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Learning to Teach through Recursive Boundary Crossing in the Teaching Practicum

Zhaoxuan Wang ^a, Rui Yuan ^a and Wei Liao ^b

^aFaculty of Education, University of Macau, Macau, SAR, China; ^bCenter for Teacher Education Research, Beijing Normal University, Key Research Institute of the Ministry of Education of China, Beijing, China

ABSTRACT

Informed by a conceptual framework on boundary crossing, this qualitative case study explored how a student teacher engaged in professional learning through recursive boundary crossing between her field school and the university programme in a U.S. context. The findings revealed the power of boundary crossing as a cyclical, intense, and transformative learning mechanism that helped the student teacher connect teaching knowledge and experiences acquired at different sites and facilitated her reflective practice and self-transformation. However, the lack of communication between the university and the field school caused a cognitive disturbance and emotional challenges for the student teacher. The study concludes with practical implications for reforming teaching practicum to maximise the potential of boundary crossing for teacher learning.

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Student teacher; teaching practicum; boundary crossing; qualitative case study

Introduction

Teaching practicum is considered an essential component of university-based teacher education programmes as it can equip student teachers with a contextualised understanding of learning and teaching in authentic school settings (Loughran & Hamilton, 2016). As student teachers enter the field schools, they gradually learn to make sense of new experiences and practices and interact with different stakeholders in order to develop their own membership in the situated communities. Such a process can be defined as boundary crossing, which refers to a powerful form of experiential learning at the intersection between different ideologies, beliefs, practices, and cultures (Bakker & Akkerman, 2014). Learning at boundaries enables student teachers not only to acquire pedagogical and contextual knowledge and hone teaching skills but also to develop their self-efficacy, teaching commitment, and professional identities (e.g., Allen & Wright, 2014; Redman & Campbell, 2018; Trent & Lim, 2010).

In the field of teacher education, a large bulk of studies (Hara, 2020; Qin et al., 2021; Xie & Cui, 2021) have been conducted on student teachers' boundary crossing experiences during the teaching practicum, which are often described as perplexing, challenging, and filled with uncertainty and risks. Researchers (e.g., Song, 2021;

Ulvik et al., 2018) have pointed out the dichotomy between university coursework and field school experiences, which may overwhelm student teachers and leave them with persistent tensions. One reason behind the phenomenon is that during the teaching practicum, student teachers may find their own teaching theories formed on the university campus detached from the complex classroom situations, as a result of which, they may have to give in to the traditional conventions and mimic school mentors' teaching behaviour. Such a washing-out effect asserted by Zeichner and Tabachnick (1981) can permeate the whole practicum, thus exacerbating the gap between academic knowledge and practitioner knowledge in teacher education (Zeichner, 2010).

In addition, student teachers' professional learning at the two sites (i.e., the universities and field schools) may be disrupted by the lack of connection and communication between university-based teacher educators and school mentors in the practicum. Such a divide, partially derived from the institutional boundary and different work cultures, can pose challenges for student teachers who may feel lost and isolated in the new learning environment (Allen, 2009; Sinner, 2012). This is particularly the case when student teachers share different or even contradicting views about classroom teaching with their school mentors. Without external guidance and mediation, student teachers may be caught in the conflicts between their personal beliefs and the existing practice prescribed by the school mentor and curriculum, thus abating their self-efficacy and teaching motivations (Yuan, 2016). To help student teachers bridge the theory-practice divide, scholars (e.g., Darling-Hammond, 2017) have called for establishing a sound and sustainable partnership between universities and field schools in the teaching practicum. In response to this call, this paper reports on an innovative attempt of a U.S. pre-service teacher education programme to help student teachers connect their learning at the university and the field schools. As opposed to the traditional mode of teaching practicum where student teachers are assigned to field schools for class observation and teaching practice with relatively limited contact with the university, this programme requires student teachers to return to the university campus and attend specific teacher education courses in the middle of the teaching practicum. In these courses, student teachers receive new pedagogical input and conduct reflective activities in relation to their ongoing practicum experiences. Such an arrangement aims to engage student teachers in recursive boundary crossing between the two sites and help them bridge the theory-practice gap as an entrenched problem in current pre-service teacher education.

Drawing on the approach of a qualitative case study (Yin, 2014), the present study examines the professional learning of one student teacher—Haley (pseudonym)—through recursive boundary crossing between her field school and the university coursework. This study can deepen our understanding of student teachers' learning to teach through continuous meaning construction and negotiation within and across different learning sites. In addition, the study can generate implications for current pre-service teacher education programmes, particularly concerning the design, implementation, and reform of the teaching practicum to close the theory-practice gap and better prepare future teachers.

Conceptual Framework

The notion of boundary crossing theoretically anchors the study to investigate how a student teacher travels back and forth between the university and her field school through different forms of engagement (e.g., observation, teaching, and coursework) as part of her learning to teach. In general, boundary crossing refers to the complex negotiated process through which professionals encounter and interpret the differences and discontinuity when interacting with unfamiliar territory with diverse practices, norms, and cultures (Suchman, 1993). Thus, 'boundary' is not merely a physical borderline; it also implies cultural and ideological differences within the discontinuity of diverse contexts (Akkerman & Bakker, 2011). Traversing across boundaries thus demands practitioners' strategic adjustment and negotiation to embrace fresh perspectives and practices to overcome the discontinuity between communities (A. Edwards & Mutton, 2007). To further unpack the potential of boundary crossing for learning and its underlying mechanism, Akkerman and Bakker (2011; also see, Bakker & Akkerman, 2014) have proposed a conceptual model which consists of four crucial dimensions, i.e., identification, coordination, reflection, and transformation. This framework, which links professional learning and boundary crossing, provides theoretical foundations for the present study to explore a student teacher's practicum experiences.

Identification arises from practitioners' questioning of their core identities and values through boundary crossing, which may lead to 'new insights into the practices that are of concern in each site' (Yuan 2, 2020, p. 196). For example, in Ramsaroop and Gravett's (2017) study, the student teachers compared their learning about pupils' development in university courses and their school-based practice. Compared to what they had learned in the university, the student teachers identified that the pupils they taught had diverse backgrounds and differing needs with great learning potential. Such an identification pushed the student teachers to actively reflect on their practicum experiences by viewing the field school as 'a walking talking textbook' (p. 857).

Coordination refers to the communication and dialogue for discerning the vague boundary as well as the effort to bridge diverse practices (Akkerman & Bakker, 2011). For example, in Ure et al. (2009) study, a student teacher successfully motivated a student by adding more Unidentified Flying Object (UFO) elements to the physics lesson during the teaching practicum. This research finding suggested that the student teacher became an active coordinator who could adapt the teaching activities and resources to arouse students' learning interest through boundary crossing. Similar findings were observed in Allen's (2009) study, in which the student teachers saw teaching strategies learned in the university courses as a backup and used them flexibly in conjunction with the traditional instruction practice (as a form of coordination) in a tight and structured curriculum.

Reflection is a metacognitive and meaning-making process that involves realising the differences from one practice to another and acquiring new understandings and knowledge from multiple sites (Körkkö et al., 2016; Ruffinelli et al., 2021). The individually practiced or socially constructed reflection activities enable student teachers to interpret teacher actions with theories in situated social communities and construct practical knowledge for future teaching practice (Allas et al., 2020). Körkkö et al. (2016), for example, found some student teachers could not focus on pupils' learning despite the

educational knowledge they had accumulated through university coursework. Such a gap pushed the student teachers to reflect on their roles and practice in classroom teaching. Specifically, by analysing feedback on the strengths and weaknesses of their teaching provided by mentors and peers, the student teachers started to think about the underlying reasons behind the gap and came to a deepened understanding of the teaching process and its effects. The reflective practice thus shifted the student teachers' attention away from themselves and enriched their understanding of the 'how' and 'why' of teaching.

Transformation pushes individuals to (re)consider the interrelations between different worlds, and the resulting change entails the identity (re)construction that can inform future practice (Akkerman & Bakker, 2011). Transformation can be triggered by confrontation and contradiction, that is, the 'driving force of change and development' (Engeström, 2001, p. 135) that remains in individuals' inner learning systems. For instance, Edwards and Tsui (2009) examined how a student teacher negotiated the conflicts between a communicative approach to teaching English advocated by university coursework and the static syllabus and test-oriented culture in the field school. By requesting more autonomy from the English department and directing more attention to students' communicative competence in language classrooms, the student teacher transformed and constructed coherent identities (i.e., a competent language teacher and learner) to inform her ongoing practice. Behind the student teacher's transformation was her self-agency, which refers to teachers' capacities to make choices and take intentional actions when facing challenges in constraining contexts (Toom et al., 2015). According to the existing literature (Carson et al., 2021; Yuan, 2019), the agency is mutually constructed by individual affordances and socio-cultural resources. In the face of contextual divergence and tensions that may arise from boundary crossing, student teachers with a strong sense of self-agency are likely to engage in active identification, coordination, and reflection, which may lead to the transformation of their cognition, practice, and identities.

In addition to the four learning mechanisms outlined above, boundary crossing can be activated by the use of different boundary objects as 'nexus of perspectives' (Wenger, 1998, p. 107) that carry information from site to site with a mediation function (Bakker & Akkerman, 2014). Boundary objects sometimes are jointly generated by practitioners in different learning systems, and they can connect the practitioners from different spaces of practice and sustain their collaboration (A. Edwards & Mutton, 2007). Not only mental and symbolic tools (e.g., learning models, strategies, and concepts), but materials and concrete tools (e.g., learning materials and curriculum documents) can also function as mediating instruments to help learners move across boundaries and seek continuous learning (Konkola et al., 2007).

Overall, the present study, informed by the concept of boundary crossing and the four associated learning mechanisms, aims to explore a student teacher's boundary crossing experience in an innovative teaching practicum in a U.S. context. The practicum is innovative in that student teachers are required to engage in recursive boundary crossing by returning to the university campus to take pedagogy courses while engaging in classroom teaching in the field schools. Through such an arrangement, the programme strives to help student teachers meaningfully connect their learning at the two different sites and close the gap between theories and practice. More specifically, as shown in

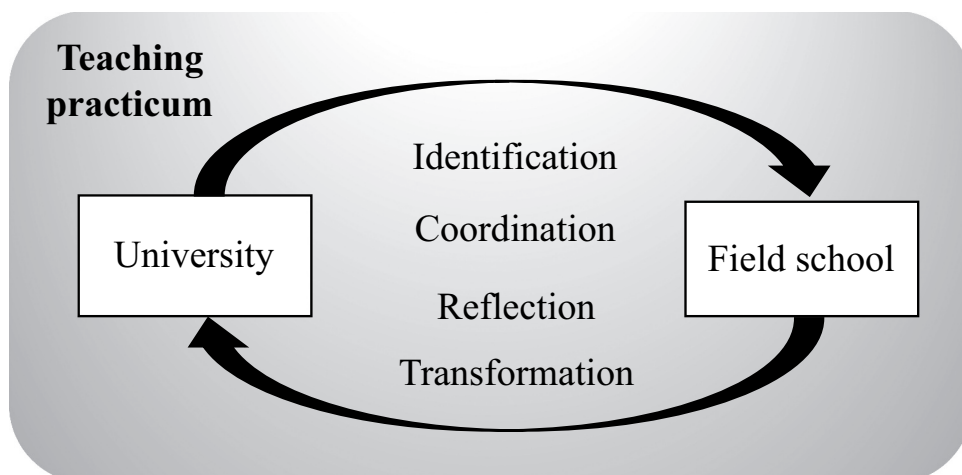


Figure 1. Conceptual framework of boundary crossing.

Figure 1, boundary crossing can engage student teachers in identification of and reflection on the differences between the university and field schools, in coordination and utilisation of diverse resources to deal with potential problems, as well as in self-interpretation and identity transformation over time. One central research question guides the study: *How does a student teacher learn to teach through the recursive boundary crossing between the university and field school?*

The Study

The Research Context and Participant

The study took place in a five-year pre-service teacher preparation programme at SU (pseudonym), a public research university located in the midwestern region of the U.S. The nationally top-ranked elementary teacher preparation programme aims to prepare competent teachers to teach different subjects (i.e., maths, literacy, social studies, and science) from pre-kindergarten to the sixth grade. After four years of university coursework (e.g., about educational philosophy, student psychology, and classroom pedagogy) on campus, student teachers are required to conduct a year-long teaching practicum in local primary schools. Specifically, they need to socialise with the school environment and learn to conduct classroom teaching of different subject areas, while they also need to return to SU for coursework after four weeks of observation and practice in field schools. These courses normally last two months and such arrangements engage student teachers in recursive boundary crossing during the teaching practicum.

During their practicum, each student teacher is assigned to a school mentor (normally an experienced teacher) who provides ongoing support about classroom management as well as lesson design and implementation. At the same time, a field supervisor (i.e., a teacher educator with rich pedagogical expertise and experiences) from SU also visits student teachers in the practicum school on a regular basis for classroom observation and post-lesson reflections. Additionally, in the middle of the practicum, student teachers

need to return to the university campus and take courses offered by the university-based teacher educators (occasionally Ph.D. students specialising in teacher education). The courses provide additional knowledge input related to student teachers' practicum teaching while organising reflective activities to help them link educational theories with classroom practice. Figure 2 shows the teaching practicum arrangement that facilitates student teachers' boundary crossing.

Adopting a qualitative case study design (Yin, 2014), this study focuses on one participant, Haley (pseudonym), a 22-year-old female student teacher, in the pre-service teacher education programme. As several research methodologists (e.g., Maxwell & Chmiel, 2014; Yin, 2014) point out, the case study approach is especially powerful for unpacking complex social phenomena in a holistic, deep, and contextualised manner. The present study focused on student teachers' boundary crossing experiences during teaching practicum—a complex phenomenon in current teacher education practice. Additionally, the case study approach has been used in a number of previous studies (e.g., Mesker et al., 2018; Tsui & Law, 2007) that focused on topics related to the present study (e.g., boundary crossing, teaching practicum, teacher learning). The case study approach has helped those studies generate trustworthy, valid, and insightful findings on their research topics. Thus, we believe the case study approach is a suitable research methodology for the present study.

The study covered the first academic semester of the teaching practicum from September to December 2019. A convenient sampling technique was used to recruit

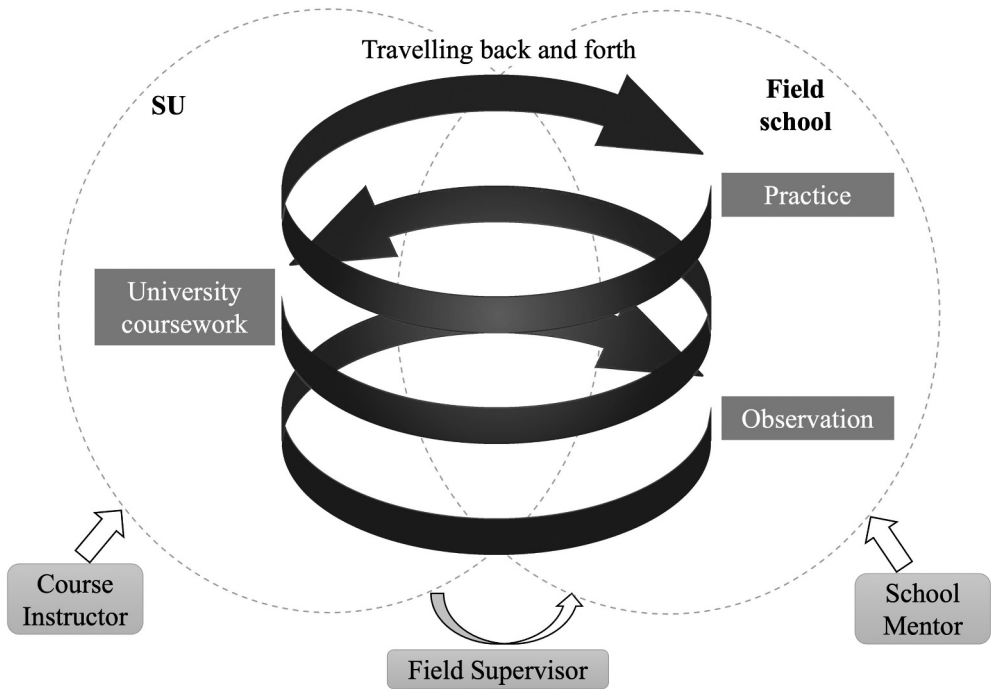


Figure 2. The arrangement of the teaching practicum.

a participant who was 'easily accessible to the researcher' (Palinkas et al., 2015, p. 536) for gathering rich and in-depth data over the whole semester. At the beginning of the project, the first author approached the programme coordinator (i.e., the key informant) and explained the aim of the study (Patton, 2002). Among the three recommended student teachers, the first author selected Haley, who was considered reflective and hardworking with a strong passion for education based on the programme coordinator's previous observation. A consent form was sent to Haley. She signed it and joined the study on a voluntary basis. Considering the length of data collection (i.e., four months) and the different research sites involved (e.g., the field school and university classrooms), it was reasonable and manageable to focus on one case for in-depth investigation.

During her teaching practicum, Haley was placed in a kindergarten classroom in the suburban area of the city with students from different linguistic and socio-cultural backgrounds. In particular, there were a number of young children from new immigrant families with limited English proficiency. The school mentor assigned to Haley had been working in the kindergarten for twenty years with six years' experience in supervising intern teachers. Besides the school mentor, Haley also received support from a field supervisor assigned by SU. The field supervisor used to teach in local primary schools and she had been working as a teacher educator in SU for three years with her rich pedagogical expertise and classroom experience.

Data Collection and Analysis

Upon the research ethics approval gained from SU, the first author engaged in data collection through in-depth interviews and field observations as guided by the study's conceptual framework mentioned above. Three semi-structured interviews (with different interview protocols) were conducted in the second, third, and fourth months of the teaching practicum to probe Haley's boundary crossing experience (Akkerman & Bakker, 2011) over time. During the first and second interviews, Haley was invited to share how she identified and reflected on practicum engagement as she transitioned from the university to the field school and travelled back and forth between the two sites. The interviews also probed whether and how Haley coordinated different ideas and resources to improve her teaching and seek self-transformation (if any) across the two sites. In the last interview, Haley was guided to reflect on her whole experience in the first semester with specific attention paid to the significant others (e.g., school mentor) she encountered and the critical incidents she experienced during her boundary crossing. The interviews were conducted in English and audio-recorded, ranging from 90 to 120 minutes each.

In addition to interviews, the first author visited the field school at least three times a week, focusing on Haley's classroom teaching and interactions with her students, the school mentor, and the field supervisor. Through direct observation, the study collected first-hand information about Haley's professional learning and practice in the university and field school. For instance, the first author observed the intern meetings organised by the field supervisor six times, the co-planning activities eight times, and had informal communication with Haley on a regular basis. When the university courses (i.e., maths and literacy advanced pedagogical course) started, the first author followed Haley to SU and observed

her interactions with the course instructors and classmates six times. During the observation, the first author took field notes with analytic memos (i.e., around 52,000 words). The observation lasted for one academic semester, and all the activities were audio-recorded (around 60 hours long). Furthermore, the study gathered relevant documents, including Haley's teaching plans and materials as well as her reflection journals (required by the programme) to enrich the dataset. The first author transcribed all the audio-recorded interviews verbatim and observation data pertaining to the research question for further analysis.

Informed by the research question and conceptual framework, the data were thematically analysed using a qualitative and iterative data analysis approach (Miles et al., 2014). With a combination of inductive and deductive analysis procedures, the authors interpreted and examined the data from a theoretical view of boundary crossing (Akkerman & Bakker, 2011) and engaged in further discussions to reach a consensus when disputes arose.

First, the interview transcripts were read and reread to identify the critical episodes in Haley's boundary crossing process. For example, Haley invited the school mentor to manage the disruptive students, which was identified as a critical episode. Then, the episodes were coded with reference to the four learning mechanisms, including identification, coordination, reflection, and transformation (Akkerman & Bakker, 2011) to shed light on Haley's learning through boundary crossing between the university and field school. For instance, Haley shared that she started to see herself as a legitimate classroom teacher with the freedom and support provided by the school mentor to try out different teaching ideas. This instance was thus coded as her identity transformation through boundary crossing. All the identified codes were re-examined, modified, and confirmed with the field notes and relevant documents, and such comparison led to a richer and deeper interpretation of the data. In the end, three major themes emerged: 1) learning to survive in the practicum school, 2) moving back and forth between the university and field school, and 3) engaging in independent teaching as a full-fledged teacher. Under each theme, the four mechanisms of boundary crossing worked interactively to facilitate Haley's learning to teach. Table 1 presents the main themes and mechanisms of boundary crossing with examples of coded text.

The Researchers' Positioning

In the interviews, the first author assumed the role of a qualitative researcher who engaged in meaning construction by listening to Haley's lived experience, sharing her personal observation, and posing critical questions to Haley. During the fieldwork, the first author worked as an observer who sat at the teacher's table in the classroom; sometimes she also worked as a volunteer teacher to help with a learning group during Haley's teaching. Such roles not only assisted the first author in developing a rapport with Haley and collecting first-hand information but also contributed to the contextualised understanding of Haley's boundary crossing experiences. The two other authors served as critical friends to the first author and worked collaboratively with her in conceptualising the study, analysing the data, and drafting the manuscript, which helped enhance the trustworthiness and validity of the research findings.

Table 1. Main themes with examples.

Main themes	Learning mechanisms	Examples	Original data
Learning to survive in the practicum school	Identification	The disparity between the imagined teaching practice brought by the university course and the highly structured curriculum in the field school.	<i>It's a whole different story because we didn't see the curriculum at SU before, but we now have to follow the scheduled curriculum in the field school (Interview 1).</i>
	Coordination	Using reference books to facilitate her teaching and address specific problems in the practicum school.	<i>The field supervisor introduced different resource books for my reference in classroom teaching (Field observation).</i>
	Reflection	The operation and constraints created by a prescribed curriculum.	<i>We just fill in the printed templates, but the content can vary based on what children are learning (Interview 1).</i>
	Transformation	Identity construction as a 'kindergarten teacher'.	<i>I really like to be a kindergarten teacher and work with young children (Interview 1).</i>
Moving back and forth between the university and field school	Identification	The literacy course was not adapted to her teaching of non-native English-speaking kindergarteners in the classroom.	<i>We watched a lot of videos and stuff, which weren't useful to what we were going through in the field schools (Interview 2).</i>
	Coordination	She took the initiative in coordinating different resources to help the disruptive students stay focused on the tasks and maximise all students' learning.	<i>I invited the school mentor to sit in the class to monitor their behaviour and keep them in check (Field observation).</i>
	Reflection	The students with behaviour problems made it difficult to apply the idea of equitable learning advocated by the course instructor.	<i>It seemed unrealistic to keep an eye on all students to ensure equitable learning (Interview 2).</i>
	Transformation	Identity transformation as a responsible teacher.	<i>I am satisfied and proud as a responsible teacher (Interview 2).</i>
Engaging in independent teaching as a full-fledged teacher	Coordination	Using Common Core State Standards introduced in the SU courses to revise and enrich the existing forms of practice in the field school.	<i>The use of the white board with ten dots arrayed on it and guiding students to observe the change when the teacher takes one dot away (Lesson plan).</i>
	Reflection	The fostering of students' thinking abilities by trying out new ideas and engaging in written reflections to track the change of her students and examine her teaching effectiveness.	<i>I would like to think of other ways to get students to push their thinking, learn different perspectives, and work together, besides the tasks I have implemented this year so far (Reflection journal).</i>
	Transformation	She identified herself as a full-fledged teacher with a sense of responsibility for her teaching and students.	<i>It feels like I'm a real teacher. ... I need to be prepared each day (Interview 3).</i>

Findings

Stage One: Learning to Survive in the Practicum School

When Haley entered the practicum school, she immediately identified the disparity between what she had learned in teacher education courses provided by SU and her practicum practice. For instance, through her lesson observation in the field school, she realised the gap between her imagined teaching practice brought by the university course and the classroom reality influenced by the school curriculum and culture. As she elaborated in the first interview, she used to picture that she would have the freedom to design fun and challenging activities based on students' backgrounds and abilities in

the practicum school. This imagined form of practice, which originated from the university coursework with a focus on student-centred teaching, misaligned with the school policy, which required the teachers to follow a structured curriculum in their daily practice. As an intern teacher who just moved to a new environment, Haley was challenged by her identification of the gap between her preferred teaching approach advocated by the university course instructors and the school requirement, which caused her strong negative feelings such as confusion and anxiety. Haley recalled that one day she had to leave the school due to the strong reality shock she experienced in the classroom:

I had a bad day at school, and I felt sick. But I think it was just anxiety, and I felt dizzy and lightheaded. . . . I actually had to go home that day (Interview 1).

To overcome the negative emotions, Haley tried to reflect on the identified gap and coordinate different resources afforded by the university-school partnership to seek her professional learning (Akkerman & Bakker, 2011). Not only did she observe the school mentor's classroom teaching every day, she also participated in the joint lesson planning with the mentor to understand the design, implementation, and evaluation of lessons. As detailed in the interview, after 'observing the school mentor and knowing all the basic things to do' (Interview 1), Haley began to serve as a 'cooperating teacher' who planned and taught with the mentor:

I guess it's just me becoming more familiar with the curriculum. At first it was her telling me what to do. But now we can decide together and then I understand what she does every day. . . . She made a template and then we designed and filled the template together. Each template contained the activities we would do with students (Interview 1).

Through interactive learning, Haley also revised her view about the constraints created by a prescribed curriculum. As she shared, while the curriculum provided a general structure in terms of teaching goals, content, and activities, teachers can 'do certain things' to adapt and improve the curriculum in line with students' needs and unfolding classroom situations (Interview 1). In particular, Haley updated her previous identification of the discrepancy between her preferred teaching approach and the constrained school curriculum. She formed a balanced understanding of the function and operation of school curriculums in relation to teachers' professional autonomy.

Besides the guidance from the school mentor, the field supervisor from SU also played a positive role in supporting her boundary crossing and professional learning. For instance, during her school visits, the field supervisor met Haley and listened to her challenges at both cognitive and affective levels. The field supervisor organised group meetings in which Haley and other interns from the school could sit together and share their boundary crossing experiences and reflections. Realising that Haley lacked knowledge about how to teach kindergarten children, the field instructor introduced different resource books for her reference (Field observation). To Haley who suffered from strong negative emotions at the beginning, this turned out to be highly therapeutic and comforting:

The encouragement and reassurance from the field supervisor and peers made me feel I was doing something right and I did pick the right job (Interview 1).

Thus, the field supervisor introduced, organised, and coordinated new forms of learning (e.g., reference books and peer support), which facilitated Haley's reflection on the link between the teacher education courses and the actual teaching practice and transition from SU to the practicum school (Ruffinelli et al., 2021).

Overall, the first month in the practicum turned out to be a challenging yet meaningful experience for Haley. While she was overwhelmed by the identification of the gap between her imagined practice and school reality at the initial stage, she managed to update her identification with enriched knowledge and coordinated her learning to teach with the support from the various sources including the school mentor, field supervisor, and peers. Reflecting on such experiences, Haley reported her self-transformation as she began to see herself as a 'kindergarten teacher':

I really like to be a kindergarten teacher and work with kindergarteners. . . . I like their new ideas and the way they think. They'll say interesting things that surprise you. I like working with them a lot (Interview 1).

Stage Two: Moving Back and Forth Between the University and Field School

In the second month of her teaching practicum, Haley returned to university and took two advanced pedagogy courses (one related to maths teaching and one about literacy teaching) as required by SU. In the two courses scheduled once a week respectively, she received additional input about how to teach the two subjects, while she also engaged in discussion and reflections with the course instructors and peers in different schools. In the maths course, for instance, the course instructor advocated that the interns should 'provide all children with access to mathematics regardless of race, gender, family backgrounds, previous history with maths, and identified disability' (Course syllabus). Haley discussed with other interns about the topic of equity, diversity, and teaching for social justice in the classroom (Field observation).

However, Haley identified that she had some children with behavioural problems in the class. Reflecting on her previous teaching, she felt that it 'seemed unrealistic to keep an eye on all students to ensure equitable learning' (Interview 2). She further reflected:

The biggest issue is trying to balance and giving Elsa and Noah (pseudonyms) the attention they need. Sometimes while I was teaching, Noah walked around. I could not immediately stop him. . . . If I give them the attention, the rest of the classes may not learn (Interview 2).

Therefore, Haley came up with a new identification of the gap between her learning at the two sites triggered by the students with behavioural issues. Fortunately, the maths course instructor introduced some useful teaching techniques to help the student teachers learn how to put the idea of 'teaching for equity' into practice. For example, the instructor required all the student teachers to record their students' maths strengths and weaknesses when they returned to the field schools. Haley followed the instruction and carefully examined her students' performance with a checklist provided by the course. By completing this task, Haley identified students who struggled to learn with detailed observations and this form of coordination (i.e., the application of her maths instructor's ideas in her classroom practice) paved the way to fulfilling the goal of promoting equity and inclusiveness in her teaching:

She (the course instructor) had us make a list of the kids and then find out their strengths and weaknesses in math learning. . . . For twenty kids, I had a whole table with detailed information after the task (Interview 2).

As Haley further reflected on the information she gathered from her observation and analysis of the students, she came up with new ideas about how to help the disruptive students stay focused on the task. For example, Haley would deliberately put the 'problematic students' in different groups to ensure that they could focus on their designated tasks without external distraction (Field observation). For a few students with severe learning difficulties, she invited the school mentor to sit in the class to monitor their behaviour and keep them in check (Field observation). This attempt turned out to be quite effective as she felt she finally 'had all students' attention in the class,' and she even 'managed to cater to the disruptive students' needs' (Interview 2). As shown in this example, Haley kept an open mind and took the initiative in coordinating different resources to address her initial identification (i.e., the gap between the maths course and the reality of her teaching) through deepened analysis and reflections (e.g., about students' strengths and limitations), which led to new forms of practice to address discipline problems and maximise all students' learning.

Apart from maths teaching, Haley volunteered to teach English writing to a group of non-native English-speaking (NNES) students in the practicum school. Those students were five to six years old, and they could barely speak English. Their low level of English proficiency posed a challenge to Haley who felt confused about where to start in her writing lessons. While Haley hoped to find some answers in the literacy course offered by SU at this stage, she found it had little relevance to what she was experiencing in the school. The literacy course instructor was a first-year Ph.D. student with limited knowledge about the needs of the intern teachers who had just returned from the frontline of school teaching. After the first two sessions, Haley identified the literacy course as a repetition of the courses she had taken before, and she felt that 'it was not adapted to her teaching of non-native English-speaking kindergarteners' (Interview 2). Such a gap between her university learning and practicum experience exacerbated her anxiety and frustration in the process of learning to teach because she did not receive sufficient support from the course:

I did not learn very much. I'm not going to lie. I think sometimes she doesn't know what's going on, and then we don't know what's going on. . . . We watched a lot of videos and stuff, which weren't useful to what we were going through in the field schools (Interview 2).

Since she had to take the literacy course as the programme mandated, Haley decided to be proactive in seeking concrete support from the course. For instance, she specifically asked the instructor how she could teach young NNES learners to spell and write, and the course instructor suggested the method of 'draw and label' with some examples. This showed that Haley transformed from guided coordination to agentive coordination to gather and utilise available resources (i.e., suggestions from the literacy course instructor) and solve specific problems she had encountered in the field school. Further, Haley did not blindly follow the instructor's ideas, and instead she drew on her own observation in the classroom and engaged in meaning negotiation with the course instructor, thereby suggesting a deepened form of coordination and reflection. For instance, with reference to her students' levels and needs, Haley continued to ask the course instructor if they

needed to write by following a certain structure, and the instructor advised that her priority should be on the writing itself at the beginning, which could allow the students to practice in fun and relaxing manner. She further stressed that ‘adding a sequence or structure might be challenging for young learners with low English proficiency’ (Interview 2).

Following the course instructor’s advice, Haley guided students to draw and label pictures of themselves in their Halloween costumes and encouraged them to present the pictures in groups (Field observation). As the students started to develop some writing skills, she then highlighted the structure of a sentence and engaged them in sentence construction for practice (Field observation).

During the rest of the course, according to first author’s field observation Haley often ‘bounced ideas off the course instructor’ (Interview 2) in order to assimilate new knowledge about how to teach literacy. On the other hand, the boundary crossing experience in this period was instilled with immense pressure. Haley found that she ‘needed to be as a full-time teacher and also a full-time student’ (Interview 2), and the dual identity turned out to be exhausting and overwhelming. After a long day working in the classroom, Haley still had to complete the huge amount of homework assigned by the course instructors, such as writing teaching plans and reflective essays.

I think each of the SU courses is hard. Our instructors don’t see what we’re doing at the school. So, it is kind of disconnected and I think they’re giving us too much work. . . . If you are a teacher and a student, you will have a lot of stress. There are always extra priorities and assignments (Interview 2).

Therefore, the course instructors at SU seemed to be disconnected from the field schools in terms of workload allocation, and this took a toll on Haley, who had to travel back and forth between the two sites and meet their individual demands as both a practicum teacher and a university student. In addition, while the course instructors in SU tried to link their courses with the student teachers’ practicum experience, Haley expressed a certain level of disappointment and doubts about the efficacy of their attempts. In particular, the course instructors asked the intern teachers to video-record their classroom teaching and then present some critical episodes in the courses for critique and discussion. To Haley’s surprise, the comments from the course instructors and peers seemed to focus largely on the observed teaching behaviours in the video without considering the teaching contexts and students’ levels. Such a decontextualised interpretation, according to Haley, proved to be ‘superficial and limited’ (Interview 2), which defeated the purpose of using the videos as a boundary object to bridge the field teaching and university courses.

Overall, at this stage, the opportunities to return to SU with additional input from the courses added to Haley’s identity transformation as a professional teacher. For instance, through her continuous experiments and efforts at maths teaching supported by the course instructor, the students gradually made progress with an enhanced sense of motivation towards maths learning. Their learning thus made Haley feel ‘satisfied and proud as a responsible teacher’ (Interview 2). Haley’s interaction with the mentor served as another critical source of her self-transformation. For instance, when she invited the school mentor to assist students’ group work during her teaching, the mentor gladly accepted her invitation and offered her support. Haley summarised:

I guess it's kind of the role changed, right? It is my lesson and I'm the only teacher for that part. Every time she was more than happy to help with a group. . . . She supports me, encourages me and always makes sure that the classroom teachers are her and me. We're both teachers (Interview 2).

This excerpt describes the equal and supportive relationship between Haley and her school mentor, which created positive conditions for her to coordinate and experiment with different ideas in classroom teaching, thus contributing to her identity development as a legitimate teacher in the practicum school.

Stage Three: Engaging in Independent Teaching as a Full-Fledged Teacher

Approaching the end of this semester, Haley finished all her university courses and returned to the field school. Instead of travelling back and forth between the two sites, she felt she could make use of the rest of the time (i.e., around one month) and fully immerse herself in classroom teaching. At this stage, Haley became more independent as a teacher, and especially since the school mentor took personal leave for several weeks, she had greater autonomy in lesson planning and execution. Different from her teaching practice in the previous stages, Haley gradually shifted her attention away from students' classroom behaviour and attached more importance to their thinking development.

To promote students' thinking, Haley drew on the Common Core State Standards (CCSS) as a boundary object (Edwards & Mutton, 2007) to coordinate and improve her teaching in the classroom. The CCSS promulgated by the educational authorities of the government prescribes what students are expected to achieve at each grade in maths and English language arts with a rich set of teaching tasks and materials. While Haley found that the school curriculum that she was asked to follow was relatively vague, she recalled the CCSS, which was just introduced to all student teachers in the SU courses. For example, in the maths syllabus of the school, one learning target was 'Children would explore numbers 1–10 and the –1 pattern/relationship between these numbers' (School curriculum). Haley felt the lesson objective was unclear and she was particularly uncertain about the meaning of 'explore'. Then she checked the CCSS and found it required teachers to 'represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), and acting out situations, verbal explanations, expressions, or equations'. From such a detailed description, she understood the need to use visual representation to illustrate the process of subtraction when teaching young learners. As shown in her lesson plan, she attempted to use the whiteboard with ten dots arrayed on it and guided students to observe the change when she took one dot away (Lesson plan). She also designed multiple learning activities to facilitate students' comprehension, including pattern block puzzles, number tiles and so on. These activities provided students with visual evidence of the subtraction and allowed them to observe and discuss with each other (Field observation). As such, Haley created a meaningful link between her previous learning in the SU course and her current teaching practice. The CCSS served as a boundary object, which was introduced to revise and enrich the existing forms of practice in the field school (Konkola et al., 2007).

Haley's reflection on fostering students' thinking abilities was supported by the field supervisor who continued to visit her for class observation and discussion (Allas et al., 2020). For instance, in a meeting the field supervisor asked Haley to set up a new learning

goal for herself in the field school, and she immediately shared that she hoped to promote creativity and critical thinking through collaborative work in her classes. The field supervisor then asked Haley to try out new ideas and engage in written reflections to track the change of her students and examine her teaching effectiveness. The reflections were then sent to the field supervisor, who offered her comments and suggestions to help Haley further explore how to integrate the focus on thinking abilities into her classroom teaching. Such a dialogic process facilitated by her written reflections as a boundary object co-constructed by the field supervisor and herself proved to be highly meaningful, which brought positive changes to her classroom practice:

In my teaching, I have focused on promoting critical thinking through class discussion and asking higher-order questions. I have embedded these in all the lessons I have taught (Reflection journal).

Moving beyond the exhaustion she experienced at the previous stage, Haley enjoyed staying in the classroom and teaching all day. She felt less stressed and identified herself as a full-fledged teacher with a sense of responsibility for her teaching and students. Reflecting on the whole boundary crossing experiences, she concluded:

We are not going to class at SU and we are just supposed to teach. So, it feels like I'm a teacher and I don't have anything else to worry about. I just need to be prepared each day for what I want to teach and there is less stress (Interview 3).

The opportunities to engage in independent teaching further prompted Haley to think about her continuing professional development in the future. To push students to think deeper, acquire different perspectives, and work together in groups, Haley planned to collaborate with her school mentor and other kindergarten teachers. In this way, she hoped to form a learning community where they could brainstorm new strategies and create useful resources to cultivate students' critical and creative thinking. In other words, she was constructing an imagined identity as an agentive and collaborative teacher to inform her future work:

It is good to work together. It's good to have such a relationship that we all meet once a week or two and talk about teaching. I think it probably benefits the new teacher. Next year I will be a new teacher and I hope I can work with my colleagues on this in the new school. We can support each other (Interview 3).

Therefore, while Haley actively engaged in individual and collaborative reflections (e.g., with her field supervisor) to adjust and improve her practice in the field school, her reflections also embraced a future orientation, which contributed to her self-transformation through continuous boundary crossing (i.e., moving to a new school after graduation).

Discussion and Implications

Drawing on data from multiple sources, the study demonstrates Haley's endeavour to bridge the gap between the practicum experience and university courses supported by four modes of learning mechanisms triggered by her boundary crossing between the university and field school (Bakker & Akkerman, 2014; Williams & Berry, 2016). The findings shed light on the nature of learning to teach as a dynamic, non-linear process

entangled with potential tensions, leaps, and stumbles (Moussay et al., 2011). Through the recursive and interactive process of boundary crossing, Haley identified and reflected on the disparity between the knowledge and experience accumulated at SU and the existing practice and curriculum of the field school (Ruffinelli et al., 2021). Such experiences led to her coordination of different resources as well as the transformation of her identities and practice (Akkerman & Bakker, 2011). In particular, she moved from guided coordination (e.g., co-planning with the school mentor) to agentic coordination (e.g., asking the literacy course instructor for advice on her teaching challenges with ongoing discussion), which contributed to her identity transformation from a student teacher to a legitimate and professional kindergarten teacher.

In light of the four learning mechanisms, the findings further reveal that the identification of and reflection on the differences between the two sites is a cyclical process as one cycle can give impetus to a new one, thus leading to deepened and transformative learning (Yuan, 2020). For example, when travelling back and forth between the university campus and field school, Haley engaged in identification, reflection, and coordination based on different ideas and experiences at the two sites. This process, nevertheless, did not stop there. After she completed the courses and engaged in full-time teaching in the field school, some teaching ideas and resources such as the CCSS introduced in the university courses became a new source of inspiration to help coordinate her practice in order to meet the school's curricular requirements. Therefore, boundary crossing may exert a potentially long-term impact on student teacher's sense-making and teaching practice, triggered by their flowing experiences and reflections in specific situations. In light of this finding, student teachers should be encouraged to keep a record of their reflective thoughts and feelings through boundary crossing and revisit them individually or collaboratively (e.g., via collaborative dialogue) in their continuing practice and learning (Körkkö et al., 2016). This may help elevate their sensitivity and openness towards their flowing experiences in shifting situations so that they can make meaningful connections between their past, present, and future.

The study also highlights the mediating role of boundary objects in facilitating the student teacher's boundary crossing between the university and field school (Akkerman & Bakker, 2011). For instance, with the guidance of the field supervisor, Haley engaged in written reflections on how to enhance students' critical thinking in her classrooms. As a boundary object, the reflective journals served as a platform where she engaged in meaning negotiation with the field supervisor, thus resulting in her transformed identity and practice (Tsui & Law, 2007). Similarly, Haley identified that the lesson objectives stated in the school curriculum were vague and unclear, while the CCSS introduced by the course instructors at SU provided detailed learning goals and teaching strategies. Thus, the CCSS became a boundary object that prompted her to actively coordinate the available resources and revise her teaching practice to promote students' maths learning. Based on such results, it is suggested that teacher education programmes should intentionally introduce a variety of boundary objects to mediate student teachers' learning. These objects, such as lesson plans, curriculum documents, and reflective journals need to be created and shared in a professional community for active meaning negotiation and construction among student teachers and other important stakeholders.

The study further speaks to the potential of contradiction as the 'developmental driving force' (Engeström, 2015, p. 193) that compelled Haley to reconsider diverse

perspectives and facilitated her learning at boundaries (Akkerman & Bakker, 2011). The impetus is triggered primarily due to her self-agency enacted in conflicting situations, which helped her flexibly revise teaching strategies with social support (Ebersöhn & Loots, 2017). For instance, tensions emerged when Haley identified that the disruptive students in her classroom made it difficult to teach for equity—a new teaching belief she acquired through the university courses during the teaching practicum. Thus, not only did she try to analyse the students' learning needs and styles as suggested by the course instructor, but she also took the initiative to seek her mentor's continuing support to incrementally address the problem. Thus, Haley, as an agent of change, navigated the tensions between the two sites with updated knowledge and transformed identity as an equity-oriented teacher (Moussay et al., 2011).

The enactment of her self-agency, however, could not take place without the university-school partnership embedded in the teaching practicum. Specifically, the course instructors offered new ideas and suggestions to facilitate Haley's reflections and coordination in teaching writing for students of low English proficiency. The school mentor also provided space for Haley to link theories with practice through joint lesson planning and teaching (Ambrosetti & Dekkers, 2010). In particular, the school mentor's respect of Haley's autonomy (e.g., allowing Haley to teach journal writing independently) evoked positive emotions, which gave rise to her self-perception as a legitimate teacher in the classroom (Waber et al., 2021). Their ongoing social interactions also inspired Haley to foster an imagined identity ('a collaborative teacher') in her future work. Furthermore, the field supervisors appointed by the university played a supportive role in observing, guiding, and assessing Haley's teaching in the field school. The field supervisor's timely visit helped her cope with negative emotions and reflect on her professional goals (i.e., promoting critical thinking) in relation to the school reality. These findings thus attest to the social, affective process of learning to teach. It is important for student teachers to receive guidance from diverse perspectives that help them navigate emotional tensions and crisis, try out different teaching approaches, and construct their desired identities as future teachers (Evelein et al., 2008; Yuan, 2019).

On the other hand, our study presents that the lack of communication between the course instructors and school mentors has caused disturbance and challenges for the student teacher (Allen, 2009). For example, because the course instructors and the school mentor did not negotiate the workload allocation, Haley was overwhelmed by different responsibilities, which resulted in negative emotions especially in the initial stage of the teaching practicum. Additionally, similar to Allen and Wright's (2014) study, our study also found that owing to the university teacher educator's lack of understanding of specific school situations, the video-based analysis provided in the university course was irrelevant to Haley's classroom teaching. Such issues hence suggest a sense of divide between the three parties (i.e., university teacher educators, school mentors, and field supervisors) who tended to work independently with student teachers without a shared agenda. In view of such a gap, there is a need for the different parties to maintain communication and collaboration throughout the practicum so that they can all keep abreast of student teachers' performance and progress and offer tailored support from their respective perspectives. Indeed, the different assessment tasks in the coursework and practicum need to be coordinated and streamlined to ensure that they can be fully

integrated into student teachers' field experiences with positive impacts on their reflective practice and learning.

Conclusion

As opposed to the traditional mode of teaching practicum, the study investigates the opportunities and tensions embedded in an innovative practicum arrangement, which engages student teachers in recursive boundary crossing for professional learning. The study adds new knowledge to the existing literature by highlighting the power of boundary crossing as a cyclical, intense, and transformative learning mechanism, which can support student teachers in making meaningful connections between knowledge and experiences acquired at different sites, improve their teaching knowledge and skills, and facilitate their self-transformation (Ulvik et al., 2018). This study is not without limitations. First, it drew on a single case to explore the complexity of boundary crossing experiences in the teaching practicum. Further research can thus involve more participants for cross-case analysis to generate a more holistic picture of student teachers' learning to teach within and across multiple communities. Second, the present study tracked the student teacher's experiences for one semester, and whether and how the positive effects derived from recursive boundary crossing would sustain over time remain unclear. Longitudinal studies can be carried out to follow the student teacher and track her future professional engagement and learning beyond the programme.

Highlights

- Student teachers (STs) engage with boundary crossing during teaching practicum
- Boundary crossing is a cyclical, intense, and transformative learning mechanism
- STs identify, coordinate, reflect, and transform in boundary crossing
- Boundary crossing facilitates STs' reflective practice and self-transformation
- Communication across boundaries is pivotal for strengthening STs' practicum

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Notes on contributors

Zhaoxuan Wang is a Ph.D. student at the Faculty of Education, University of Macau. Her research focuses on teacher learning, professional development, and teacher educators.

Dr. Rui (Eric) Yuan is an associate professor at the Faculty of Education, University of Macau. His research focuses on teacher education, particularly teacher cognitions, identities, and emotions, as well as English medium instruction (EMI) in higher education. His publications have appeared in a number of international journals, including *Teaching and Teacher Education* and *TESOL Quarterly*.

Dr. Wei Liao is an assistant professor (lecturer) at the Center for Teacher Education Research, Beijing Normal University. His research centers around equity-oriented teacher education, teacher educators' professional learning, and qualitative research methodologies. His publications have appeared in a range of academic journals, such as *Teaching and Teacher Education*, *Professional Development in Education*, and *International Journal of Qualitative Methods*.

ORCID

Zhaoxuan Wang  <http://orcid.org/0000-0003-4954-4941>

Rui Yuan  <http://orcid.org/0000-0002-6603-6423>

Wei Liao  <http://orcid.org/0000-0001-9987-3546>

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