Chapter 7
Pre-Service Teacher Professionalization: Becoming a Teacher in South Africa

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In this book chapter, the authors focus on pre-service teacher professionalization through the medium of teaching experience at a South African university. They first provide an overview of the policy guidelines and expectations of teacher professionalization in South Africa and proceed with one example of their implementation at Wits University. They then present a case study in which teacher professionalization was implemented through teaching practice supervision and mentoring for pre-service science teachers in both B.Ed. and PGCE programs. Using the comments of supervisors and mentor teachers, as well as the students' self-reflections, they will use Legitimation Code Theory (LCT) to provide insights into how students see themselves acquiring a professional identity. The findings suggest that, frequently, there were mismatches between university lecturers' and school mentors' expectations, resulting in the teaching students acquiring fragmented knowledge about what it means to become a teacher. Arriving at these conclusions about teaching student professionalization, we recommend a more integrated approach to teaching experience supervision between school and university, leading to a professionalization partnership.

1 Introduction

There is no doubt that teaching experience is fundamental to becoming a teacher. In South Africa and many other countries, the teaching internship is widely accepted as part of the professionalization of student teachers. Although there have been many

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studies relating to professionalization through practical experience in other disciplines, such as nursing and medicine, fewer studies have focused on student teacher professionalization through teaching practice. In this chapter, the authors explore the role of student teacher supervision and mentorship in addressing the challenges of professionalization. They argue that school experience is essential to the professionalization of novice teachers. They further argue that the impression student teachers acquire during teaching experience are paramount in determining their attitudes towards the teaching profession when they graduate. It is therefore logical to assume that the quality of supervision and mentorship during teaching experience will influence how the pre-service teachers perceive the teaching profession.

This chapter seeks to understand how pre-service teacher supervision is practiced by university lecturers and school-based mentors at a South African university. The research applies the Legitimation Code Theory (LCT) to investigate how professional knowledge is accumulated through the teacher supervision and mentoring methods applied. The authors will apply the specialization concept from LCT to profile the mentor / mentee relationship with regards to professional and classroom efficacy. This will be illustrated through the document analysis of supervision templates used by teachers and university supervisors during school visits. Finally, the chapter will look at how well the supervision / mentorship process aligns with the two aspects of teacher efficacy mentioned above. The chapter then concludes with some recommendations aimed at improving the efficacy of the supervision process for both teachers and university supervisors.

The authors use the term "professionalization" to refer to the process by which student teachers are inducted into the practice of teaching. This process includes the development of the teachers' professional identity, as well as their expertise in classroom management and competence. Professionalization can thus be viewed as the process by which teachers acquire efficacy as professionals. Mushayikwa (2013) identifies teacher efficacy as comprising two interconnected efficacies: classroom efficacy and professional efficacy.

1.1 The South African education context

Prior to 1994, the South African education system was one of the most complex systems in the world. The apartheid system's legacy ensured the existence of nineteen Departments of Education (Gordon, 2009) to cater to the perceived interests of the various racial groups within the country. Each of these departments had its own standards for teaching and learning, and there was very little cohesion (Ogunniyi & Mus-

hayikwa, 2015). According to social critical theory (Leonard, 2004) this state of chaos was not accidental, but reflected the architecture of Apartheid, whose goal was to privilege certain races according to skin color. Bengu (1995) reports that at the onset of democracy, the Government of President Nelson Mandela, which advocated for equal rights and justice for all, was faced with the mammoth task of amalgamating these disparate departments into one unified and truly national system of education and training, providing quality education to meet the aspirations of the Rainbow Nation's youth. The task also involved attending to aspects of quality education for all, equity in the distribution of resources, and the development of a teaching force that understood and articulated the aspirations of the young democracy. According to Ogunniyi and Mushayikwa (2015), this was necessary to address the parochial, unjust and exclusivist nature of the apartheid education system.
The following strategies were used:

A. The establishment of National Departments of Basic and Higher Education
B. The merger of FET colleges and universities and in particular, the subsumption of Teachers' Colleges into universities
C. The development of a single, unified National Qualifications Framework of Education providing a continuum of credits for achievement, from kindergarten to doctoral qualifications
D. The development of an outcomes-based curriculum and
E. The development of a single national framework for teacher education and development

After the demise of Apartheid in 1994, as one of the first actions carried out by the new dispensation, a single National Department of Basic Education was established by dissolving the multiple education boards and creating a single ministry. The aim of this, according to the ANC's policy paper on education (ANC, 1994), was to remove segregation in the education sector, to ensure unity of purpose in the education system, and also to increase access to higher quality education for learners from previously disadvantaged groups.
Prior to the onset of democracy in 1994, the higher education sector had a myriad of institutions for training teachers. Teacher training colleges, technikons and universities all vied for the right to train teachers. In the Homelands and Bantustans, college-trained teachers were released into schools. Some of these teachers did not have adequate subject matter content to teach effectively, whereas the universities mainly supplied teachers to private, privileged and former model C schools. This diversity in

teacher training strategies perpetuated inequalities in the matriculants' education and career prospects, and maintained the legacy of Apartheid. Inequalities in higher education opportunities served as bastions of the apartheid socio-economic fabric. To dismantle these divisive structures, it was therefore necessary to restructure the higher education sector as well. Higher education institutions were thus rationalized through mergers to ensure that their qualifications upheld comparable standards across the sector.

This restructuring culminated in a single unified national qualification framework system using credits. This system assigns credits for each level of educational development, from kindergarten to the PhD level. Using this system, it is possible to compare qualifications, both intra- and internationally.

Although these changes were far-reaching and fundamental in terms of the country's democratic aspirations, it was recognized even then that, if these ideals were to be met, there had to be changes in the national curriculum itself. This called for a completely different approach to education. The outcomes-based education curriculum was designed to mold a new South African, free from racial prejudice, progressive and able to fully participate in the country's economy.

1.2 Post-Apartheid teacher education policies

As stated above, the new democratic dispensation had to dismantle the bastions of Apartheid in education through affirmative policies aimed at eradicating the imbalances inherent in the education system—policies that affirmed values of equity, opportunities and justice for all. Since 1994, three such landmark policies have been enacted, ensuring equal access to educational resources, learning opportunities and educational transformation.

The white papers (Government Gazette, 1995; DoE, 2001; DoE, 2004), spelt out the agenda for educational transformation, highlighting the three imperatives mentioned above: resource mobilization and re-distribution in educational institutions, the development of an inclusive curriculum, and a uniform qualifications framework to ensure justice, equity, and equal opportunities for all. It advocated setting up an integrated curriculum that espouses the values of restorative justice, equality, and human rights, while at the same time providing high quality educational content that would enable South Africa to become a competitive economy on the global stage.

While these policies levelled the playing field as far as educational resource delivery was concerned, the largest hurdle to be overcome remained that of teacher training. Successive international benchmark testing (TIMMS) carried out every 4 years (in

1999, 2003, 2007, 2011, 2015 and 2019) consistently presented South African learners between Grades 4 and 8 at the bottom of the achievement ladder in mathematics and the physical sciences. Over the years, the trend has shifted only slightly, highlighting what some researchers (e.g., Spaul, 2013) have dubbed a "crisis" in science and mathematics education. Consequently, much research has been carried out, focusing on teachers, teaching and competencies in the classroom. Over the years, two main trends have crystallized in research and intervention with regard to teachers and teaching. These are: a) studies focusing on teachers' subject matter mastery and delivery, and b) studies focusing on peripheral (but perceived fundamental) aspects of teaching, such as language and context. Both these aspects focus on the teachers' classroom practice. The underlying assumption has been that addressing the teachers' classroom practice will help teachers produce higher quality teaching.

However, despite years of concerted interventions, as the aforementioned TIMMS results demonstrated, the quality of teaching in schools has hardly improved. Clearly there still exist some barriers to achievement, despite all the progress that has been made in levelling the playing field by providing resources and equity in training facilities and opportunities to learn. Some researchers contend that the Achilles' heel of successful teaching and learning lies in how teachers are inducted into their profession (Ingersoll & Smith, 2004), besides their pedagogical content knowledge and skills. In South Africa, the regulation of teacher practices and conditions of service is carried out by the South African Council of Educators (SACE), a statutory and professional body with a mandate to (a) register educators as professionals legally working in South African schools, (b) promote the development of the teaching profession, and (c) develop, maintain and implement a professional code of ethics for all teachers registered with it. SACE has the power to sanction and suspend a teacher's membership in the event of a professional misdemeanor (Government Gazette 34620, 2011). SACE members are appointed by the Minister of Basic Education. In making this appointment, the Minister takes into consideration the educational professional expertise of the members, as well as gender, disability, race, and geographical representation. The establishment of a statutory body such as SACE places teaching on the same professional footing as law and other professions. True to its mandate, SACE has identified desirable attributes that it feels teachers should emulate in order to become proficient and successful, for example by collating research findings (Bernadine, 2019). These attributes are contained in a document called "The continuing professional teacher development (CPTD) management system" (SACE, 2013). This document was formulated in response to the gazetted policy document: "Minimum Requirements for Teacher Education Qualifications", affectionately known as MR TEQ (DHET, 2011),

which, among other things, sought to provide a basis for the construction of core curricula for initial teacher education leading to the qualifications of professional teachers. One of the highlights of MR TEQ is its acknowledgement that successful teaching includes both contextual and situational factors. Hence, it makes teaching experience mandatory prior to qualification, ensuring that student teachers experience and handle diverse classroom and professional contexts before they graduate. In addition, the document spells out the desirable attributes that South Africans expect from the educators of their children. The South African government contended that:

» ... the overriding aim of (teacher education) policies was to properly equip teachers to undertake their essential and demanding tasks, to enable them to continually enhance their professional competence and performance, and to raise the esteem in which they are held by the people of South Africa (DET, 2006).

It is thus argued that this development of professional efficacy should not begin only after qualification, but should instead be incorporated through induction during training.

This chapter focuses on how student teacher mentoring and supervision facilitates the development of professional efficacy in novice teachers. We strive to answer the question: in what ways does teaching experience help in professionalizing student teachers? This is achieved by scrutinizing the professional values and attributes that are reinforced through student-teacher supervision and mentorship during teaching practice.

In the next section, the authors discuss the concepts of teacher efficacy and how they contribute to quality education. After this, they will outline the use of LCT (*specialization concept*) as an analysis tool for framing the development of professional knowledge among teachers.

2 Theoretical and conceptual background

2.1 Teacher professionalization as a concept

Moss (2012) describes professionalization as the process of connecting prescribed practice and procedures with expectations to meet set outcomes. Thus, professionalization is often linked to performance. However, other researchers (Mushayikwa, 2013; Griesbaber, 2017) argue that focusing only on performance demonstrates a mechanistic view of teaching as a profession and only considers its technical and ma-

nagerial aspects. The authors contend that this is far removed from the human elements of becoming a professional teacher, such as acquiring a teacher-identity, with the values, attitudes, and ethics of a successful teacher.

Mushayikwa and Lubben (2009) suggested that during the process of professionalization, a teacher needs to acquire efficacy in both performance and the affective (professional) areas of their work. Teacher efficacy may be defined as the teachers' values, beliefs and ability to effect positive student outcomes. These beliefs are dependent on the teachers' confidence and mastery of the tools of their trade. They must simultaneously develop pedagogic and managerial skills related to their classroom practice, and values and attitudes related to their unfolding identity as a teacher. These two efficacies together determine the teacher's growth and performance within the profession. Figure 1 below (Mushayikwa & Lubben, 2009) shows the relationship between classroom efficacy (performance) and professional efficacy. The diagram, presented as a model, consists of two light panels facing a translucent bulb at the center. The two panels represent the teacher's classroom efficacy (as demonstrated by the teacher's content knowledge, classroom practice skills, pedagogic knowledge, general PCK about their discipline, practical knowledge, skills and CoRes about the discipline, and topic-specific PCK within the discipline), and the teacher's professional practice (as represented by where they are in their career, the extent to which they have developed an awareness of professional ethics, the extent to which they have developed a positive professional identity, and the extent to which they have developed values to guide their practice). When the panels glow proportionally to the state of the efficacies they possess, the glow is reflected in the translucent bulb, and this in turn represents the cumulative / aggregate efficacy of the teacher at any given time.

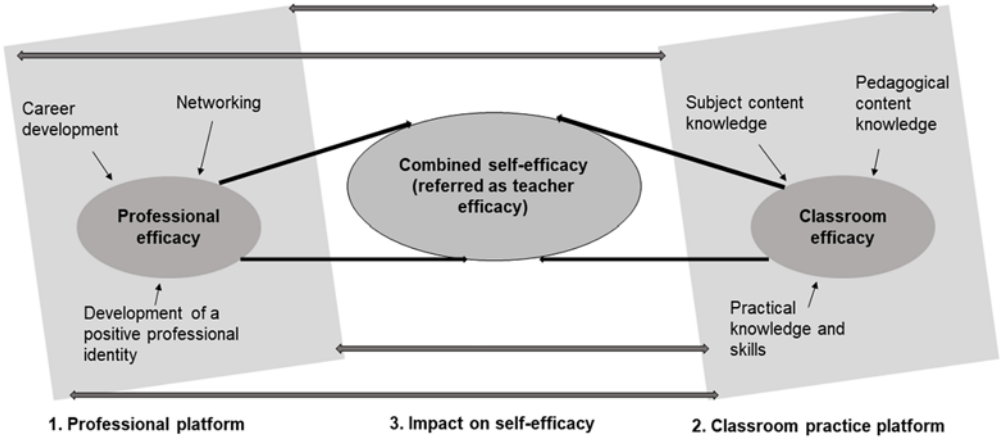

Figure 1 The teacher efficacy model (Mushayikwa & Lubben, 2009)

The model thus shows that for a teacher to develop high efficacy (high professionalization), they need to be well developed in both their classroom practice and their professional practice. This means that the two platforms need to be equally bright.

The efficacy model of student and novice teacher professionalization implies that teachers need to be well coached and mentored in both professional efficacy and classroom efficacy for them to develop into highly skilled teachers. The teacher efficacy model is one way to demonstrate how the exacting standards of the South African Minimum Requirements (MR TEQ) and SACE can be met.

Ware and Kitsantas (2007) argue that teacher efficacy helps to develop teachers' belief in their ability to fit into the profession. This in turn affects their commitment to the profession: teachers who experience weak belief systems tend to have low affective commitment, which lessens their confidence in teaching and their emotional attachment to it. Thus, during TE, student teachers are expected to develop the right efficacies and attributes for commitment to the profession.

Typically, current teacher training practices focus much more on classroom practice aspects, both during content and methodology classes. It is usually assumed that the professional aspects of teaching can be acquired more easily during the teaching internship, which is typically six weeks a year over the four years. During this time, student teachers are normally assigned to a mentor teacher at the school where they teach, as well as to a supervisor from their institution. The mentor teacher inducts the student teacher into the school curriculum and both classroom and professional aspects of teaching, while the university supervisor is on hand to provide advice. However, in practice, university lecturers are inhibited in their role, as they can only visit and observe the student at work two or three times during the six weeks. In most cases, they act as advisors / guides in the first two visits, while the last visit is usually a summative assessment of the student teacher's development.

Be that as it may, efficacy research has been mired in controversy. Several researchers, for example Wheatley (2005) and Labone (2004), have argued that efficacy research is more academic than utilitarian, focusing on what teachers tell themselves they "feel" about teaching. They further argue that such perceptions of efficacy are not useful on a practical level, as teachers tend to either exaggerate or minimize their perceptions of their own effectiveness. Thus, teachers' feelings about their capabilities do not necessarily align with what they are able to do. In this chapter, the authors follow an interpretivist approach, arguing that teacher perceptions influence their decision-making. Thus, the development of teacher efficacy in teacher education can be encouraged or suppressed by the foci provided during induction.

2.1 Legitimation code theory

Existing research about teacher professionalism identifies specific attributes that should define a teacher. Lee Shulman (1987), for instance, highlights teachers' pedagogical reasoning and actions as integral to teachers' decision making. Pella (2015) identifies Shulman's (1987) pedagogical shifts as consisting of key pedagogical shifts, namely: (i) comprehension (that includes critical interpretation and preparation of text material); (ii) content representation (including identification of big ideas, explanations, and use of analogies); (iii) instructional selection (including teaching and learning strategies, and use of pedagogical resources such as teaching/learning aids); (iv) adaptation of content and instruction to the appropriate level of the learners.

Loughran (2004) extends Shulman's findings by identifying how teachers can develop and present conceptual knowledge from one topic to another. Shulman's findings suggest that the way teachers develop and present conceptual knowledge of a specific topic varies from teacher to teacher, depending on their experience.

While extant research about teaching and learning has been published, Karl Maton (2014) proposes *Legitimation Code Theory (LCT)* as an alternative framework for exploring knowledge practices in terms of their organizing principles. Maton's argument is that the bases of achievement in any professional practice are tacit and cannot be readily discerned – therefore it is difficult to assign causation to professional practice. LCT, however, makes these bases visible by encoding the professional's behavior. By studying these codes, it is possible to determine how different behaviors enable or constrain knowledge-building in professional practice.

This chapter adopts Karl Maton's legitimation code theory (LCT) to discuss mentorship during TE regarding teacher professionalism and subject matter knowledge. Below is a brief description of LCT.

Maton (2014) defines LCT as a multidisciplinary and multidimensional theory that offers a language of description to social practice. Thus, LCT combines and extends Bourdieu and Bernstein's theories as an explanatory conceptual framework for analyzing the educational practice. While confirming the importance of acquiring a specialized gaze into educational practice as a trainee teacher (the knower-gaze), conceptions (knowledge) that validate it are also paramount (Maton, 2016). For instance, Bourdieu (2000) affirms the importance of developing a trained gaze in any practice, such as the teaching profession, stating that it requires apprenticeship in the field. Furthermore, trainee teachers' mentorship during teaching practice in schools is not linear, even with assessment rubrics. Pre-service teachers need experts' continued advice.

According to Maton, LCT comprises five different dimensions: "Autonomy, Density, Specialization, Semantics, and Temporality" (Maton, 2014, p. 18). Whilst three of these dimensions (Semantics, Specialization, and Autonomy) are well established through research, the other two (Density and Temporality) are still under development (Clarence, 2017). Although these dimensions can be used to look at a specific research situation, they provide different "gazes". For example, the Semantics dimension looks at the abstractness and complexity of knowledge in a practice, whilst the Specialization dimension looks at the professional practice (Maton, 2014). The Specialization dimension is described in more detail below.

To track the nature of mentor-mentee apprenticeship during TE, the authors adopted the specialization dimension of LCT, which is one of its five dimensions. The specialization dimension of LCT is used to analyze and explain the nature of mentorship with regard to teacher professionalism and subject matter knowledge during TE. According to Maton (2016), the specialization dimension can be used to study any practice, such as the teaching profession, with regard to the relations between the knowledge-knower structures. The specialization codes govern the organizing principles' continuum of strength, from epistemic relations (ER) knowledge to social relations (SR) knowers. To illustrate the epistemic relations (ER) as a continuum of strength, refer to Figure 2 below.

Figure 2 The epistemic relations (ER–/ER+)

To illustrate the social relations (*SR*), which stands for the relationship between practice and its subject along a continuum of strengths, see Figure 3 below.

Figure 3 The social relations (SR– and SR+)

Furthermore, ER and SR continua can be brought together to illustrate a specialization plane used to describe change in practice across time (Maton, 2016).

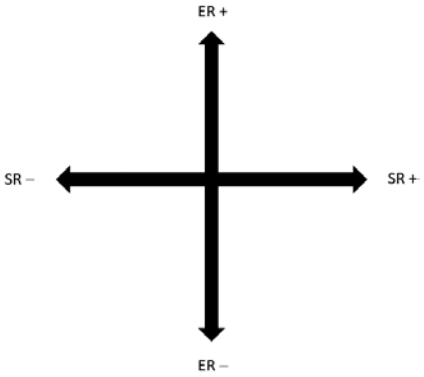

Figure 4 The specialization plane

Figure 4 below shows the specialization plane, mapping out the *knowledge code* along ER+ and SR–. For this paper, ER+, SR– will represent a strong emphasis on the *knowledge code* (classroom efficacy), which includes subject matter, knowledge of appropriate teaching strategies, and classroom control (see Martin, 2016).

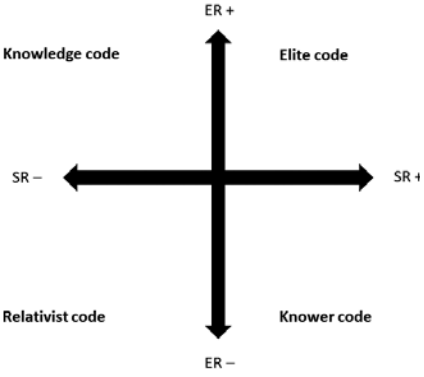

Figure 5 The specialization codes (Martin, Maton & Doran, 2019)

When the mentor emphasizes the need for professional efficacy in the comments, the *knower code* is represented by *ER–*, *SR+*.
ER–, SR– represent a *relativist code*, meaning that the legitimation here is neither knowledge nor gazes.
Lastly, the *elite code (ER+, SR+)* means that legitimacy is based on expertise in both the knowledge and the knower codes (Maton, 2014). Thus, LCT is used to encode supervisors' and mentor teachers' comments on the teaching practice experience of the stu-

dent teachers. The authors chose the specialization dimension because it enables the authors to compare the perception of the comment with its intent in terms of building up knowledge for professional practice along with the continuum level for each code.

3 Methodology and data analysis

The research seeks to answer the question: in what ways does teaching experience help in professionalizing student teachers? The main objective of the research was to determine the nature of the advice that university supervisors and school teachers provide student teachers with during teaching experience, as expressed in their comments after observing the students.

The authors established that the university employed a dual mentorship strategy to assist the professionalization of student teachers: a) university supervisors would visit the student at least twice while on teaching experience to provide continuing support, with the final visit usually concluded as a summative assessment for grades; and b) the university also engaged school subject teachers as mentors to the student teachers for the full duration of their teaching experience.

Four supervisors (University supervisors—US) and four mentor teachers' (school teachers—MT) assessment documents were obtained from the teaching experience archives. The archives contain hundreds of folders with teaching experience documents from past students. These folders are kept in a secure storeroom for ten years and are then destroyed. Four folders belonging to 4th year B.Ed. and PGCE Science students were selected, from archives generated between 2014 to 2018 at the university. The reason for making this selection was that both authors are familiar with the content and methodologies used in science education. It made sense to choose fields in which they know the teaching environment well. The additional criteria used in selecting specific folders were:

1. The location of the teaching experience host school—we selected schools from diverse backgrounds, including township and private schools. Two folders had documents indicating that the teaching experience had been carried out in township schools, and two in private schools. This selection was made to determine whether the host school environment had any impact on the observed trends.
2. The authors also selected folders that contained all three documents, i.e., university supervisor comments, mentor teacher comments and the student's reflective diary. This selection was made as it enabled us to collate the supervisors' comments with the student's own perceptions of what the supervisor and mentor had suggested,

giving us insight into the student's reaction to the comments. However, due to the limitations of the scope of this chapter, student teachers' reflections are not included in this discussion.

3. Folders that were isolated for potential analysis were read through to determine whether they had rich data that could be used for the purpose of this study. The analysis was more concerned with the nature of the comments than with the individual teachers, and the supervisors' / mentors' advice was classified as addressing issues of either classroom efficacy (CE) or professional efficacy (PE).

The university supervisors' and school mentors' reports were then manually and thematically analyzed using grounded theory. Ideas that recurred across each of the four document sets were identified and grouped according to either the classroom efficacy attributes or the professional efficacy attributes identified earlier. The attributes that were supported were then organized into themes. Table 1 shows the themes that emerged from this analysis.

Grounded theory analysis of the scripts yielded four recurring themes for classroom efficacy (CE) across both university supervisors and school teacher mentorship commentaries. Both groups identified: (i) Classroom management (PE1); (ii) Teacher identity development (PE2); (iii) Professional integrity (PE3). However, only the school teachers identified Administration (PE4) as a theme in the classroom. Table 1 provides details of the descriptors for professional efficacy, as arising from the commentaries of the university supervisors and mentor teachers.

	Classroom efficacy	**Professional efficacy**
University supervisor themes	Comprehension: critical interpretation, and preparation of text. CE1	Classroom management: use of time, pacing, planning, discipline (noise control), and reflectivity. PE1
	Content representation: identifying big ideas, explanations, and analogies. CE2	Identity development: motivation, and attitude towards learners (e.g., knowing learners by name). PE2
	Instructional selection: teaching / learning strategies, pedagogical resources e.g., L / T aids, and feedback. CE3	Professional Integrity: ethics, attitude towards work etc. PE3
	Adaptation: of content to learners' level and learners' needs. CE4	

School mentor teacher themes	Comprehension: critical interpretation, and preparation of text. CE1	Classroom management: use of time, pacing, planning, discipline (noise control), and reflectivity. PE1
	Content representation: identifying big ideas, explanations, and analogies. CE2	Identity development: motivation, and attitude towards learners (e.g., knowing learners by name). PE2
	Instructional selection: teaching/learning strategies, pedagogical resources e.g., L/T aids, and feedback. CE3	Professional Integrity ethics, attitude towards work (punctuality). PE3
	Adaptation: of content to learners' level and learner needs. CE4	Administration: recordkeeping, registers, mark lists, and reports. PE4

Table 1 Themes identified from document analysis of university supervisors

Maton (2016) argues that in order to make sense of the themes emerging from the grounded theory analysis, an external language of description must be developed to interpret the thematic analysis. Such a language of description is called a translation device. A translation device is a tool [an external language] used to interpret the typologies or the thematic analysis. Research that used Bernstein's (1977) theory of classification and framing coined the notion of translation device from the external languages: here, classification deals with the strength of boundaries between contexts and categories, while framing refers to the strength of control within the contexts or the categories (Muller, Davies & Morais, 2004).

In this chapter, two translation devices were used to discuss weak and strong epistemic relations (ER) and social relations (SR), respectively. This was done to discuss the supervision and mentorship of student teachers during TE in terms of classroom efficacy and professional efficacy from the university supervisors' and school-based mentors' perspectives. The specialization dimension and its concepts have been widely used to understand different practices, such as educational practice. Maton and Chen (2016) used LCT's specialization dimension to analyze the curriculum, pedagogy, and assessments in terms of strong and weak ER and SR. Langsford (2020) also used the specialization dimension and its concepts to analyze the pedagogical reasoning of pre-service teachers who used different pathways to become teachers.

Table 2 shows the translation device developed for the university supervisors' comments. It shows the supervisors' comments as raw data from the selected sample, illustrating how the translation device was constructed. The four university supervisors

were coded as US1 through to US4. Similarly, Table 3 shows the translation device used to code the school teachers' comments. The four mentor teachers (school teachers) were coded as MT1 through to MT4.

Epistemic Relations (ER)		
Concepts demonstrated emphasizing:	**Indicator**	**Examples using excerpts from data**
Classroom efficacy (ER+)	When classroom efficacy is emphasized as the authentic form of knowledge during mentorship	*You need to demonstrate that you are aware of misconceptions that may arise in the content. These may be misconceptions that learners bring from home, from their everyday interactions or from their understanding of the content knowledge. You need to show how you will tease out these misconceptions and how you will address them.* *I liked that you incorporated the lesson evaluation aspect that we discussed last time I was here.* (US1)
Classroom efficacy (ER–)	When classroom efficacy is suppressed as less important during TE mentorship	*You tend to talk too much, and you introduced too many new terms all at once; for example, mole concept, relative atomic mass, each of these is a lesson in its own right.* (US1)
Professional efficacy (ER+)	When professional efficacy is emphasized as authentic during TE mentorship	*The lesson plan was well written, with detailed objectives, prior knowledge of learners, and lesson sequence written in steps.* (US2)
Professional efficacy (ER–)	When professional efficacy is suppressed and downplayed during TE mentorship	*It would help if you were more assertive and confident in your presentation.* (US4)
Social Relations (SR)		
Concepts demonstrated emphasizing:	**Indicator**	**Example with excerpts from data**
SR+	When classroom efficacy is explicitly emphasized based on opinions and personal experiences.	*Asking learners to work in groups to demonstrate oil floating and chalk sinking was a better option than the teacher using a simple small beaker.* (US2)
SR–	When personal experiences and opinions about classroom efficacy are downplayed during teaching experience mentorship	*…, but I still feel that the student plans less work for the lesson. Please minimize the use of "I will…; I will… let the learners take a major role in their learning." Give them tasks to do in groups, for, say, 10 mins, followed by class discussion.* (US2)
Professional efficacy SR+	When professional efficacy is explicitly emphasized based on personal experiences and opinions	*Good classroom management. Learners were busy throughout the lesson.* (US3)

Professional efficacy SR–	When opinions and personal experiences downplay the professional efficacy	*I feel that this lesson did not have much content to cover. You could have covered more work.* (US3)

Table 2 The translation device using LCT's specialization dimension for discussing university lecturers' (US) mentorship

Epistemic Relations (ER)		
Concepts demonstrated emphasizing:	**Indicator**	**Examples using excerpts from data**
Classroom efficacy (ER+)	When classroom efficacy is emphasized as the authentic form of knowledge during teaching experience mentorship	*Topic: Concentration* *The lesson was well executed. Definition clearly explained through representation. The formula was also explained with emphasis on the units of concentration.* (MT1)
Classroom efficacy (ER–)	When classroom efficacy is suppressed as less important during teaching experience mentorship	*Class worked and followed the lesson along. No doubt the student teacher had taken her time planning and preparing for this lesson.* (MT1)
Professional efficacy (ER+)	When professional efficacy is emphasized as authentic during teaching experience mentorship	*Educator was professional in approach and has the potential to be a good teacher.* (MT2)
Professional efficacy (ER–)	When professional efficacy is suppressed and downplayed during teaching experience mentorship	*Don't allow girls to go to the toilet unaccompanied.* (MT4)
Social Relations (SR)		
Concepts demonstrated emphasizing:	**Indicator**	**Example with excerpts from data**
SR+	When classroom efficacy is explicitly emphasized based on personal experiences and opinions	*Good that you went through common mistakes that learners made in the test.* (MT3)
SR–	When personal experiences and opinions about classroom efficacy are downplayed	*Good to practice conversions.* (MT3)
Professional efficacy SR+	When professional efficacy is explicitly emphasized based on personal experiences and opinions	*Good blackboard use and clear handwriting.* (MT4)
SR–	When professional efficacy is downplayed based on personal experiences and opinions	*Can cope with class when left alone.* (MT4)

Table 3 Translation device for discussing mentor-teachers' (MT) comments

These comments were also compared with the student teachers' reactions to the lesson observations, as reflected in their journals. The LCT analysis enabled the authors to get a sense of the efficacy bias of the supervisors and mentors, as well as to determine whether the comments generated would be deemed useful in developing efficacy in the professionalization of the student teacher.

4 Analysis and discussion

In the discussion, LCT's specialization dimension is used to understand the mentorship of university supervisors and school teacher mentors in terms of how they understand the teaching profession as a practice. In Figure 3 above, the knowledge codes ER+ and SR– answer questions about what you know, whereas the knower codes ER–; SR+; answer questions relating to the knower under the specialization dimension (Martin, Maton & Doran, 2019).

4.1 University supervision reports

The university supervisors legitimized the knowledge code (ER+ / SR–) of pre-service teachers, as demonstrated by the discussion below. Their reports focused on the following aspects of knowledge: relevant activities; what knowledge the mentee planned to teach; the way the topic was introduced; the nature of the teaching strategies adopted; and the interactions between the pre-service teacher and the learners. These aspects of knowledge were exemplified in the comments made by the supervisors in the written reports.

Caveat 1: Comprehension (CE1)

For example, in a report on the teaching of a Grade 10 lesson on chemical change, the lecturer US3 commented:

» Your lesson plan is incomplete. There are several sections that are missing from your plan, (please refer to the TE booklet), each lesson should reflect what the learners are expected to know (content knowledge), be able to do (skills), and understand (attitudes and values). These three important areas are missing from your plan. [US3] **(ER+, SR–)** CE1

The comment above legitimizes the knowledge code. It emphasizes what the supervisor considers as the authentic knowledge that the student teacher should have ap-

plied. Thus, the epistemic relations score is strong (ER+), but the social relations score is weak (SR–), which is why this comment is coded in the upper left quadrant of Figure 6 below.

Caveat 2: Treatment of misconceptions

» You need to demonstrate that you are aware of misconceptions that may arise in the content. These may be misconceptions that learners bring from home, from their everyday interactions or from their understanding of the content knowledge. You need to show how you will tease out these misconceptions and how you will address them. [US1] **(ER+ SR–)** CE2

The comment above authenticates the knowledge code by reminding the PST to take note of the content knowledge vis-à-vis what learners know and the misconceptions they may harbor. Using the concept of teacher's pedagogical reasoning and action according to Shulman (1987) and Pella (2015), the student teacher is reminded to think and plan with essential science ideas in order to keep in mind the judgement of what learners know, and what the teacher wants them to know, considering effective strategies as well as difficulties in teaching the concept (Loughran, Mulhall & Berry, 2004). Again, in this caveat we find that the emphasis is on the content knowledge dimension, so the comment is encoded in the upper left quadrant (see Figure 6).

Caveat 3: Affective

» I liked that you incorporated the lesson evaluation aspect that we discussed last time I was here. [US1] **(ER– / SR+)** PE3

In this case, the supervisor affirms appreciation and provides positive feedback, which helps to strengthen the student teacher. This represents a professional emphasis and positive reinforcement of what is expected of the student teacher. This affirmation statement authenticates the knower code. The lecturer follows up on previous visits' recommendations to make sure that the student teacher has implemented them. The emphasis here is on professional growth.

Caveat 4: Holistic lesson evaluation

» You started well recapping on the baseline assessment and introducing the mole concept. However, you took too much time on the introduction. [**ER–, SR+** (CE1)]

» It would help if you were more assertive and confident in your presentation. [**ER–, SR+ (**PE3)] You tend to talk too much, and you introduced too many new terms all at once; for example, mole concept, relative atomic mass, each of these is a lesson in its own right. [**ER–, SR+ (**CE1)]

» It looks like you were not well-prepared for this lesson. [**ER–, SR+** (PE1)] You kept on making small mistakes. You did not indicate, for example, why you have atomic mass and relative atomic mass. You did not explain the foundations for these. [**ER+, SR+ (**CE1)]

» This Periodic Table can be wrong—you need to talk about isotopes and how they (relative atomic masses) are derived from the isotopes. [**ER–**, **SR+** (CE1)]

» This lesson was a disaster; you need to come prepared to teach. [**ER–**, **SR+** (PE1)]

» You say RAM has no units, but the atomic mass has units. What are the units of atomic mass? [**ER+**, **SR–** (CE1)]

» 1 amu is equal to ½12 of C-12 atom, so the formula for relative atomic mass is 1 amu or ½12 × 12 × the element. [**ER+**, **SR+** (CE1)]

» Atomic mass is equal to the number of protons and neutrons in the nucleus. Therefore, atomic mass is a whole number. [US2] [**ER+**, **SR+** (CE1)]

In this caveat, the university supervisor's comments are distributed between knowledge, knower, and elite codes (see Figure 4a below). The university supervisor details the lesson process by indicating to the student teacher what they did well. For instance, a baseline assessment is vital in tying the previous lesson into the day's lesson topic. This enhances the student teacher's comprehension of their role as a teacher. The US also advises the student teacher to be more assertive in explaining the concept and in engaging learners. This caveat addresses all critical aspects of the teaching profession as explained above, namely classroom efficacy (comprehension, content representation, instructional selection, and adaptation) and professional efficacy (classroom management, professional identity, professional integrity, and administration). Therefore, the lecturer is not only judging the student teacher to be knowledgeable in terms of subject matter knowledge, but

also furnishing them with the right kind of knower code to become an elite teacher (Figure 4a below, upper right quadrant). They even advise the student teacher not to take things for granted when they warn the student teacher that "the Periodic Table can be wrong—you need to talk about isotopes and how they are derived from the elements."

The above caveat affirms that the supervisor mentors the pre-service teacher to know more than what the learner textbook provides, thus training the student teacher to excel and become an expert teacher in the field *elite code.* The supervisor concerned dissects the lesson process to guide the student teacher on what it takes to become a teacher.

Caveat 5: Content representation

» You should have provided the learners with more and varied examples similar to the ones given in their textbooks to help them master the idea of relativity before moving onto the relative molecular mass. [US4] **(ER+ / SR–)** CE2

Lastly, the mentorship provided to the ST aims at developing their classroom efficacy. Through the guidance given, the ST in question is inducted into what the topic entails, i.e., the teacher's PCK (Loughran, 2006).

However, it should be mentioned that most of the university supervisors were writing in the third person in their mentorship reports. Rather than addressing the student teacher, they became reports *about* the student teacher. The impersonal nature of the reporting gives the impression that these reports were not meant to build up the students, but rather to report on them—as in a summative evaluation. The authors believe that this kind of supervision had an impact on the student teacher's view of the supervision process.

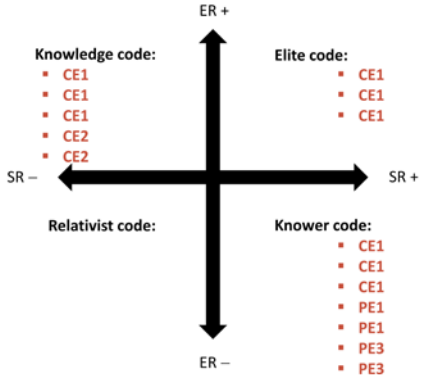

Figure 6 University lecturers: mapping of specialization codes

Figure 6 shows how the four university supervisors' comments are mapped to reflect the specialization codes. The distribution of the codes reflects an emphasis on knower and knowledge aspects of specialization, wherein the knower aspects of specialization are more instructional. One of the supervisors' comments are distributed across three of the domains / quadrants, with comments ranging from highly specific to balanced advice (elite code) through the knowledge and knower domains.

4.2 Mentor teacher reports

Now a discussion about the nature of the schoolteachers' mentorship reports ensues.
Caveat 1: Time-keeping

» Arriving on time is very important! You must be here to greet them! Create your atmosphere and your own discipline. [MT1] **(ER–, SR+) PE3**

The mentor teacher's comments show that he was more concerned with the student teacher's professional behavior and projected image. Thus, these comments were aimed at motivating the student teacher to develop professional ethics, which is an important part of developing a professional identity. The reported statement emphasizes strong social relations, but a suppressed epistemological relationship.
Caveat 2: The lesson process

» The lesson was well executed [**ER–, SR–** (PE1)]. The definition clearly explained through representation. The formula was also explained with emphasis on the units of concentration [**ER+, SR–** (CE2)]. The preservice teacher engaged learners by asking some of them to write on the board when answering homework questions [**ER–, SR+** (CE3)]. The class worked and followed the lesson along. [MT4] **(ER–, SR–) PE1**

Some parts of this mentor teacher's report are explicit, though there are also generalized evaluative statements. These reports were meant to benefit the student teacher, but the way this report was written indicates that it was directed at the assessors, rather than at the student. There is a sense of finality in the writing style. Although the mentor teacher touches on both classroom efficacy and professional efficacy aspects, the knowledge is suppressed.

Caveat 3: Classroom advice

» Madam, "I don't know" can be broken down into questions. [MT1] **(ER–, SR+) CE3**

This teacher presented more general comments. However, the comment that stood out was the one above. This is because it emphasizes knowledge of learners and contexts. What the teacher means is that if learners say they do not know something, the teacher must break down the question into further simpler questions. Hence, this was classified as revealing the knower code.

Caveat 4: Classroom management

» When a girl is busy on the board, think of a way to involve the whole class. Sometimes the girls (girl's) confusion can lead to disruption, ask for hands [MT3] [**ER–, SR+** (PE1)].

In this comment, the mentor teacher was emphasizing classroom management, advising the student on strategies for keeping the class focused. This kind of knowledge helps the student teacher acquire a deeper understanding of the learners and of learning behavior. For this reason, we classified the comment as being in the knower quadrant. See Figure 7 below.

Caveat 5: Classroom management

» Weird things do happen in class, draw attention of the learners to you. The back of the class is disruptive, so you must settle the class before carrying on. Don't be afraid to single out bad behavior but be wary of distracting from the lesson. [MT4] [**ER–, SR+** (PE1)].

In this comment, the mentor teacher was emphasizing the maintenance of discipline in class. The emphasis is once again greater in the social relations and suppressed in the knowledge domains. Thus, this comment is more focused on professional efficacy.

Caveat 6: Contextually bound classroom management

» Girls forget. (They) don't always work. Give spot tests. But be careful with frustration. Class clowns like to catch out the teacher. [MT3] [**ER–, SR–** (PE1)]

This comment by a mentor teacher at a girls' high school was focused on classroom management that is contextually bound. The advice is relational, as it applies to generalized classroom management in a specific context. Therefore, this comment is coded "relativist", i.e., the bottom left quadrant in Figure 4b. The insight generated in this context is focused on professional efficacy, as it deals with being aware of the context in which the teacher is working.

Caveat 7: Girl-child protection

» Make sure you have a list of the girls who are staying on after school. The rule is that the girls need to give 24hrs notice if they are going to stay behind after school. [MT3] [**ER–, SR–** (PE4)]

The advice is relational, as it applies to generalized classroom management in a specific context. This comment is therefore coded as "relativist", i.e., the bottom left quadrant in Figure 4b. The comment is meant to sensitize the teacher to the need to protect the girl child and thus speaks to the ethical role of the teacher as a guardian in loco parentis.

Caveat 8: Content knowledge

» Please make sure to use molar mass all the time when explaining and calculating. Never use mass. Mass is different and will confuse the learners. [MT2] [**ER+, SR+** (CE3)]

This is a precise instruction to make sure that the student teacher gets their content knowledge right. Therefore, it falls in the epistemic relations knowledge quadrant (top left in Figure 4b).

Caveat 9: Pacing

» Marking homework is taking too long. You can give a memo to the learners to mark during break time before coming to class. They then can just ask what they do not understand. You are too slow. You need to move faster with the curriculum. [MT2] [**ER–, SR+** (PE3)]

In this comment, the mentor teacher was admonishing the student teacher for moving at a slow pace and using strategies that waste time. The mentor then suggested better, more efficient methods. This increases the "knower" code for the student teacher and speaks to their professional efficacy through an increased awareness of professional ethics.

Caveat 10: Content knowledge

» Careful with the use of the word “atom”. Don't use “one atom” of sulphate! There are 5 atoms in -SO_4 but 1 set of an ion of sulphate! [MT2] [**ER+, SR+** (CE3)]

This comment focuses on accuracy in techno-scientific language to avoid misconceptions. It is therefore coded in the top right quadrant, as it emphasizes specific epistemological relations and helps develop the student teacher's classroom efficacy and professional efficacy.
Figure 7 shows how the four mentor teachers' reports are mapped to reflect the specialization codes. See Figure 7 below.

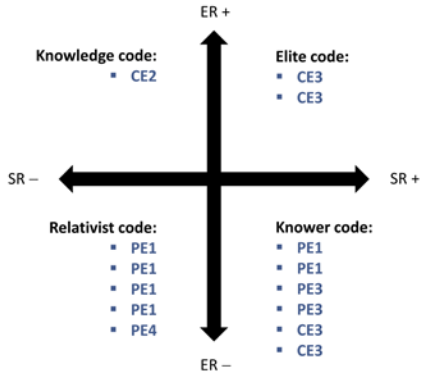

Figure 7 Mentor teachers: mapping of specialization codes

The remarks made are mainly from the knower code (ER–, SR+), the bottom-right quadrant in Figure 7 above. The code's distribution shows that the majority of the mentor teachers' concerns were more about developing the student teachers as knowers. The advice provided in the reports was of a practical nature and focused mainly on classroom / ethical behaviors, focusing on learner management, time management and pacing. Mentor teachers also made generalized comments.
Figure 8 provides combined specialization codes for the university supervisors and mentor teachers. The school mentors concentrated on professional efficacy in their reports, which varied depending on the school context. Their main emphasis was on classroom management and professional integrity. The mentor teachers paid attention to contextualized administration issues. For example, one mentor teacher's report from a girls-only school addressed issues of being early to school to set the day's atmosphere with learners. The mentor teacher then comments at length about not allowing girls to leave class. In general, all four mentor teachers provided very specific com-

ments that would fall in the relativist code, in the bottom left quadrant. The comments were more contextualized to the school culture.

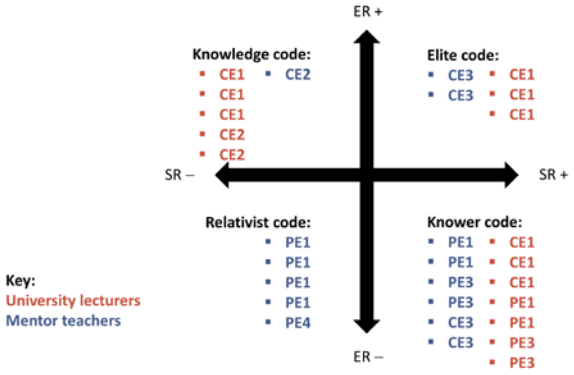

Figure 8 Combined specialization codes for university and mentor teachers

On the other hand, the university supervisors' comments revealed a strong focus on the student teacher's content knowledge. For example, in Table 2, the statement focuses the student teacher's attention on pedagogical knowledge necessary for classroom efficacy:

» You need to demonstrate that you are aware of misconceptions that may arise in the content. These may be misconceptions that learners bring from home, from their everyday interactions or from their understanding of the content knowledge. You need to show how you will tease out these misconceptions and how you will address them. I liked that you incorporated the lesson evaluation aspect that we discussed last time I was here. (UL1)

As demonstrated in Figure 5, some of the comments by the university lecturers covered all quadrants, including the elite specialization codes, indicating strong grounding in both professional and classroom efficacies.
MR TEQ lays down minimum requirements for teacher education qualifications and specifies that student teachers should spend a total of two semesters in the schools during the four years of their education. This is to ensure that student teachers acquire practical teaching experience and develop both professional and classroom efficacies by the time they qualify. The findings of this chapter reveal a synergy between university and school-level expectations of the knowledge that student teachers are supposed to bring with them to the schools. For instance, university supervisors' reports

tended to focus on the knower, knowledge, and elite codes from the quadrants above, which are more theory-based, while the mentor teachers' reports tended to refer to all four quadrants, making their mentoring style more practical and contextualized.

5 Conclusions and recommendations

In this chapter, the authors sought to describe and analyze how student teacher mentoring and supervision facilitate the development of teacher efficacy in novice teachers. The study revealed that student teacher supervision and mentoring covered both professional and classroom efficacies. The foci and manner of presentation were also found to be cumulative. However, the mentoring and supervision reports were found to be oriented towards summative evaluation, when in fact they were meant to be developmental. It is therefore necessary that both the supervisors and mentors agree on the supervision process and address the student teacher to show them that supervision and mentoring are meant to help them become better teachers. The study showed that there is a synergy in the co-operation between the mentor teachers and the university supervisors, which ensures the development of professional values and rigor during the teaching experience supervision process.

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