2011)'s study was conducted with in-service teachers, the results point to which types of knowledge and skills should be developed and evaluated during initial education such that pre-service teachers learn to guide discussions that facilitate comprehension from the outset of their teaching careers.

Because learning a core practice can be so complex, it can be helpful to decompose it into key tasks that can be specifically taught during the teacher education program, so that pre-service teachers can master the practice. In this study, we propose one such decomposition of a core practice and test it across a series of teacher education courses to relate the course learning opportunities and pre-service teachers' performance on the tasks.

A main challenge in the field of teacher education is how to evaluate the knowledge and skills involved in this core practice. Kucan, Hapgood et al. (2011) proposed the Comprehension and Learning from Text Survey (CoLTS). What is innovative about the CoLTS as compared to others for reading comprehension is that it evaluates the specialized knowledge necessary to lead a text-based discussion through constructed-response and scenario-based questions. Other instruments, in contrast, principally assess only PCK through a variety of literacy-related topics, ranging from knowledge of linguistic structure (phonology, orthography) to ability to support student learning (comprehension strategies, questions), and include even the reading process itself (decoding, fluency). Moreover, the majority of instruments use multiple-choice items, and few are based on potential or real scenarios in teaching-learning contexts (Phelps & Schilling, 2004; Phelps, 2009; Rowan, Schilling, Ball, & Miller, 2001). The features of the CoLTS are clearly advantageous over other instruments when it comes to gathering specific information related to the key knowledge and skills to facilitate text-based discussions that arise from decomposing the practice. However, the performance of teachers in initial education programs on tasks that evaluate specialized knowledge needed to facilitate a text-based discussion—with the purpose of understanding how pre-service teachers are developing this practice in their preparation courses—has been only minimally explored. In this study, we propose specific task to be taught and assessed the specialized knowledge of the core practice to facilitate text-based discussion and we evaluate this knowledge in pre-service teachers in three different courses of the initial teacher preparation in order to explore the relation between the opportunities to learn this core practice and the performances obtained in each task.

4. Context and purpose of the study

This study was carried out at a Chilean university that has been educating teachers since 1942. At the time of the study, 880 elementary school student teachers were enrolled in the program. The study was conducted in the broader context of an institutional plan to improve the quality of initial teacher education in Chile.

In 2013, the Chilean Education Ministry launched a competitive grant process for improving teacher education. The grant injected the funding needed to make structural changes and transformations to increase the quality of initial teacher preparation in accredited universities. Under this grant, every institution has been given the freedom to develop its own model of change to achieve the Ministry's goals. In broad strokes, this university in particular set out to redesign initial teacher education to foster learning opportunities for disciplinary and pedagogical content knowledge, drawing on a practice-based curriculum.

Specifically, four changes were made to the elementary school teacher preparation program: (1) increase the number of opportunities to learn disciplinary and pedagogical content knowledge; (2) change the focus of instruction to core practices, or specifically of interest here, the practice of facilitating a productive discussion for reading comprehension; (3) create opportunities for practical learning through the pedagogies of practice (representation, decomposition, and approximation); and (4) use performance and scenario-based assessments to evaluate the development of core practices.

In order to design a coherent framework to support pre-service teachers learning of this core practice, we explore in this study the pre-service teacher performances in tasks to assess the specialized knowledge of the core practice to facilitate text-based discussion. The teacher preparation program entails exposing pre-service teachers to learn the core practices using different pedagogies of practice across courses. In this study, we explore the pre-service teachers' performance to facilitate a text-based discussion from three different courses in consecutive years that build opportunities for learning the core practice.

In the redesign of subject-matter course for pre-service teachers in language (year 1), this core practice is introduced to students by modeling. This is followed by the methods course (year 2), which challenges pre-service teachers to decompose, prepare and rehearse the practice. Pre-service teachers' experience concludes with the field experience (year 3), when student teachers are expected to enact the practice in the classroom. For this research, we explore some pedagogies of practice for learning this core practice (McDonald et al., 2013).

One of the main challenges in preparing pre-service teachers to enact core practices is to reach a common vision among all teacher educators of the program. One way of reaching alignment within and across courses in teacher education is to develop a common assessment not only among sections of one course but also across courses with explicit practical learning for the specific core practice.

In this paper, we examine pre-service teachers specialized knowledge in three different cohorts: disciplinary course, method course, and a field-experience. As discussed, in these courses of the elementary teacher program, each group of pre-service teachers has different opportunities to learn the practice of facilitating a text-based discussion.

Specifically, the objectives of our study are to determine and characterize the performance of pre-service teachers in three different groups in initial teacher education as they learned how to facilitate productive discussions to support academic text comprehension. Four research questions guide this paper:

(1) How well do pre-service teachers in three course levels perform on facilitating text-based discussions at the beginning and end of the academic semester?
(2) What is the relation among the specialized knowledge and skills—*text analysis*, *making decisions*, *evidences and errors*, and *observing productive discussions*—to compose the core practice of facilitating the text-based discussion?
(3) Are there significant differences in the performance of pre-service teachers within each type of course?
(4) Are there significant differences in the performance of pre-service teachers across courses?

Our study is based on the assumption that pre-service teachers in later, more advanced courses of the education program, outperform pre-service teachers in earlier, more introductory courses, given the more explicit opportunities to learn this core practice. Moreover, in addition to opportunities pre-service teachers have in the later courses to examine the core practice, there is also dedicated space for enacting it and thinking about how to improve their own performance of facilitating productive discussions.

5. Method

5.1. Participants and study context

The study sample consisted of 79 pre-service elementary school teachers enrolled in a university teacher education program located in Santiago, Chile. The sample was distributed over three courses: the first-year disciplinary course in language (36 pre-service teachers), the second-year reading methods course (22 pre-service teachers), and the second field experience in the third year of the program (21 pre-service teachers). The participants

were predominantly female (97%).

Table 1 describes the courses and opportunities available to pre-service teachers to learn how to facilitate a productive text-based discussion.

5.2. Tasks to evaluate the specialized knowledge for facilitating text-based discussions

The Comprehension and Learning from Text Survey (CoLTS) (Kucan, Hapgood et al., 2011) was functionally and culturally translated and adapted into Spanish. This instrument was originally designed in English to evaluate how in-service teachers conduct a text-based discussion and scaffold students in comprehending an expository academic text. Pre-service teachers performed four tasks to evaluate their specific skills and knowledge to facilitate a text-based discussion. The three tasks in the English version were kept for the Spanish version. A fourth task, video observation, was added to assess the pre-service teachers' skills in noticing and using meta-language about productive discussions. This observation task, adapted from Müller, Calcagni, Grau, Preiss and Volante (2013), portrays a reading instruction situation in the classroom.

For the first three tasks, an expository academic text about the life cycle of flowering plants was selected from a textbook for fifth-grade students. The text was considered to be multimodal, containing both verbal and visual information about a scientific process. A scenario placed the tasks in context: "Imagine that you will be reading the text The Life Cycle of Flowering Plants with your fifth-grade students during your next class".

Task 1. Text analysis and the challenges of academic text comprehension. This task consisted of two open-ended questions. The first evaluated pre-service teachers' reading comprehension of the text and the second identified the challenges in comprehension students may face.

Task 2. Making decisions to facilitate a text-based discussion. This task entailed four scenarios with transcript excerpts. Each scenario demonstrated interactions between a teacher and a group of students during a text-based discussion activity. Questions were designed based on segments of text read in a group and question-and-answer exchanges between teacher and students. For example, "pre-service teachers first read: «Section 1 with title Seeds», you ask a student to volunteer to explain how a plant reproduces. The student answers: 'Through seeds.' How would you respond to this student's answer?" Then they asked to come up with a response and justify their decision.

Task 3. Identifying evidence of comprehension and conceptual errors. Two open-ended questions were used to determine the pre-service teachers' capacity to identify evidence of students' reading comprehension, as well as identify discipline-related misconceptions that could interfere in the construction of meaning and text-based learning. For example, "after reading the final paragraph, several students share the following comments: Student 1: 'The plants grow like people. They are babies, then children, and later adults who deliver food to the children.' Student 2: 'The flowering plants begin the life cycle as soon as the fruit dies'. Compare these students' responses. How are they similar? How are they different? How would you answer them?".

Task 4. Observing productive discussions. For this task, pre-service teachers were asked to describe a video in which a productive discussion is taking place in a classroom. Using an open-ended question ("What do you see in this video?"), the pre-service teachers' noticing and meta-language skills were evaluated to see if they could identify the productive discussion, together with its most relevant components, in a given situation.

5.3. Procedure

Pre-service teachers completed the four tasks through an online, open-response questionnaire administered at the beginning and end of the first semester of the school year (April and June). All of the pre-service teachers participated voluntarily and signed an informed consent form before taking the first questionnaire.

5.4. Coding system

To score the open-ended responses to each task, a coding system was developed to determine which specialized skills and types of knowledge pre-service teachers had mastered to facilitate productive text-based discussions. Table 2 describes the coding system for each task as well as the scores for each specific skill or knowledge type.

As evident in Table 2, the tasks were scored on different scales, so to ease comparison among tasks, the scores are presented as a percentage.

The coding system was tested and refined using a double formative coding process. Subsequently, coders were trained, and they double-coded 20% of the data. The Cohen's kappa coefficient was calculated for each task: Task 1 = .89, Task 2 = .86, Task 3 = .85, and Task 4 = .83, demonstrating the reliability of the coding system

Table 1
Characterization of the Sample by Course, Learning Opportunities, and Pedagogies of Practice

Type of course	n	Year	Course objective	Opportunities for learning about productive discussion	Pedagogies of practice
Disciplinary Course	36	Year 1	Explain language complexity and organization from a functional, semiotic and socio-discursive approach as the basis for pre-service teachers.	Participation in two productive discussions about the key concept. (3 h approx.)	Representation Level: - Text analysis - Modeling
Reading Method Course	22	Year 2	Design and enact reading activities to improve opportunities to learn to read and to comprehend diverse genres.	Design and simulate a text-based discussion activity with peers. (8 h approx.)	Representation Level: - Text-based discussion concept - Modeling Decomposition Level: - Text analysis - Planning text-based discussion Approximation Level - Rehearsal
Second Practicum	21	Year 3	Design and enact a learning sequence about reading comprehension with primary students at a school.	Enact a text-based discussion activity with a small group of students at the school. (6 h approx.)	Decomposition level: - Analyzing planning of text-based discussion Approximation level: - Rehearsal - Enactment with small group of students

(Bakerman & Gottman, 1997).

5.5. Psychometric information of tasks

The four tasks that we adapted and developed to evaluate specialized knowledge and skills pre-service teachers need to facilitate productive discussions do not yet constitute an instrument. In fact, this exploratory version evaluates knowledge related to this core practice using open-response questions, making the review process extremely time-consuming. As such, a next step after this study would be to use the answers we collected to build an instrument with closed-response assessment items to ensure that it can be administered properly and to make scoring the tool less demanding. Nevertheless, psychometric analyses were conducted based on this version to empirically test the construct of the specialized skills and knowledge to facilitate text-based discussions. The analysis to determine the fit of the instrument was performed with a total of 125 pre-service teachers in order to have greatest variability. As such, all pre-service teachers who completed the tasks at the beginning and end of the academic semester were included in the analysis.

Using classical test theory, the difficulty index was calculated to be over 0.8, with only five items classified as very difficult and 94% of the items displaying an adequate discrimination index. Moreover, item response theory analysis was conducted, finding that 15 items exhibited infit statistics within the 0.75 to 1.33 range suggested by Wilson (2005), and another five items showed infit statistics only slightly below or above the cutoff score. The confirmatory factor analysis (CFA) was adjusted for four dimensions using R software (R Development Core Team, 2013) and, more specifically, the lavaan package. The RMSEA indicator for the four-dimensional model was .075, indicating good model fit, with a TLI of .41 and a CFI of .45, less than what was expected. Accordingly, the exploratory analyses of the tasks demonstrate promising evidence that the internal structure of the specialized knowledge for facilitating a text-based discussion is fitted at item-level to a four-dimensional model. However, future research should be conducted with a multiple-choice instrument to validate and definitively test the internal structure of the construct.

5.6. Analysis

Descriptive analyses were conducted to measure pre-service teachers' performance on each of the tasks that comprise a productive text-based discussion. Bivariate Pearson correlations were generated for exploring the relations among tasks. A *t*-test analysis was done to determine if there were significant differences by comparing the averages of each course between the beginning- and end-of-semester measurements for each task. Moreover, to compare between courses, a one-way ANOVA with a 95% confidence level and a Bonferroni post-hoc test was conducted to determine, specifically, between which courses significant differences existed.

6. Results

6.1. Pre-service teacher performance at the beginning and end of the academic semester

To measure the performance of pre-service teachers on the various tasks used to assess their knowledge of facilitating text-based discussions, the mean score on each task at the beginning and end of the academic semester was calculated for each of the courses. Table 3 displays the results to answer the first research question concerning descriptive analyses of the pre-service teachers' perform on each task.

Table 2
Specialized Knowledge and Skills Coding System for Facilitating Text-Based Discussions

Task	Sub-task	Dimension	Skill or knowledge	Score
1. Analysis of the text and comprehension difficulties	Summarize the text	Main idea	Identify the main idea of the text.	0–2
		Secondary ideas	Identify the relevant secondary ideas that develop the main idea.	0–2
		Structure	Write an organized summary as an autonomous and cohesive text.	0–2
12 points				
	Anticipate comprehension difficulties	Content	Evaluate aspects of the content of the text that could entail obstacles to student comprehension.	0–2
		Organization of the text	Evaluate aspects of the organization of the text that could be obstacles to student comprehension (progression of the information, images, text-image relations).	0–2
		Vocabulary	Evaluate specific aspects of the vocabulary that could entail obstacles to student comprehension.	0–2
2. Making decisions to facilitate discussion	Propose an intervention	Focus	Propose an intervention that redirects students' responses to the main ideas of the text.	0–5
		Intervention type	Propose an intervention through a question that enables students to take their ideas a step further and engages students.	0–1
48 points				
		Pedagogical talk moves	Use specific pedagogical talk moves such as revoicing, reasoning, adding on, repeating, waiting. etc.	0–1
	Justify the proposed intervention	Argumentation	Justify the decision made with an argument about extending reasoning and getting students to participate.	0–4
		Explanation of the pedagogical talk moves	Propose a specific pedagogical talk moves in the justification set forth.	0–1
3. Evidences and errors	Gather evidence of comprehension	Type of evidence	Determine specific evidence of vocabulary, content, or prior knowledge linked to reading comprehension.	0–2
6 points	Identify mistakes	Recognize conceptual errors	Determine conceptual errors present in students' responses.	0–1
4. Observing a productive discussion	Describe what is observed in a video of a teaching situation	Productive discussion	Explicitly notice when a situation contains a productive discussion.	0–3
		Pedagogical talk moves	Explicitly mention the pedagogical talk moves identified adequately in the productive discussion presented.	0–2
6 points		Judgment	Describe classroom interactions without issuing value judgments.	0–1

As shown in Table 3, the tasks proposed as the components of the specific skills and knowledge needed to facilitate text-based discussions capture sufficient variability not only across groups but also within groups. Pre-service teachers performed the best on Task 1, *text analysis and the challenges of text comprehension*, regardless of where they were in the teacher preparation program. This means that a good portion of pre-service teachers managed to at least achieve comprehension of the essential ideas in the text. In contrast, performance on the other three tasks varied depending on the courses in which the pre-service teachers were enrolled. First-year pre-service teachers in the disciplinary course exhibited the lowest average performance of below 50% on three tasks.

First-year pre-service teachers in the disciplinary course had similar performance at the beginning and end of the semester on all tasks. As we expected, essentially, they made no observable progress on any of the tasks, and some even performed slightly worse at the end of the semester. The pre-service teachers at year 1 had less opportunity to develop practical and explicit knowledge about how to facilitate a text-based discussion.

Second-year pre-service teachers in the method course exhibited patterns similar to those of first-year, but with higher average performance on Task 1, *text analysis,* and on Task 3, *evidence and errors.* Nevertheless, not surprisingly, they performed better at the end of the semester on Task 2, *making decisions to facilitate discussion* (beginning $M = .49$, $SD = .09$; end of semester $M = .53$, $SD = .09$), and Task 4, *observing productive discussions* (beginning $M = .45$, $SD = .28$; end of semester $M = .50$, $SD = .23$). In the methods course, they have had opportunities of explicit learning to decompose the core practice, to plan a text-based discussion and to rehearsal in university context.

Finally, third-year pre-service teachers in the field experience course, by contrast, performed the best on the skills related to Task 1, *text analysis* ($M = .67$, $SD = .13$), and Task 2, *making decisions to facilitate discussion* ($M = .53$, $SD = .09$), at the end of the semester. Conversely, on Task 3, *evidence and errors*, pre-service teachers performed slightly worse at the end of the semester. On Task 4, they performed the same at the beginning and end of the semester. As we expected, the third-year pre-service teachers are better performance at the end of the semester in two tasks. However, the skills for noticing a productive discussion and looking for evidence and errors were not improved. This may be because they have more opportunities to rehearsal a text-based discussion than to analyze a productive discussion.

6.2. Relations among the tasks used to evaluate the decomposition of specialized knowledge to facilitate text-based discussions

Correlation analysis was conducted to explore the relations among the different tasks developed to assess the specialized knowledge for the core practice of facilitating a text-based discussion. The results of this analysis are displayed in Table 4.

Table 4
Correlation Among Text Analysis, Making Decision, Evidences and Errors, and Observing Productive Discussions

	Task 1	Task 2	Task 3	Task 4
Task 1 Text analysis	1			
Task 2 Making decision	.22*	1		
Task 3 Evidences and errors	.06	.19*	1	
Task 4 Observing productive discussions	.10	.27**	.17**	1

Note. * = p-value < 0.01; ** = p-value < 0.05.

As Table 4 shows, a low positive correlation was found among the four tasks, indicating that none of these tasks is represented by another. Accordingly, they measure specific types of knowledge distinct from one another but all involved in the ability to enact a text-based discussion. In addition, it emerged that Task 2, *making decisions*, was significantly correlated with Task 1, t*ext analysis* ($r = .22$, $p < .01$); Task 3, *evidence and errors* ($r = .19$, $p < .01$); and Task 4, *observing productive discussions* ($r = .27$, $p < .05$).

As expected, these results indicate that the specialized knowledge and skills involved in facilitating text-based discussions are related to one another but at the same time different, supporting an independent exploration of each task. Moreover, confirmatory factor analysis pointed to a good fit for a four-dimensional model to test the internal structure of the construct of the specialized knowledge needed to facilitate a text-based discussion (RMSEA = .075). Although these analyses are for the time being exploratory, they are promising inasmuch as they support an appropriate decomposition of facilitating text-based discussions into specific task components that can be used to assess specialized knowledge.

6.3. A comparison of pre-service teacher performance at the beginning and end of semester

Comparing performance at the beginning and end of the semester for each task by course, the *t*-test analysis only revealed significant differences on Task 2, *making decisions to facilitate discussion,* for second-year pre-service teachers in the method course ($p = .09$) and third-year pre-service teachers in the field experience ($p = .06$). This result is consistent with the opportunities of explicit and practical learning offered in these courses, since the pre-service teachers learn how to segment the text for the discussion, to formulate questions, and to use talk moves to extend student's

Table 3
Mean Performance Scores of Pre-service Teachers on Tasks to Support a Text-Based Discussion at the Beginning and End of the Semester

		T1 Text analysis %		T2 Making decisions %		T3 Evidences and errors %		T4 Observation %	
Group	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Disciplinary course									
Beginning	36	.61	.17	.36	.11	.40	.19	.25	.17
End	36	.56	.16	.39	.10	.32	.19	.21	.15
Method course									
Beginning	22	.74	.20	.49	.09	.55	.23	.45	.28
End	22	.61	.18	.53	.09	.47	.27	.50	.23
Field experience									
Beginning	21	.64	.16	.47	.10	.48	.26	.60	.22
End	21	.67	.13	.53	.09	.41	.24	.60	.26

reasoning and participation.

Fig. 1 shows how pre-service teachers performed on the productive discussion tasks at the beginning and end of the semester.

6.4. A comparison of pre-service teacher performance across courses: disciplinary, method, and practical

In order to compare how pre-service teachers performed across courses, a variance analysis (ANOVA) with a 95% confidence level was conducted, with the dependent variable being the average score obtained on each task and type of course in which the pre-service teachers were enrolled taken into account as a factor. The analysis reveals significant differences for two of the four tasks: Task 2 *making decisions to facilitate discussion* [$F(2, 76) = 22.01$, $p < .001$], and Task 4 *observing productive discussions* [$F(2, 76) = 28.28$, $p = .006$]. There were no significant differences for Task 1 *analysis text* [$F(2, 76) = 3.66$, $p = .030$] and Task 3 *evidences and errors* [$F(2, 76) = 2.98$, $p = .056$].

To determine more specifically where the differences between groups were, we conducted a Bonferroni post-hoc test. Hence, for Task 2, there were differences between the disciplinary course and the method course ($p < .001$), as pre-service teachers from the method course performed better on this task. In addition, between the disciplinary and field courses, pre-service teachers from the field course performed better on this task ($p < .001$). Table 5 provides some examples that illustrate the performance discrepancies across the different courses on Task 2, *making decisions*.

For Task 4, there were differences observed between the disciplinary course and the method course, as pre-service teachers from the method course performed better on this task ($p < .001$). In addition, between the disciplinary and field courses, pre-service teachers from the field course performed better on this task ($p < .001$). Table 6 introduces some examples of this varied performance, illustrating the discrepancies across the courses.

These examples show how pre-service teacher performance differed across courses in the teacher education program. In the method (year 2) and field experience course (year 3), pre-service teachers develop their noticing skills, as well as the specific language that underpins higher performance on two of the four tasks used to evaluate specialized knowledge. As mentioned earlier, these results are consistent with the opportunities to learn how to develop and enact the core practice of facilitating text-based discussion. The pre-service teachers in these courses not only construct specialized knowledge of the core practices with analyses of videos and preparing the text-based discussion, they also have more authentic levels of approximation with the rehearsal and enactment of the activity with students in school contexts.

7. Discussion

In the context of practice-based teacher education, learning how to facilitate a productive discussion is considered a core practice for pre-service teachers (Grossman, Compton et al., 2009). The text-based discussion approach is particularly challenging, because it implies demanding interactions that require specialized knowledge. Text-based discussions, while characterized as ill-structured spaces, are designed to help participants jointly construct ideas to achieve comprehension (Kucan, Hapgood et al., 2011). Pursuant to the concept of professional learning described by Grossman, Hammerness et al. (2009), this study advances in decomposing the practice of facilitating a productive discussion to support the comprehension of academic texts, looking at specific tasks likely to be taught and assessed in initial teacher education.

More saliently, this study extends research about core practices and teacher education pedagogies to initial teacher education in Latin America, and specifically in Chile, where there is consensus about the need for a policy to improve the preparation of teachers with deep disciplinary and practice-oriented knowledge (Ávalos, 2010; Cox et al., 2010). As such, this paper reports on exploratory results from a teacher education effort to improve teacher education in one Chilean university, by introducing course explicit learning opportunities to address the enactment of practice-based pedagogy.

The significance of our findings resides not only in the decomposition of this core practice into specific skills and types of knowledge (*text analysis*, *making decisions to facilitate a discussion*,

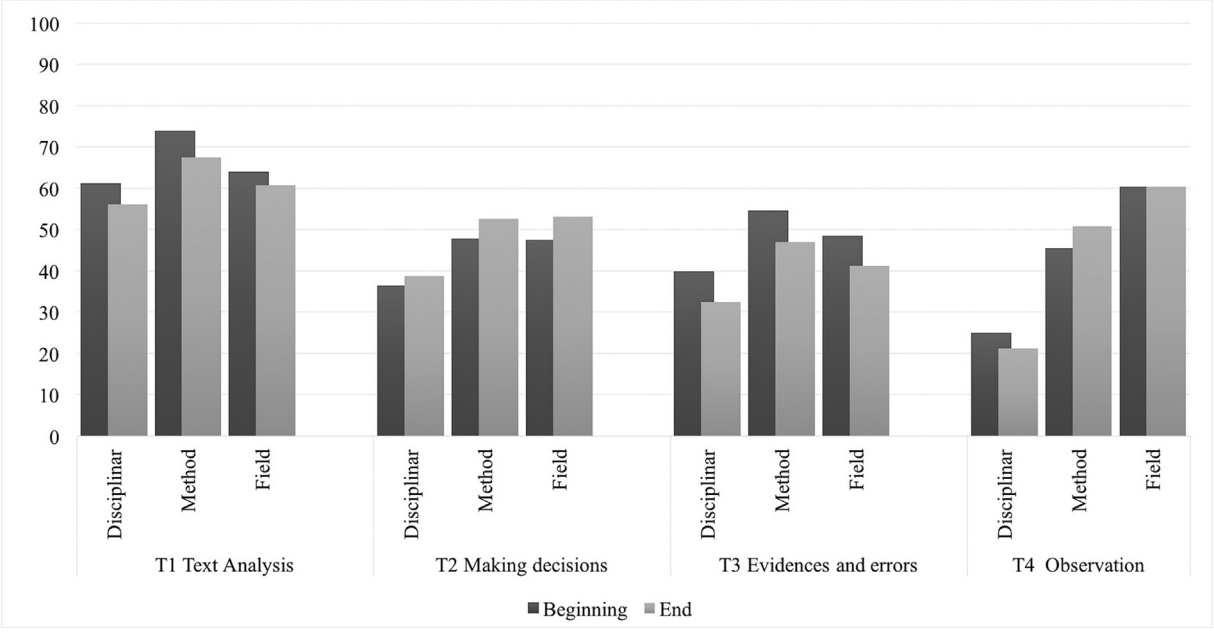

Fig. 1. Mean Performance Scores of Pre-service Teachers on Tasks to Support a Text-Based Discussion at the Beginning and End of the Semester

Table 5
Examples of Performance Across Courses in Task 2, *Making Decisions to Facilitate a Text-Based Discussion*

Task 2 Question 1	After reading the first part of the text, up to "the tomato plant, like all plants that come from a seed, has three stages in its life cycle," you ask a student to summarize what he or she has understood. The student says: "The life of a tomato." How would you respond to this student's answer?		
	Course		
	Disciplinary (First year)	Method (Second year)	Practical (Third year)
Response	"I would respond that it is a good phrase to summarize what was read".	"I would tell him or her to go back to the text and focus on the second phase of the cycle. I would ask him or her, did the plant develop the fruit at this stage? Does it have tomatoes? When did they grow? So more than the life of the tomato, what is the cycle?"	"OK, very good. Below is an explanation of a flowering tomato plant. What other plants can you think of that have a similar life cycle? Why do we say cycle and not just life?"
Analysis focus	Does not focus attention on the content.	Focuses attention on a specific aspect (one phase).	Focuses attention on the central idea (cycle).
Intervention type	Assessment	Question	Question
Pedagogical talk moves	Not mentioned.	Not mentioned.	Not mentioned.

Table 6
Examples of Performance Across Courses in Task 4, *Observing a Productive Discussion*

Task 4	What do you see in the video?		
	Course		
	Disciplinary (First year)	Method (Second year)	Practical (Third year)
Response	"The teacher is managing the class and keeping the kids concentrated. Moreover, patience in asking for greater detail in the children's explanations. She also encourages them to participate and gives students the chance to recall what they have learned on their own and how it applies to the given case about a type of music".	"The students present strategies that can be used to synthesize the text. These ideas are debated by the students, who say why some will work or others will not. They delve deeper into the why, where the students give concrete reasons, and reason and reflect on their thinking".	"In the video, I see a student teacher using different talk moves to foster a productive discussion. The teacher elicits what the students are thinking by asking them to explain their responses. She also paraphrases the students' responses and considers their responses in her own discourse, developing a more conceptually elaborate response and formulating new questions based on those responses. Finally, the student teacher seen using the talk move of "adding on" when she asks other students to explain if they agree or disagree with the responses given by their peers earlier".
Analysis	- Does not allude to productive discussion as a learning mechanism. - Does not mention any pedagogical talk move. - Includes a valuation.	- Mentions evidence of interaction but does not specifically mention that it is a productive discussion. - Does not mention any pedagogical talk move. - Describes what is going on without any judgments or opinions.	- Explicitly mentions the productive discussion. - Explicitly mentions pedagogical talk moves. - Describes what is going on without any judgments or opinions.

evidences and errors, *observing productive discussions*), but also we proposed, adapted and validated four specific tasks to evaluate these specialized skills and knowledge. Our study extends previous research by Kucan, Hapgood et al. (2011) on evaluating specialized knowledge of text-based discussions and going beyond pedagogical content knowledge toward the specifics of teaching reading comprehension (Phelps & Schilling, 2004; Phelps, 2009). In fact, we find that specialized knowledge to learn core practices is specifically oriented to teacher's enactment (Ball & Forzani, 2009).

Kucan, Hapgood et al.'s (2011) research evaluated 60 elementary school teachers who participated in the professional development initiative using the CoLTS instrument. Through a functional and cultural adaptation of the CoLTS to Spanish, and with the addition of the productive discussion observation task (Müller et al., 2013), our study evaluated 79 pre-service elementary school teachers. Accordingly, our findings include three main contributions: (1) a measure of the performance of pre-service teachers in initial teacher preparation; (2) a comparison of pre-service teachers' performance at the beginning and end of an academic semester; and (3) a comparison of the performance across groups in different years of the program (disciplinary, method, and field experience courses).

The exploratory psychometric analyses revealed that the four tasks furnish initial and promising evidence as to the internal structure of specialized knowledge for facilitating a text-based discussion by fitting the items to a four-dimensional model. However, the eventual goal would be to use this research as a stepping stone for developing a multiple-choice instrument to make the scoring process easier and conduct a study to validate the instrument and definitively test the internal structure of the specialized knowledge and skills construct for facilitating text-based discussions.

It makes sense to view our findings in light of results from the US for in-service teachers because part of this work is based on previous Kucan, Hapgood et al.'s study. (2011). Our results confirm findings from Kucan, Hapgood et al. (2011) and advance in understanding how pre-service teachers in three different initial teacher preparation groups perform, beyond merely descriptive analysis.

According to both studies, teachers from both the United States and Chile display only limited skills when it comes to analyzing texts. The study conducted in the United States found that 67% of the teachers were unable to devise a summary of a text and distill the most important ideas into sentences. Moreover, 89% demonstrated only limited skills in identifying the reading difficulties their students face. In our study, at the end of semester, pre-service teacher performance reached 61% of achievement. Furthermore, in the American study, on Task 2, 33% of students focused their attention on ideas not considered to be the main ideas. In our study, at the end of semester, the pre-service teachers reached 48.3% achievement in demonstrating the skills to propose an intervention, to redirect student attention to a text's main ideas and take the students' ideas a step further. Accordingly, learning how to engage with students represents a challenge in teacher education.

Although the results obtained in this study are consistent with those found in Kucan, Hapgood et al. (2011), our study goes even further in comparing pre-service teacher performance in initial education courses. We proposed a decomposition of a core practice and assessed the specialized knowledge and skills acquired in consecutively-taught courses to garner preliminary information about how this complex core practice is acquired against the backdrop of the program's efforts to augment opportunities for practical learning. We found that only pre-service teachers in the method and field experience courses, and only on the task of *making decisions to facilitate a text-based discussion*, were able to perform significantly better at the end of the semester than at the beginning. As such, it appears that courses that offer more explicit opportunities for learning how to facilitate text-based discussions do indeed help pre-service teachers make progress between the beginning and end of the academic semester. Additionally, our findings revealed how complex it is to develop the specialized skills and knowledge that comprise the core practice of facilitating a text-based discussion in just one semester. Essentially, performance on Task 2, *making decisions to facilitate discussion,* and Task 4, *observing productive discussions,* varied significantly across courses. Pre-service teachers in the method and field experience courses performed significantly better than those in the disciplinary course, suggesting that explicit opportunities to learn this core practice do indeed help pre-service teachers perform better on these two tasks.

This study provides evidence for the need to develop coherent, explicit, and practical opportunities to learn core practices in teacher education and, furthermore, to work on pedagogies of practice that permit future teachers to integrate practices so as to foster ambitious teaching and learning for all students. Although this study focused on decomposing this core practice of facilitating discussions, it remains to be seen how such skills and knowledge can be integrated to effectively facilitate reading comprehension-oriented discussions.

Our findings show that although pre-service teachers perform better on the task of *analyzing an academic text* than on the other three tasks, they still do not exceed the score of 70%. This means that the academic texts are complex to understand, even for university-level students. Counter to what we might think, pre-service teachers do not necessarily have the discursive and lexical-grammatical resources required to understand elementary school level academic texts. If understanding the texts is difficult, then even more complex is learning how to gather evidence of student comprehension and knowing how to scaffold comprehension through discussion. Although there is widespread consensus as to the advantages of dialogue- and discussion-based approaches to comprehension (Applebee et al., 2003; Beck et al., 1996; Murphy et al., 2009; Wilkinson et al., 2010), this study demonstrates the challenges pre-service teachers face in attaining the specialized knowledge they need to enact text-based discussions effectively.

Our findings are preliminary because the number of participants is small for volunteer basis application of the tasks. We were measuring the learning in only one academic year; therefore, we were not able to observe the accumulated effect of the three courses. Finally, since the innovative aspects of teacher education curriculum were newly introduced at the time of our data collection, this was not necessarily the fully optimal implementation.

The limitations of this research suggest that future studies should consider four aspects. First, performance evaluations should be administered in paper-and-pencil format, rather than online, in order to augment student engagement and prevent scores from slumping between the beginning and end of the semester simply due to low motivation towards the task. Second, incorporating analysis of videotaped text-based discussions conducted by pre-service teachers to understand the specific contribution of specialized knowledge in enacting this practice, as well as the differences between courses, would support comprehension in the context of whole-class discussions. Third, diving deeper into the learning trajectories for the core practices and how pre-service teachers advance in specialized knowledge and enactment throughout their initial teacher preparation programs would require longitudinal studies. Fourth, future studies could design an intervention specifically for teaching core practices and, in particular, an initiative focused on facilitating text-based discussions in the context of initial preparation, to gain insight into the effectiveness of a practice-based curriculum.

8. Conclusions

This research decomposed the subject-specific practice of facilitating a text-based discussion into the specific types of knowledge and skills needed to enact this core practice: skills and knowledge related to analyze academic texts, making decisions to facilitate a discussion, looking for evidence of comprehension, and noticing a productive text-based discussion. Tasks were developed for each of these skills to illuminate the performance of pre-service teachers, whose responses were analyzed.

When performance at the beginning and end of the semester for each task was compared by course, the results showed that there were only significant differences in one of the four tasks—*making decisions to facilitate discussion*—in the group of second-year pre-service teachers in the method course and third-year pre-service teachers in the field experience. Additionally, when the outcomes of the tasks were compared among the different courses, significant differences were observed in two of the four: *making decisions to facilitate discussion* and *observing productive discussions*. In both tasks, there were differences between the disciplinary course (first-year) and the methods course and between the disciplinary and field experience course. In all cases, the pre-service teachers furthest along in the course of study performed better on the tasks. As such, the results suggest that teachers need explicit and practical opportunities to learn these specialized skills and types of expertise. Aiming to develop a practice-based pedagogy of teacher education, the challenge is therefore to develop coherent, practical, and specialized knowledge across courses in the curriculum, as well as the pedagogies of practice to learn and integrate this core practice into teacher performance and foster ambitious teaching and learning for all students.

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