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Research paper

Using collaborative self-study and rhizomatics to explore the ongoing nature of becoming teacher educators

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H I G H L I G H T S

- Rhizomatics and self-study of teacher education practices produced non-linear insights on becoming teacher educators.
- Teacher educators were becoming collaborative, accountable, and innovative.
- Collaborative self-study of teacher education practices supported intra-departmental professional learning.

A R T I C L E I N F O

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The purpose of this research was to explore how we were becoming teacher educators as we built and engaged in relationships through collaborative teaching and research practice. By engaging with collaborative self-study as methodology-pedagogy and rhizomatics, our data pertaining to teaching-research (i.e., group and pair meetings, reflective diaries) highlight how collaborative self-study produced evolving and meaningful practices, learning, and relationships that resulted in our becoming collaborative, committed, and innovative teacher educators. This study demonstrates the potential of using collaborative self-study together with relational and non-linear frameworks such as rhizomatics to reveal different and ongoing understandings of becoming teacher educators.

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1. Introduction

The concept of “becoming” has been used as a metaphor from a diverse range of theoretical perspectives where it is positioned as: “an evolutionary, iterative process emerging from the way individuals become entangled within the networks of social relations and material settings that constitute their existential worlds” (Ovens et al., 2016a, p. 356). According to Ovens et al. (2016a), the metaphor of becoming teachers or teacher educators encourages

exploration of a multi-dimensional, non-linear, and always changing professional self and related identities that takes into account the social, cultural, and material environments where becoming is produced. When the production of self is viewed as an ongoing process rather than something static and settled (Deleuze, 1994; Hamilton & Pinnegar, 2015), a teacher educator’s relationships with their contexts and experiences (including human, material, and non-tangible elements and conditions) become central to who they are, and how they learn and teach (Hordvik, MacPhail, & Ronglan, 2020; Martin, 2018). Subsequently, teacher educators are continually in a process of changing; they are always becoming different due to the entanglement of multiple relationships and the ways these relationships co-produce practice, learning experiences, and ways of identifying.

We are a group of teacher educators from Norway and Canada

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who are interested in exploring our individual and collective processes of becoming teacher educators. Like Ovens et al. (2016a), we believe that becoming teacher educators is an ongoing, relational, and dynamic process. By taking a critical posthuman lens (Barad, 2007; Braidotti, 2013; Deleuze & Guattari, 1980/1987), several teacher educator-researchers have produced non-linear thinking about becoming teacher educators to recognize the ways in which social, cultural, and material relationships contribute to who teacher educators are, what they do, and how and why they do things (Hordvik et al., 2020; Ovens et al., 2016b; Strom et al., 2014, 2018). It becomes clear then that explorations of becoming will be different from teacher educator to teacher educator, from place to place, and from teacher education program to program. The use of critical posthumanism and its related theories (such as rhizomatics) and particular concepts (e.g., “becoming” and “assemblage”) can offer generative insights into becoming a teacher educator. This is due to an explicit acknowledgement that each context and situation will contain different teacher educators in particular configurations. These dynamics produce particular social, cultural, and material relationships and enable nuanced interpretations of becoming.

To this end, the purpose of this research was to explore the ways we were becoming as teacher educators as we built and engaged in multiple relationships through collaborative teaching and research practice in one physical education course in a Norwegian teacher education program. In the following section, we review literature on becoming teacher educators.

2. Becoming a teacher educator

Examining the process of becoming a teacher educator is deemed important for teacher education and the educational system as a whole because it acknowledges what it means to engage in ongoing professional learning as a teacher educator (Bates et al., 2011; Smith, 2003). While there appears to be general agreement that becoming a teacher educator is a difficult and challenging process filled with contradictions, tensions, and ambiguity (Berry, 2007; Knight et al., 2014; Korthagen, 2016; Loughran & Hamilton, 2016), this research comes at a time when there is a spotlight on a lack of teacher educator professional learning (Loughran & Menter, 2019), particularly in Europe (European Commission, 2013a). For example, MacPhail et al. (2019) have called for teacher educators to employ methodological and pedagogical approaches that enable them to explore their own practices, experiences, and identities in the specific contexts where teacher education occurs. Due to the lack of formal learning opportunities, many teacher educators have sought learning experiences alone or collectively (Bates et al., 2011; Gallagher et al., 2011), even extending to collaborations across international borders (Pithouse-Morgan & Samaras, 2018). These desires have led many to use self-study of teacher education practices (S-STEP) as both methodology and pedagogy to examine and facilitate their ongoing professional learning (Lunenberg & Willemse, 2006; Smith, 2003; Zeichner, 1999). Similarly, we use collaborative S-STEP as methodology for researching how we were becoming teacher educators – focusing specifically on our practice, professional learning, and identity – as well as offering a pedagogical framework to guide our professional learning (Hamilton & Pinnegar, 2014).

2.1. Collaborative S-STEP to explore the processes of becoming teacher educator

S-STEP allows teacher educators to address the process of becoming (Hamilton & Pinnegar, 2015), because it enables exploration and better understanding of the interconnectedness

between their practices, experiences, identities, relationships, and contexts (Pinnegar & Hamilton, 2009). In many examples S-STEP has been used by researching teacher educators that represent a wide range of contexts, languages, cultures, and countries to provide a framework to examine their practices, identities, and professional learning experiences (Pithouse-Morgan & Samaras, 2018; Thomas & Guðjónsdóttir, 2020). Within these studies, the value of collaborative approaches to exploring processes of becoming teacher educators has been highlighted.

As well as providing a methodological frame, there are several examples where S-STEP has been used to frame the professional learning for small groups of teacher educators, often within the same program (e.g., doctoral studies) or department. For instance, Kitchen et al. (2008), Gallagher et al. (2011), Goodnough et al. (2020), Gregory et al. (2017), Ritter et al. (2018), and Tuval et al. (2011) demonstrated how collaborative S-STEP was used to facilitate authentic conversations around developing interests and identities as teacher educators and scholars. Group members described the role that collaborative S-STEP played in creating a comfortable but critical collaborative space where experiences could be shared and debated. Discussion and debate from these collaborations provided a space where moments of doubts and confusion, joy and reward could be shared, critiqued, and interpreted. Members of these groups often taught in different teacher education courses (e.g., subject specific courses), which provided consideration of multiple contextual issues in teacher education (Kitchen et al., 2008). The group process also made members accountable in a safe way, which led to a commitment to sharing vulnerabilities within the group and, in turn, supported ongoing professional learning and scholarship (Gallagher et al., 2011; Goodnough et al., 2020; Gregory et al., 2017; Ritter et al., 2018). Tannehill et al. (2015) and Tuval et al. (2011) also described how group membership and participation led to a deeper understanding of the ways in which individual identities were implicated and informed by one's specific practices, and vice versa. For example, Tannehill et al. (2015) explained how, through reflection and dialogue, all members of the group (which consisted of beginning and experienced teacher educators) saw themselves continually learning, regardless of their diverse career stage. Analysis of artifacts presented by group members showed both the similarities and differences in personal beliefs about teaching and teacher education, facilitating discussion about how to enhance their effectiveness as teacher educators as well as the effectiveness of the teacher education program in which they taught.

From these examples there is evidence of the value that S-STEP holds as both methodology and pedagogy for the ongoing professional learning of teacher educators across a range of levels of experiences, from doctoral students to veteran teacher educators. The collaborative S-STEP process provides a space and structure to share and debate teacher educators' practices, which promotes dialogue, reflection, interrogation, and interpretation of experiences (Gallagher et al., 2011; Ritter et al., 2018; Tannehill et al., 2015). These processes have, in turn, led to the acknowledgement and effectiveness of certain practices for some (Goodnough et al., 2020), and also to the development of particular identities for others (e.g., Gregory et al., 2017; Lunenberg et al., 2018; Tannehill et al., 2015; Tuval et al., 2011). While many of these examples paid attention to the particular identities of group members, with the exception of Tuval et al. (2011), there is less attention paid to the ways in which collaborative S-STEP can facilitate identities and practices at both the individual and group level (Martin & Dismuke, 2015). Moreover, the predominance of communities of practice (Wenger, 1998) as a socio-constructivist framework for the analysis of group practices and identities means there is an opportunity to

develop different understandings of the processes and outcomes of collaborative approaches to S-STEP (Martin, 2019).

From a socio-constructivist lens, becoming a teacher educator is an autonomous endeavour of identity change and professional learning that is co-constructed through an individual's interaction with their present and past experiences in particular social contexts and cultures (Lee & Schallert, 2016; Martin, 2019). Becoming a teacher educator is thus considered a challenging but mostly linear learning process that develops over time and through experience as interactions occur with new contexts, cultures, and experiences; importantly, teacher educators' identities have also been shown to develop from these interactions (Davey, 2013; Lunenberg et al., 2018; Murray & Kosnik, 2016; Rice et al., 2015). While this literature has enabled the generation of a substantive knowledge base on becoming a teacher educator, as we explained at the beginning of this manuscript, other theoretical perspectives that explicitly acknowledge the contextual, relational, and non-linear nature can offer new insights into becoming teacher educators. Specifically, we draw from rhizomatics (Deleuze & Guattari, 1980/1987) to explore applying this lens can offer novel insights into the processes of becoming teacher educators.

3. Conceptual framework: A rhizomatic consideration of becoming teacher educators

According to Martin (2019), critical posthuman perspectives, such as rhizomatics, break from humanistic and socio-constructivist perspectives where the self is positioned as "an autonomous actor, self-actualized, independent of context, agentic, and rational" (p. 4). In thinking with rhizomatics "[b]ecoming is a verb with a consistency all its own; it does not reduce to, or lead back to, ... 'Being'" (Deleuze & Guattari, 1980/1987 p. 279). From such thinking, teacher educator identity and professional learning have no permanent "substance or essence" but are always in a process of formation (Ovens et al., 2016a). Becoming a teacher educator therefore is not about linear development (through learning) and identity construction where you approach an end point (e.g., from novice to expert teacher educator or from a group of teacher educators to a well-functioning community of practice); rather, becoming a teacher educator is a dynamic journey involving movement between various locations (such as courses, programs, universities with particular pre-service teachers, teacher educators, and material facilities) that provokes an ongoing re-production and transformation of the self (Deleuze & Guattari, 1980/1987; Ovens et al., 2016a). This particular use of the concept of "becoming" represents a shift in how it has been typically used in research on teacher educator identity change and professional learning (e.g., Murray & Male, 2005; Williams et al., 2012; Zeichner, 2005), where becoming is usually regarded as a rather continuous, linear process. Instead of focusing on the acquisition of skills and knowledge in the transition from novice/beginning to expert/experienced teacher educator, a rhizomatic focus shifts attention to the ongoing and dynamic learning process in which the teacher educator self is produced and re-produced. That is, the teacher educator is continually in a process of changing, always becoming different (Deleuze, 1994).

Essentially, teacher educator becomings are produced through their relationships and connections with others. For Deleuze and Guattari (1980/1987), these are described as "assemblages". Assemblages can be considered machines or arrangements of heterogeneous human, material, and non-tangible elements and conditions that form particular relationships and connections to produce, for example, teacher educators' individual and collective practices, learning experiences, and identities (Deleuze & Guattari, 1980/1987; De Freitas, 2012; Strom et al., 2018). Becomings in an S-

STEP assemblage, for example, are produced by the relationships between particular elements and conditions, such as between teacher educators, pre-service teachers (PSTs), S-STEP scholarship, data production methods, physical and virtual spaces, departmental and course traditions and cultures, and multiple discourses. As elements and conditions change (e.g., through evolving experiences, relationships, and understandings, and/or various colleagues, and/or particular facilities) the assemblage function also changes and, in this way, produces a learning journey characterized as dynamic and non-linear.

3.1. Using collaborative S-STEP and rhizomatics to explore the ongoing nature of becoming teacher educator

To our knowledge, there are only a few examples where a group of teacher educators has used S-STEP and rhizomatic concepts to explore the ways they are becoming as teacher educators. For instance, Ovens et al. (2016b) used rhizomatics to explore their diverse, relational, and co-evolving professional selves. Such an approach resulted in an understanding of how their human, material, and contextual relationships co-produced particular situations in which their teacher educator selves were always changing and becoming different, despite having a wide range of experiences as teacher educators. This new understanding led the authors to shift their focus from the teacher educator-self as existing in isolation to include the teacher educator "self and ...", where the "and ..." consists of other diverse relationships with human, material, and contextual elements (p. 186). Similarly, Strom et al. (2014) used rhizomatics to explore and understand how the relationships between themselves, their histories, interests, experiences, and practices produced both individual and collective transformation. Extending that work, Strom et al. (2018) explored how technology produced particular relationships as a result of multiple human, material, and contextual elements. In both examples, Strom et al. (2014; 2018) showed how the process of their individual and collective becomings over time and distance, and with technology allowed them to better understand the processes of becoming-self-study-researchers and becoming-a-self-study-collective.

4. Research focus

When used together, S-STEP (Hamilton & Pinnegar, 2015; Pinnegar & Hamilton, 2009) and rhizomatics (Deleuze & Guattari, 1980/1987) encourage a shift away from "what" questions of becoming teacher educator, towards "how and why" questions of ongoing teacher educator identity production and professional learning; in other words, a look at becoming-in-action (Strom & Martin, 2017) where every configuration of teacher educators will involve particular relationships and therefore, different ways of becoming. In this research, our use of collaborative S-STEP and the rhizomatic concepts of "becoming" and "assemblage" provoked us to explore the relational and ongoing processes that co-produced the ways we were becoming as teacher educators in our particular contexts. Guided by the purpose of this research, the research question was: "How does collaborative S-STEP function to produce our teacher educator becomings?"

Our research builds on examples of collaborative S-STEP research (e.g., Gallagher et al., 2011; Goodnough et al., 2020; Tannehill et al., 2015; Tuval et al., 2011), particularly those informed by rhizomatics (e.g., Ovens et al., 2016b; Strom et al., 2014; Strom et al., 2018) that were reviewed in the previous section. However, we believe our work carries the potential to offer new perspectives. For example, Strom et al. (2014; 2018) examined the experiences of a relatively homogeneous group in terms of career stage, with all

participants enrolled in a doctoral program together (although each graduated in various year). In contrast, we are a diverse group in terms of career stage, with two early career teacher educators (less than 5 years of experience), two mid-career (5–10 years experience), and one with more than 20 years of experience. Moreover, two of our five participants hold doctoral degrees, which has implications for teaching and research expectations in those roles, particularly in the Norwegian context (Guberman et al., 2020). We also focused on one innovation that provides a pedagogical context for this research: models-based practice in physical education. This has the potential to offer new insights into how teacher educators' processes of becoming are shaped in the context of this and other social, cultural, and material innovations in teacher education. Through making connections across these self-studies and our own (Zeichner, 2007), we aim to enhance the knowledge and understanding of the multiple, relational, and changing nature of becoming teacher educator.

5. Methods

Our inquiry is grounded in collaborative S-STEP methodology (Pinnegar & Hamilton, 2009) interpreted through rhizomatic thinking (Deleuze & Guattari, 1980/1987). In keeping with LaBoskey's (2004) characteristics for quality in S-STEP research design, our collaborative inquiry: (i) is self-initiated and self-focused, (ii) is improvement-oriented and transformative in purpose, (iii) is interactive, (iv) draws on multiple qualitative data sources, and (v) offers richly descriptive examples to describe the key themes, ideas, and transformable moments. A essential consideration in collaborative forms of S-STEP is navigating the balance between the voices and experiences of the particular teacher educators engaged in the research, as well as any collective self or selves that might emerge from the research process (Loughran, 2004).

5.1. Context

Context plays a profound role in any type of S-STEP research and particularly those where rhizomatics frames the inquiry. While recognizing the differences across contexts and cultures, descriptions of context establish a grounding so that others may consider degrees of resonance with the processes and findings

described. Mats, Berit, Lasse, and Anders were working in a physical education teacher education department at Oslo Metropolitan University in Norway and functioned as critical friends to each other (See Table 1 for information about our professional characteristics). Tim was working at Brock University in Canada and offered a second layer of critical friendship, acting as a critical friend to the group and, at times, to the individuals within the group (O'Dwyer et al., 2019). He was invited to be involved based on his previous experiences as a critical friend in other S-STEP collaborations and due to interest in the pedagogical innovation in physical education we used. We define critical friendship as involving a "trusted person who asks provocative questions, provides data to be examined through another lens, and offers critique of a person's work as a friend" (Costa & Kallick, 1993, p. 50). Critical friendship enables teacher educators to explore alternative interpretations of practice-based situations and develop a shared understanding of teacher education practice (Vanassche & Kelchtermans, 2015). Multiple layers of critical friendship (e.g., person to person or person to group) can provide a "dual dimension" (Loughran & Brubaker, 2015, p. 259) or "meta-level" (Fletcher, Ní Chróinín, & O'Sullivan, 2016) whereby further alternative perspectives are offered both on the practices being examined and on the research process. As a meta-critical friend, Tim was keen to position himself not as an outside expert but as a collaborator interested in learning about the innovation and about the group process.

Pedagogical context. Models-based practice is an innovation that provided a pedagogical context for our inquiry. It is a student-centred approach to teaching physical education and entails teaching through multiple pedagogical models in order to focus on specific learning outcomes; together these models form a models-based practice. Models-based practice moves away from traditional approaches that privilege the subject matter (i.e., curriculum) or the teacher (i.e., instruction), instead aligning outcomes with students' needs and diverse teaching styles (Casey, 2016). We do not focus much of our attention on models-based practice in this particular paper, instead focusing on ways models-based practice, as an innovation, provided a common pedagogical reference point for our collaboration. Readers might consult Casey (2016) and Hordvik, Haugen, Engebretsen, Møller, and Fletcher (2020) for further detail.

Setting. As in other European countries (European Union, 2013b; Lunenberg & Hamilton 2008), in Norway there is no

Table 1
Professional characteristics of teacher educators.

Name	Position	Teaching-research requirements	Teaching experience	S-STEP experience
Mats (project organizer)	Associate professor	65% teaching 35% research	Two years as secondary school physical education teacher and 11 years' as junior team handball coach Four years as teacher educator (25% during PhD)	Mats defended his PhD three months prior to this study, where he used S-STEP as methodology-pedagogy, focusing on his teaching and pre-service teachers' learning about teaching physical education (Hordvik et al., 2017; 2020)
Lasse (course leader)	Assistant professor	80% teaching 20% research	18 years as primary and secondary school physical education teacher and 14 years as senior and junior soccer coach Seven years as teacher educator	New to S-STEP at the time the inquiry began
Berit	Assistant professor	80% teaching 20% research	17 years as an adult education teacher 22 years as teacher educator	New to S-STEP at the time the inquiry began
Anders	Assistant professor	80% teaching 20% research	Three years as primary school physical education teacher Five years as teacher educator	New to S-STEP at the time the inquiry began
Tim	Associate professor	50% teaching 50% research	Five years as secondary school physical education teacher Nine years as teacher educator	Tim has been involved in many collaborative self-studies (e.g., Fletcher & Casey, 2014; Fletcher, Ní Chróinín, & O'Sullivan, 2019)

shared understanding for the role of teacher educators, the competencies and qualifications needed, and no set curriculum for induction. At present, teacher educators can be recruited with or without a doctoral degree or experiences of teaching in either schools or higher education. However, coupled with heightened institutional requirements for conducting research, recent policy changes implemented in general teacher education (see [Regulation for primary and lower secondary teacher education, 2016](#), §3–2) and physical education teacher education (see [Regulation for teacher education in practical and aesthetic subjects, 2020](#), § 3–2) which state teachers need to be educated at the master's level, teacher educators entering higher education will likely be required to hold a doctoral degree ([Smith, 2011](#)).

The particular programmatic setting for our S-STEP was the course called “Curriculum and teaching” that Lasse, Berit, Anders, and Mats taught to two classes of first year physical education teacher education undergraduate PSTs (50 in total). Lasse was the course leader and responsible for the overall planning of the course and allocated a certain number of hours to each teacher educator to teach particular content. For example, out of the 646 total hours for the course, Mats was allocated 162h to classroom/gymnasium teaching and planning, 10h to supervise exams and 5h for assessment/marketing. The course description states that PSTs are going to learn about the pedagogical process that goes from interpreting the curriculum to planning, executing, and evaluating teaching and learning. The learning experiences were carried out in both the sports hall/gymnasium and classroom, involving 90h of face-to-face teaching. We decided that Mats, Lasse, and Anders would individually teach in the gymnasium focusing on particular pedagogical models. Berit carried out most of the classroom teaching aiming to connect the practical lessons to the Norwegian physical education curriculum and wider pedagogical literature. In addition, we carried out seven seminars that we taught collaboratively, involving a short introduction to a pedagogical topic, PST group work, a presentation of PSTs' group work, and discussion.

5.2. Data production

Data production included two sources: audio records of our meetings in various configurations (21 meetings and approximately 35h audio) and our personal reflective diaries (total of 12 entries and 30 pages). The multiple layers of qualitative data provided varied sources of experience and modes of expression, thus helping enhance the trustworthiness of the findings ([Ní Chróinín, Fletcher, & O'Sullivan, 2018](#); [Craig, 2009](#)).

Most group meetings (8) were carried out by those of us located in Norway. The other configurations were three meetings conducted in pairs after one of us informally observed another's teaching (the informal observation provided some situations to facilitate discussion in the meeting), four group meetings with Tim, and six individual critical friend meetings with Tim (one each with Anders, Berit, and Lasse, and three with Mats). Due to Tim's location in Canada, meetings with him were conducted using Skype, which is a frequently used digital medium used by S-STEP researchers ([Vanassche & Kelchtermans, 2015](#)). All meetings were audio recorded and transcribed verbatim.

The reflective diaries of Berit (2 entries), Anders (3 entries), Lasse (2 entries), and Mats (4 entries) were written following every second or third lesson they taught using a predefined template. This involved reflections on what did or did not work in planning and teaching, feelings of vulnerability and how we overcame or at least acknowledged such experiences, our impression about the content we were teaching at the time and how it influenced our practice, and the identification and description of a critical

moment. Reflections were sent to Tim for his response and followed by an individual or group critical friend meeting. Tim wrote a final reflection addressed to the group that aimed to focus attention on the research question.

5.3. Analysis

Our interactive analytic process was based according to S-STEP scholarship and on rhizomatic suggestions from [Strom and Martin \(2017\)](#) and [Strom et al. \(2018\)](#) that aims to produce different knowledge through acknowledging the complexity of social life and practice while refusing fixed systems. S-STEP scholarship encourages interacting with our past and present understandings, practice, contexts, and conditions along with a projection into future practices and contexts ([Pinnegar & Hamilton 2009](#)). Adopting a rhizomatic approach led [Strom and Martin \(2017\)](#) to shift their thinking and inquiry, moving away from traditional coding toward greater use of philosophical concepts. Subsequently, we engaged in a dialogic process of using the rhizomatic concepts of “becoming” and “assemblage” to produce different understandings about becoming teacher educators ([Deleuze & Guattari, 1980/1987](#)).

Our analysis was a non-linear process consisting of three central phases that were engaged with in multiple ways and which involved multiple iterations. One phase consisted of entering into our relationships, paying explicit attention to the most salient human, material, and contextual elements producing our relationships, practice, and learning. Specifically, this involved the five of us engaging in a process of reading our own and each other's reflections (though Tim only read data written or translated into English), and listening to and reading transcripts from meetings while thinking with the concept of assemblage, the research question, and our experiences of being involved in the data production. We took notes during this process. This phase also involved a collaborative meeting in Oslo during a visit by Tim. The meeting began with each of us discussing our personal interpretations of the data set (Tim had only engaged with the English data), including our personal reflective diaries and transcripts of our meetings. These interpretations were then discussed in relation to our experiences while using the idea of assemblage to produce understandings about the interactions producing our practices, experiences, and relationships. Drawing from [Strom et al. \(2018, p. 146\)](#), the emergent conditions and relationships were compiled into a dynamic chart while “working collaboratively to synthesize them into a set of axial categories” that consisted of: (i) personal characteristics (e.g., desire to be responsible, open-minded, reflective teacher educators), (ii) department culture (e.g., individualistic and defensive), (iii) course context (e.g., new teacher education curriculum and autonomy provided by a new department head), (iv) the content we were teaching, (v) S-STEP as scholarship, (vi) our individual and collective teaching practices (co-planning, co-teaching, and co-reflecting) and (vii) the PSTs we taught.

Another analytic phase involved generating an understanding of how our experiences, practices, and relationships in the S-STEP assemblage produced particular teacher educator becomings. In this phase we focused on how S-STEP, rather than the course itself, contributed to our teacher educator becomings. Specifically, we engaged in a discussion about how our evolving experiences, practices, and relationships interacted with other conditions (e.g., departmental context, university context, national teacher education context) to produce different becomings. In this process, the following categories were added to the chart developed in the first phase: “challenging individualistic culture”, “hybrid teaching-research practice on an individual and collective level”, and “engaging in and with the transformable potential of S-STEP”. This

led us to focus on the evolution of our experiences, relationships, and practices and how these interacted with the other assemblage conditions. As a result, we produced an understanding about how we were becoming different as teacher educators (i.e., becoming “collaborative”, “committed” and “innovative” teacher educators).

With an aim of further developing the central ideas and related themes through synthesizing what we had learned/produced in the two other phases, Mats engaged in a third analytic process similar to “memo writing” (Charmaz, 2006). The narratives produced in this process were discussed and further developed in collaboration with Tim, which supported the main themes and richly descriptive examples in the results section (LaBoskey, 2004).

6. Results

By engaging in a dialogic process with the data, the research question (i.e., “How does collaborative S-STEP function to produce our teacher educator becomings?”), and the rhizomatic concepts of “becoming” and “assemblage”, we produced three main themes that help explain the ongoing process of becoming as teacher educators in our particular context. Specifically, we produced an understanding of how collaborative S-STEP produced: (i) becoming a collaborative teaching-research team, (ii) becoming committed teacher educators and researchers, and (iii) becoming innovative teacher educators.

6.1. *Becoming a collaborative teaching-research team*

During the S-STEP data production process, Lasse, Berit, and Anders (who had been affiliated with the department for 5–22 years) identified the prevailing departmental culture in relation to personal pedagogical practice as individualistic and defensive, and resistant to change and innovation. For example, Berit explained her perception of the prevailing departmental culture:

I have been here for a long time and [...] some structures and cultures are set ... It is very often difficult to change because we are [stuck] in our [personal] tracks ... I think that we, for many years, have been working in the same track. When we discuss, we agree that we have disagreements, but we are not doing anything with it ... Then it becomes more and more difficult to discuss professional practices. (Last group Skype)

Similarly, Lasse reflected on his perceptions and experiences of the departmental culture and its influence on his practices:

In the first few years [...] I felt this opposition was influencing me in my work and desire to change and improve both my own practice and the way we do things in the department. But over the last three or four years I have gradually challenged both their resistance and my refusal to initiate development processes ... But in order to stand a little more freely in these processes, I have also deliberately avoided to develop too strong social relationships with colleagues, precisely to safeguard the ability to challenge practices that are strong in the department. (Lasse, summary reflection)

The influence of this culture resulted in Berit, Lasse, and Anders initially being sceptical of Mats’ suggestion to pursue the teaching-research collaboration. However, Mats’ desire to engage in collaborative S-STEP as methodology-pedagogy, together with certain changes in the department (e.g., implementation of a new local teacher education curriculum and a new Head of Department who provided teaching autonomy), facilitated certain encounters and

relationships that later provoked us to challenge and transform our beliefs and practice, and also the departmental culture. Along with our personal characteristics (such as having open-minded attitudes and willingness toward change; a desire to be responsible, reflective teachers; and a desire to continually improve our understanding of teaching and teacher education practice), the S-STEP process led us towards producing a teaching-research context where we were becoming collaborative teacher educators. In one of the last group Skype meetings, Berit stated that despite being in the department for 22 years, this was the first time she felt part of a collaborative team. Also, in this meeting, an exchange between Mats and Anders highlighted how the interactive S-STEP approach facilitated and enabled collaborative teaching-research practice that moved beyond the individuals involved:

Mats: The nature of S-STEP helped us come together, helped us work together and collaborate. And then, the meaningful interaction and collaboration developed from the nature of S-STEP. That provides meaningful discussions and helped us discuss theory and practice, to align our classroom teaching with our practical (sports hall/gymnasium) teaching.

Anders: ... I also think the structure [i.e., methodological characteristics] of S-STEP was crucial to achieve these effects that we all agree on. The feeling of working together and how that is meaningful ... If we were not doing a [hybrid teaching-research] project, it’s probably a lot easier to just skip the meetings because you don’t have the time.

Taken together, the individual and collaborative research-teaching practice that was facilitated by our engagement with collaborative S-STEP produced a space where we shared and engaged in discussions about our personal and collective beliefs, understandings, and practices. This facilitated the way we built relationships with each other and formed identities personally and professionally. While we believe these processes were adding value to our work and lives, we also found them challenging. Lasse addressed this issue in his final reflection:

Innovation and change are really something that triggers me but at the same time it is both scary and exhausting. Scary because you move into the unknown, away from the safe and familiar ... The positive thing of this project was that change is put into more systematic forms where the purpose of making change appears to be a goal for itself ... Initially, I felt a certain discomfort around the process to observe each other ... The reason was due to the fact that it was relatively early in the research and teaching process, and we had not yet developed proper confidence in each other. We also did not know exactly where the research project would take us (in ways of individual and group practice and learning) ... I felt an extra motivation and an even greater commitment than usual, probably because someone wanted to use their time to come and observe me and help me further develop my teaching practice ... The discussions afterwards also gave me a good feeling, that there are others who also are concerned about me, my role as a teacher and my teaching. And that my teaching has value and significance for others, and can give them ideas and new perspectives. It made our work to be something different than just teaching. (Lasse, summary reflection)

As well as providing a spark to begin collaborating in a more deliberate way than any of us had engaged in previously in the department, Lasse alludes to ways the hybrid teaching-research process also led to us becoming more committed to our teacher

education practices and to each other.

6.2. *Becoming committed teacher educators and researchers*

As suggested above, deciding on a collaborative S-STEP approach provided direction, structure, and accountability to our research (i.e., planning and producing data, and later to analyse data and write research articles) and teacher education practices (i.e., planning, teaching, and reflecting). Data from group meetings show that during the beginning of the project, we took time to discuss the S-STEP process using its methodological characteristics and pedagogical nature as a starting point. This resulted in deciding to deliberately engage in an aligned and hybrid teaching-research approach, a decision that had consequences for and influenced how we went about becoming teacher educators and researchers individually and collectively.

For example, we decided that personal reflections that mostly focused on our individual teaching served as research data but also prompted us to make individual refinements in our teaching. Based on his personal reflections and corresponding critical friend meeting with Tim, Mats decided to adjust his overall gymnasium teaching approach. Specifically, he went from modelling and using teachable moments while engaging PSTs in reflection/discussion to requiring PSTs to work with specific content literature to produce relevant student learning experiences.

The personal (i.e., reflective diaries) and group reflections (group and critical friend meetings) also produced a commitment to teaching and research on individual and group levels. For example, in a group Skype meeting, Anders and Tim discussed the way the reflective diaries served as both research and teaching data, and also influenced the nature of our evolving commitment and relationships:

Anders: When you sit down to write you really get to know what you are actually thinking, because you haven't necessarily thought about it that hard before ... You discover new things when you start to write. And, when you know someone else is going to read it, you are probably affected by that too, so I think it's a good strategy to get more aware of your own beliefs ... I recognize that it is something I see value in.

Tim: ... You make a really interesting point [about] writing for someone else.

Anders: Yeah, you are writing for yourself but it's somewhere in the back of your head that other people are going to read it and that we are going to use this [for teaching-research purposes]. So, it's not exactly the same as writing a private reflection.

Tim: And in that sense, would you say that you are more cautious with what you write, or do you feel comfortable to write what you feel you want to write?

Anders: What I think is really great about working like this, is that I'm getting more and more comfortable with writing anything. The fact that we are observing each other and talking a lot about how we teach makes it easier to not be cautious ... I am experiencing that this way of working [collaborative teaching-research] makes it easier to just expose yourself.

This extract highlights how both our personal reflective diaries and critical friend meetings (with Tim and with each other) were effective for research purposes in that they provided data that offer insights into our learning process and evolving relationships. They also influenced how we saw value in the reflective processes for our teacher education practice (i.e., getting more aware of one's beliefs, which provoked refinement of teaching practice). From a relational point of view, the excerpt also suggests that the approach helped us develop trust in one another and that through making ourselves

vulnerable we were able to learn about ourselves personally and to think about our practices collectively. This level of trust further facilitated commitment to our collaborative teaching-research approach.

In addition to providing a space to reflect on our learning about teaching PSTs, the group meetings produced research data of the co-planning process, where we discussed and tried to align individual and collaborative teaching and research practices. The following extract was taken from a group meeting that was conducted after the first lesson we co-taught and highlights our commitment to each other's individual and collective practice and to the PSTs we taught:

Berit: We need to try getting more time to plan the seminars ... There is a big difference between being early in [the course] as we are now and in just three weeks we are in a completely different place ... Then we need to run seminars with a very short intro ... Then [PSTs] can work [in groups] and that work is presented, and then end with [PSTs reflecting on their learning experience].

Mats: Yes, that [lesson structure] will be better. But I think we work well together. I don't think they experience us as disorganized.

Berit: I agree with that. And I do not mean that we are disorganized but as we talked about, there was a lot of talk today, and it is natural that we don't need to do that later.

Mats: Yes, because ... it was, in a way, not the goal, to inform ... There was information [about content in the course] in the beginning, but the rest was teaching [PSTs about teaching the specific content].

Lasse: ... They probably struggled to understand everything that was taught today. But that's not the point either. We could have spread it more, but ...

Berit: I think that ... it is that you get something that you have to go speculate on, so we will try to teach this here in the best possible manner. But the fact that they must fully understand it ... I do not think they will do that until they have tried it [in schools] and experienced it [as learners] in our practice.

This extract shows how our commitment to produce individual teaching practices that aligned with our collective aims encouraged engagement in deliberate discussions about the "hows and whys" of co-teaching (i.e., co-planning, co-teaching, and co-reflecting) for the benefits of PSTs. This also resulted in a shared commitment to talk to PSTs about our practices, engaging them in the teaching-research process. Of this, Lasse wrote:

It constantly pushed me to increase [my] awareness of the PSTs' point of view and their expectations. Seeing both the research and our teaching from their perspective was very useful and created even greater curiosity about my own teaching and ideas about our research. What [do they think] is our role [as teacher educators] and how we should teach to develop and change their thinking and practice in the ways they think are appropriate? And how will this influence my teaching and my approach to the PSTs? (Lasse, summary reflection)

Committing to collaborative teaching-research practice for the purposes of individual and collective professional learning produced interactions that facilitated relationships. In his summative reflection, Tim refers to the ways in which the deliberate processes of the collaboration supported and strengthened our relationships and commitments. Interestingly, much of this collaboration between Tim and the group was facilitated through material

conditions, such as through digital technology:

[I am] realizing the value of this [aligned and hybrid teaching-research] approach while not having done similar in my own department. I engage with my colleagues in direct 'human' ways [face-to-face interactions] almost daily, yet I don't think I can tell you nearly as much about their beliefs, the challenges they face, their priorities in physical education teacher education as I could tell about yours (and vice versa)!.. This has been a worthwhile and eye-opening project for me. It has certainly provided personal and professional development – I feel I can say I have new friends (to some extent) and colleagues as a result of this engagement, and have been forced to think deeply about what, why, and how I do things, and what, why, and how I could do them differently both individually and with colleagues. (Tim, summative reflection).

In such a context of shared teaching-research practice and the development of personal and professional relationships, we were becoming committed teacher educators and researchers on various levels; committed to our individual and collaborative practices; committed to our own and each other's personal and professional learning; committed to the PSTs we taught (and by virtue, the students they will teach); and committed to developing the knowledge base of teacher education. Subsequently, our collaborative teaching-research practice together with these commitments produced a context that also led us to see ourselves in new ways; as innovative teacher educators.

6.3. *Becoming innovative teacher educators*

Our evolving and innovative practices (i.e., collaborative teaching-research practice) and relationships produced particular experiences that provoked transformation of our teacher education beliefs, understanding, and practice. Specifically, we engaged in what we perceived as meaningful teaching-research practices that facilitated rich professional conversations. The extract below was taken from a discussion that followed an informal observation of Lasse's teaching by Mats and Anders. Based on the observation, we engaged in what we felt was a rich discussion about teaching and learning in teacher education, drawing on our individual and collective experiences:

Mats: I was wondering about ... the notion of sharing the [lesson] goal [with PSTs] ...

Lasse: You think I could have been clearer [in today's lesson]?

Mats: Yes ... But I think the way you did it, that you had a dialogue with them, is very nice. Then the goal actually emerged.

Lasse: It strikes me quite often that [sharing lesson] goals are something I can [improve]. I very often have the goal clear to myself, but to make it clear [to the PSTs] ...

Mats: Goals are difficult. I also struggle with the fact that, they are PSTs but then they are often involved in the activity [e.g., a game] as school students. [In my individual teaching earlier today] I had a goal for them as school students and also specific goals for them as PSTs.

Lasse: I think it's difficult ... Today I had to remind one group that they must have the teacher perspective ... They got engaged with the activity [and forgot the teacher perspective].

Mats: I don't think that is wrong that they are engaged but then you have to, as you did today, take them out of the role as a school student. So they can look back on themselves as a student. How did they experience that game as a student? How did you teach? It is the constant switch that is very difficult. Also

[asking] questions: I arrest myself in too often looking for the "right" answer, but it is not always us who is sitting on the "right" answer ...

Lasse: Yes, like Berit was saying [in a previous group meeting]: "Are we out on missionary work?" That we have a message that we are taking with us and force on them [PSTs]?

Anders: [Telling them]: "That's how it should be!"

Lasse: Yes, that results in not getting the reflection started, and then there will be no formation.

Anders: And the extent to which you have very specific lesson goals allow you to set where to go [with the questions]. When you have a reflecting question, you want to come up with something ... And there you become a bit vulnerable as a teacher and teacher educator, if you think you should have a reflection and then nothing comes, or very little, or that you don't think what comes is relevant. What do you do? The natural reflex is in a way to tell them the answer you had in mind. If you are lucky, you can ask the question better, so that you get some new reflections ... You try to manoeuvre yourself towards something.

This discussion highlights the way our evolving relationships allowed us to challenge what Lasse, Anders, and Berit had previously perceived to be the departmental culture in relation to personal pedagogical practice as individualistic and defensive, and resistant to change. The discussion above provided one example where we were provoked by one another and by our individual and collective experiences to reflect upon and to some extent change our beliefs (i.e., teaching as telling versus learning as transformation), understandings (i.e., not telling but having a clear lesson goal that helps guides questions and reflections), and practices (i.e., be more clear about what perspective we and the PSTs are taking) (Berry, 2007). In this way, our collaborative teaching-research approach supported how we understood teaching-research practices in new ways. In what we perceived to previously be a defensive and individualistic departmental context, we felt that our collaborative approach was innovative due to the ongoing meaningful practices, relationships, and experiences were engaged in.

According to Loughran (2004), S-STEP has transformable potential through teacher educators sharing insights with others in the teacher education community. During the project, we engaged in several informal (e.g., lunch, coffee breaks) and formal sharing (whole and individual departmental meetings) situations where we discussed our evolving practice, experience, and understanding with other departmental colleagues. Data show that through sharing our collaborative approach and subsequent learning, we experienced that our departmental colleagues became interested in what we were doing. Based on these interactions with colleagues, we felt we were not only challenging personal dispositions but also those of departmental colleagues who were not involved in the collaboration. We felt we could be part of a departmental cultural change that moved from individualistic and defensive towards collaborative, committed, and innovative. Data show that we became inspired by responses from other departmental colleagues not involved in the project but who showed interest and expressed that they wanted to engage in similar collaborative teaching-research projects. We discussed this experience in one of the last group meetings:

Mats: Hopefully this culture [we have developed] can influence the others in the department. From my point of view, it already has, because [Anders, Berit, and Lasse] presented at a research meeting, and I presented at a department meeting. It seems like

[our other colleagues] are interested in doing S-STEP and they have understood how working in a group has been a positive experience for all of us.

Berit: I think they see that we are engaged and are motivated and that we think it is fun and we are talking about it and so on. When we have been telling them about the project in formal meetings, they have listened and seen that [our teaching-research approach/project] is a good way to teach and that more of them want some changes.

Anders: Yeah. I am thinking that too, if we can get more people to do similar projects in other courses, that we can get somewhere. Because we have been using this now in a rather small part [of the program]. Maybe this way of thinking about teaching [i.e., collaborative, hybrid, and aligned teaching-research practice] should be used in other parts of the program with different people. It could be really important.

Specifically, this extract shows how our collaborative teaching-research practice that was informed and facilitated by S-STEP not only transformed our beliefs and practices but also facilitated thinking about disrupting the broader departmental culture, which some felt had been constraining of individual and collaborative practices of teacher educators in the department.

Together, these data suggest that as we engaged in collaborative and committed teaching-research practice in an individualistic and defensive departmental context, the transformation of beliefs and practices had the potential to influence the broader departmental culture and led us to believe that we were becoming innovative teacher educators.

7. Discussion

The purpose of this research was to explore the ways we were becoming as teacher educators as we built and engaged in multiple relationships through collaborative teaching and research practice in one physical education course in a Norwegian teacher education program. Results highlight how: (i) collaborative S-STEP as methodology-pedagogy can represent a powerful teaching-research approach for provoking teacher educators' ongoing understandings of becoming, and (ii) a rhizomatic frame can produce an understanding of the ways teacher educators are always in a process of becoming different regardless of their individual career stage. This research bolsters claims for the value of using collaborative S-STEP together with relational, dynamic, and non-linear frameworks such as rhizomatics to provoke and produce understanding about the ongoing nature of becoming teacher educators (Hamilton & Pinnegar, 2014; Deleuze & Guattari citation to Deleuze & Guattari, 1980/1987; Hordvik et al., 2020; Martin, 2018; Ovens et al., 2016b; Strom et al., 2018).

We argue that our research provides detailed insights into the ways collaborative S-STEP can act as both methodology and pedagogy. Specifically, collaborative S-STEP encouraged us to engage in the very intimate processes of co-teaching (co-planning, co-teaching, and co-reflecting) and co-researching (co-planning, co-researching, and to some extent co-analysing) (Martin & Dismuke, 2015), which had profound influence on the ways we were always becoming as teacher educators. Results convey that engaging in collaborative S-STEP influenced the ways we developed meaningful collaboration and commitment, and experienced becoming innovative teacher educators in our departmental context. S-STEP functioned to provoke multiple teacher educator becomings while the use of rhizomatics provided a conceptual lens that enabled us to understand the multiple and relational nature of these becoming(s).

Rhizomatics (Deleuze & Guattari, 1980/1987) provoked us to think differently about and explore the process (es) of how we were becoming as teacher educators, not in terms of progressive developmental outcomes but rather in a dynamic, temporary, and non-linear process of changing as a result of the relationships in which we existed. That is, rhizomatics helped us see instances in the data that convey how we re-produced the ways we were becoming different as teacher educators at multiple times individually and collectively during the course. In a similar way to Ovens et al. (2016a) and Strom et al. (2018), our results do not lead us to argue that we developed from outdated teacher educators to innovative teacher educators or from bad to good teacher educators; rather, we argue that our evolving practice, experiences, and relationships co-produced the context, situations, or moments where we became collaborative, committed, and innovative teacher educators.

This leads us to highlight that, in another context with particular colleagues, PSTs, and other conditions, the relationships and interactions would co-produce different teacher educator becomings and practices (see for example, Hordvik et al., 2020). For example, we could have been provided with less teaching resources and/or less time for research, or our personalities might not have matched the way they did, one of us could have refused to engage in a collaborative teaching-research practice, or the PSTs could have reacted negatively to our teaching-research practice and/or refused to be involved in the research. In these situations, our relationships would have co-produced particular experiences, relationships, and practices – resulting in the production of very different becomings. Importantly, however, we argue that engaging with collaborative S-STEP as methodology-pedagogy can support teacher educators in working collaboratively to provoke personal and collective dispositions and practices, and in this way, produce constructive rather than destructive teacher educator becomings.

Building on other examples of collaborative S-STEP research informed by rhizomatics (e.g., Martin, 2019; Ovens et al., 2016a; Strom et al., 2014; Strom et al., 2018), we have produced new insights into how a group of teacher educators collaborating in teaching-research was becoming different within one course and through experimenting with a pedagogical innovation. While we produced data that allowed insights into our individual and collaborative teaching-research practices (e.g., reflective diary focusing on our individual teaching, group meetings discussion involving co-planning and co-reflecting on our co-teaching), we acknowledge that such data did not provide insights into our actual individual and collaborative teaching practices. We therefore encourage future researchers to include additional observational data of individual and collaborative teaching practice, perhaps using video records. In addition, the results and interpretations represent one small group of teacher educators collaborating in one course within a larger department and university. Because our study highlights the transformable potential of collaborative S-STEP, we encourage other collaborations including small teaching teams, whole teacher education departments, or groups/departments collaborating with other groups in universities to engage in similar processes and to share their findings. It is through making connections across similar studies that collaborative S-STEP may meet its potential to develop the knowledge base of teacher education (Zeichner, 2007).

8. Conclusion

We draw two conclusions from the ways engaging with S-STEP as methodology-pedagogy worked to produce our teaching-research practice and the ways rhizomatics enabled us to understand how we were becoming as teacher educators. First, we argue

for the value of S-STEP in helping teacher educators engage in collaborative relationships to facilitate their individual and collective practice and to improve their understandings of such practices. These processes can subsequently contribute to other teacher educators' learning by sharing insights and results that are grounded in data. Importantly, these collaboratives help teacher educators from diverse (and similar) career stages and from the same (or diverse) departments come together to evolve in their commitments to their practices and that of others. These results therefore have implications for policies and practices concerning the ongoing professional learning of teacher educators, which has been highlighted as an area in need of vital attention in multiple international contexts (European Commission, 2013a; MacPhail et al., 2019, pp. 848–861). Our research may provide both guidance and evidence for others wishing to set up similar initiatives.

Second, this study demonstrates the potential of relational non-linear frameworks such as rhizomatics to reveal new and different understandings of becoming teacher educators. Our research shows how teacher educators can engage with S-STEP together with relational and non-linear thinking to provoke, challenge, and illuminate their always changing practice, learning, and relationships (Bullough & Pinnegar, 2001, p. 20; Hamilton & Pinnegar, 2015). We highlight how rhizomatics encouraged us to focus on and understand the ways we were continually provoked to change our beliefs, understandings, and practices as a result of the relationships we encountered in particular locations and in multiple situations. Collaborative S-STEP and rhizomatics can help teacher educators explore, understand, and appreciate that they always are becoming different as they traverse through their learning journeys and engage in and with particular relationships across all stages of their careers.

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