SUBJECT-TO-CHANGE: SOCIOMATERIAL EXPLORATIONS OF FRENCH AS A SECOND LANGUAGE TEACHER PRACTICE AND TECHNOLOGY

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Abstract

This dissertation takes up myriad theories and concepts from the umbrella of sociomaterialism to explore and experiment with technology in Core French as a Second Language (FSL). Drawing upon a 10-month study with five Core French teachers, this study broadly engages questions around what is produced when Core French teachers 'do' their professional practice. More specifically, the research-assemblage attended to the flows of actors and activity that (were) co-produced (by) these becomings.

Guided by the methodological toolkits of Action Research and Actor-Network Theory, I worked with each teacher individually in discussing problems of practice, observing, and co-developing (and sometimes co-leading) lesson plans involving technology integration. I spent two to four days per month with each teacher. I collected artifacts from the classrooms, as well as files related to the lesson plans. Additionally, I completed up to three semi-structured interviews.

The three articles which form the empirical body of this dissertation provide actor-network mappings and discussions of particular data events from the study. These data entry points are possible lines to think differently about the intricacies of becoming a Core FSL teacher in day-to-day practice, and the ways in which these educators are constantly (re)shaped in relation with the material, human, and affective elements that circulate in and beyond their classrooms. I offer several vignettes as empirical examples that extend insights into how the status of Core FSL, the material components of the school, and the teachers' practice are co-constituted.

I offer these explorations as avenues to think with in order to disrupt existing understandings and suggest how (re)imagining FSL teaching from a sociomaterial perspective might produce different engagements and interventions in these spaces. As stakeholders, I suggest it is time to consider what (else) might become in Core FSL?

Preface

As per the University of Ottawa's Academic Regulation C-7, I declare that I am the sole author of the research and documents presented in this dissertation. However, we never truly write alone in doctoral programs. Feedback on drafts was provided by my supervisor, committee, colleagues, and anonymous peer reviewers from the corresponding journals. Authorship was discussed and negotiated as appropriate. Mistakes ranging from the grammatical to the philosophical are my own.

The research received approval from the University of Ottawa Social Sciences and Humanities Research Ethics Board (S-05-22-7838; Appendix A) as well as from the Ontario school board in which the study took place. The study was supported by a Joseph-Armand Bombardier Canada Graduate Scholarship – Doctoral (File Number 767-2020-0401), as well as an Ontario Graduate Scholarship.

There is a beginning.
There is a not yet beginning to be a beginning.
There is a not yet beginning to be a not yet beginning to be a beginning.
There is being.
There is nonbeing.
There is a not yet beginning to be nonbeing.
Suddenly there is being and nonbeing.
But between this being and nonbeing, I don't really know which is being and which is nonbeing.
Now I have just said something.
But I don't know whether what I have said has really said something or whether it hasn't said something.

Daoist Philosopher Zhuang Zhou (Zhuangzi)
Trans. Burton Watson
Watson, B. (2013). *The Complete Works of Zhuangzi*. Columbia University Press.

Every new beginning comes from some other beginning's end
Closing Time — Semisonic (1998)

Acknowledgements

This dissertation is not one, but many; formed by a multitude of collisions over the years that co-produced the (un)seen parts of the process and product: innumerable pens, kilowatt-hours, scraps of paper, software programs, lunches, emails, and cups of tea. Words typed and deleted. Data bytes uploaded and downloaded. Thoughts scribbled on sticky notes and made digital; thoughts lost somewhere between their inception and getting them written down. These entities all contributed to the dissertation assemblage.

My first acknowledgement goes to my supervisor, Stephanie Arnott. Thank you for trusting and believing in me enough to continue to bring me into projects, to allow me to take the helm, and to work through the choppy waters of the many different challenges we encountered along the way. You have been a steadfast support. Thank for your making the #Squad possible.

To the other members of my dissertation committee:

Francis – thank you for sticking with me as I read around Deleuze and swore that I wouldn't engage *A Thousand Plateaus* directly. As much as I didn't appreciate the advice at the time to "just sit with" my thoughts and wonderings, I'll admit it did usually pay off. Even though this dissertation is Deleuze-ish, I hope you are pleased by the framework that emerged.

Michelle – I have consistently found your conscientious and inquisitive comments invigorating. You provided a critical eye that helped 'translate' some of the more philosophical discussions into less esoteric terms. Your insights into the FSL classroom and technology integration have helped ground the work and continue to call me back to the complex realities educators in these contexts face.

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Chapter 1

Introduction – Entering In

> If it is true that it is of the essence of the map or rhizome to have multiple entryways, then it is plausible that one could even enter them through tracings or the root-tree, assuming the necessary precautions are taken (Deleuze & Guattari, 1987, p. 14)

This chapter is an introduction: an on-ramp, a place for some loose framing, and meandering pathways into some literature, onto-epistemo-methodology, and context. Here you can find pieces of me alongside some sardonic and reflexive commentary, a retrospective on the design and start of the project, and a glance at the dissertation elements to come.

My interest in this work stems from my own experience as a French as a Second Language (FSL) teacher in elementary schools attempting to access and integrate technology in my Core French classroom. After graduating from a specialized cohort on technology leadership, I felt inspired to develop a technology-forward teaching style as I entered the profession. Yet, in an environment where technology access was limited and prioritized for homeroom classrooms, I often found myself unable to implement the technology-integrated practice I envisioned for my students. In addition to the general challenges with technology that I read about, the iPad carts were stored far from the French office, and booking them consistently across different periods was a difficult endeavour. It felt as though using the tools was too much hassle. Later, when working as a school board technology coach, I understood how pervasive this problem can be for additional language teachers, and how few professional supports there were to guide teachers who are hesitant or unsure how to take up technology in FSL. So, I began to wonder about how technology enters into other FSL classrooms. How do French teachers navigate these challenges and opportunities? Was mine a common experience, or something unique to my school? These

questions led me to my master's thesis (Smith, 2017) and to this doctoral work. While my master's study explored teacher beliefs about technology in FSL, the project presented here was intended to provide glimpses into what happens as these elements come together in classrooms. The study was originally oriented by the research questions:

1. What does a technology-focused Professional Learning Community (PLC) produce for the conditions for technology integration in FSL and for FSL teacher becoming?
2. In what ways do these different sociomaterial wonderings and tracings produce new possibilities for these findings?

This orientation was produced in response to my original research interest from my master's study, along with the increasing pull of complexity theory. During and following my proposal defense, suggestions were made to further push the sociomaterialist framing – the focus should not just be *what* the PLC produces, but *how* those instances (are) produce(d). Who or what else becomes alongside the human participants? How might teachers enact, reject, and/or repurpose calls for technology integration in response? These wonderings became part of my next iteration:

1. What might a technology-focused PLC be capable of producing with FSL teachers' capacity to integrate technology?
2. What might the becomings of PLCs, Action Research, technology, and FSL teachers be capable of producing for the research project?

As I describe later, the loss of the PLC during the emergence of the project meant that while these questions were still at play, I began to find them more constraining than invigorating. Rather than force the data to match the research questions, I looked for new entry points into this research assemblage (N. J. Fox & Alldred, 2015). The questions that are taken up in these three articles grew from what the data were doing and the connections I was forming. They were not the wonderings I had predicted, but they established new lines of thought that attracted me into these trajectories.

While I did not pursue a single, overarching research question after the collapse of the PLCs, at play throughout the study were various thoughts around what might be produced (differently) in regard to technology integration in FSL. Looking at my research journal, I see prompts to consider: what are these teachers **doing** with technology, how do they **think** about it, and how do we connect those thoughts to **research** evidence? What might extended **conversations**, mentorship, and **professional learning** around technology in FSL look like in a dyadic format?

Co-creating and revising feasible **objectives** that function within the scope of these teachers' work and push at the **boundaries** of their practice evolved continuously as lessons changed, new questions arose, energy fluctuated, and unexpected events unfolded in these schools. What emerged from each observation session or interview was connected and (re)oriented through these thoughts. More of these wonderings are included in Appendix B.

My own becoming as a (sociomaterial) researcher and practitioner was similarly implicated – how do I understand and **engage** these phenomena? What **resonates** and **differs** from existing research? How can sociomaterial concepts be **put to work** in these contexts to productively intervene in FSL classrooms? At first, the esoteric nature of sociomaterialist concepts seemed a yawning chasm between the pragmatic concerns of the teachers and my theoretical framework (a thought I return to repeatedly in this dissertation). Yet, there were moments of surprisingly simple connection: after my first conversation with Aaron (an FSL teacher participant in the study) around the complexities of the systems that surround technology integration (e.g., access, infrastructure, training), I noticed him using these terms when discussing the elements that are implicated by technology use. Seeing the many connections and unpredictability within the 'broader' assemblage became part of how he spoke about his experiences with technology beyond the immediacy of devices and lesson plans. I explore more

of these openings and intersections in the resulting articles and the two bookend chapters of this dissertation.

Given the flexibility of the thesis by article format, I was interested in tracing multiple, simultaneous happenings rather than following the 'linear' setup of the traditional dissertation. As I see it now, each of the questions or prompts in the articles is drawn from slightly different intersections of theories and concepts, with several lines of entry and loops back. For example, in the first dissertation article (Smith, 2024), my purpose was to use my experience engaging with Action Research (AR) and the vignettes to "disrupt everyday assumptions about AR, its contexts, its language, and its processes" (p. 2). This methodological reflection frames some of my thinking around the process of conducting the research. While writing the second article (Smith, under review), I was inspired by teacher becomings over the course of their day, and the material connections that produce Core French. When discussing the challenges associated with FSL, I found it essential to recognize how circulations among actors produced both changeable and persistent conditions in schools; these relational affects weave what is (im)possible in the program. In the third article (Smith, submitted), I similarly use vignettes as entry points into data on digital actors in classroom spaces. Following intra-actions (Barad, 2007; see glossary in Appendix C) with different software programs, I wondered how and what these "digital tools (un)expectedly produce in the second language classroom" (p. 3). The purpose was to explore the sociomaterial tensions that arise when technology is integrated into language learning, highlighting both disruptions and new possibilities. Read together, these articles provide entry points for thinking about Core French, technology integration, teacher becoming, and what might be (re)considered through sociomaterial approaches to methodology, conceptualization, and engagement at this intersection.

Collisions with Sociomaterialism

This study rides a tension in and among established educational and social sciences research traditions and alternative lines of flight proposed by working in the sociomaterial landscape. The movements in this dissertation flow back and forth, (un)intentionally and haphazardly, between these confluences. This disjunctive zigzagging also contributes to my (over)use of 'collisions' when I speak of assemblages (Deleuze & Guattari, 1987). The terms related to assembling, entangling, and emerging did not always bring to mind the forceful and intensive meeting of concepts, thoughts, and entities at speed. Though slower flows and joinings were likely present but less noticeable, I found many such connections jarring and uncomfortable, rather than a gentle, cohesive coming together. When things collided in this study, they felt more likely to rupture, to splinter, to crash - their status as whole bodies was shattered. Yet, this allowed me to examine how these things were produced and where new connections might be (re)made. The lack of control (and plan) for these eruptions in the research process brought unexpected pathways in the making of this study (see Article 1, Smith, 2024).

How did this trajectory come into being? At first, I was pulled by the thought that if this was my last big foray into conducting educational research, I wanted to get as much out of it as I could. When would I again get the chance to deeply explore a new onto-epistemological approach and engage the 'philosophy' aspect of the PhD? What would happen if I challenged what (little) I thought I knew about engaging in research? When would I get to spend dedicated time with educators – discussing and trying out new ideas in their practice? And all this opportunity with the support of established scholars in the field? I thought I could always 'go back' to sociocultural work; but I might not take these risks if I did not try them now.

Although I did not recall this point until late in my data analysis, I remembered that I had previous experience with materialist thinking. In 2016, I was a research assistant for Dr. Kim Lenters who first introduced me to affect, assemblages, and materialism in literacy research.

While this analysis went far beyond my capacity at the time – as a new master's student with no philosophy background – it was a funny realization that this work had been part of my graduate journey for longer than I was aware. I did not plan to be extensively diving into philosophy and theory building in either degree, but here we are.

In many ways, sociomaterialism is 'just' the term I am choosing to use to refer to the set of theories used in this study. Although there have been recent attempts to more definitively structure sociomaterial approaches (e.g., Guerrettaz et al., 2021), the kind of sociomaterialism used here is idiosyncratic, an entanglement (Barad, 2007) that was made in the flux of this research assemblage which may overlap and differ from other approaches that are called new or sociomaterialism. While it was freeing to use a term without a long-established tradition, it simultaneously leaves me the task of situating myself as transparently as I can given such ambiguity. Only in the abstraction of the Infinite Monkey theorem would I expect another analysis exactly like this one (or perhaps the Infinite Grad Student theorem? A graduate student at a typewriter for an infinite amount of time might (re)produce this study…). In an emergent field, the approach I have developed here is one instantiation among many in the current "spray" (Fenwick & Edwards, 2019).

Like for Kuby and Christ (2020), I was "ruined" by sociomaterialism. I see now that I cannot *un*know these methods and ways of thinking about data, methods, and so on; they are not glasses to be put on and off. While they may become-different (i.e., become what they are not currently; see the glossary in Appendix C) in projects and writing that is not explicitly sociomaterialist, I am not 'free' of their influence. While facets of sociomaterialism are described with greater detail in the articles, and in the methodology section below, this section provides some additional thoughts on how I have come to engage this term.

Rather than deeply diving into a select tradition, I had unwittingly chosen to be dunked, swirled, and swept in and out of the tributaries of many 'new,' 'non,' and 'post' traditions in the

sociomaterial watershed[1]. I could have chosen to only highlight one thread in this dissertation. It would have been easier to research, write, and defend with fewer articles, authors, and concepts to grapple with – let alone figuring out how they enter into conversation. Yet, that did not feel true to the journey and the work. I did not feel (the need to be) particularly Deleuzian, or ANT-ish, or postfoundational, or, or, or... In fact, and-and-and is a mantra I have heard from many authors in the field (e.g., Mineo Tagata & Ribas, 2021). It is also very on brand (as the kids currently say) for me to take a jack-of-all-trades approach, despite the incongruences in these influences. It was how the process unfolded, for better or worse. Thus, with tensions at the fore, I continued on.

I took some consolation in Kuby and Christ's (2020) suggestion that they, too, think "theory is malleable and relational; there is not one right interpretation for a theory or theoretical concept. Using a theoretical concept the 'right way' is not our goal (as we believe that is not thinkable)" (p. 19). Of course, I was also faced with the reality that some scholars are stauncher in maintaining philosophically commensurable, coherent, and delineated concepts, particularly around Deleuze (e.g., Buchanan, 2017; St. Pierre, 2024). Would it be possible to 'yes, and' both positions? Could I engage the underpinnings of these concepts and theories to some extent, yet also plug them in 'loosely' to the research assemblage? Could I agree that it may lead "to a diminished understanding of the concept" (Buchanan, 2021, p. 3), while also echoing Strom and Mills (2021) that "we do not need to know what the f*ck [a concept] is, precisely" to engage it (p. 190)? The intra-actions that affect(ed) my becoming with the sociomaterialisms and this dissertation are ultimately singularized (Deleuze, 1997); one possible unfolding of the countless

[1] Importantly, not all connections in the materialisms are 'new' – including Indigenous relational ontologies whose traditions long pre-date the Western materialist turn (Rosiek et al., 2020). However, engagement with these theories remains limited, which is sadly true of this dissertation, despite calls to extend citation practices in the field (Ennser-Kananen, 2019). I take up this discussion in another article (Bangou & Smith, under review).

others that could have or could yet still emerge. I argue there is no one way to become a sociomaterial scholar, and this instantiation is but one moment in my ongoing journey.

Conscious of the pitfall of making these concepts into metaphors, I attempted to not just 'use' these theories, but to generate "new processes more than new products . . . to energize new modes of activity that seem to offer a potential to escape or overspill ready-made channelings into the dominant value system" (Manning & Massumi, 2014, p. 87). I am still new to many of these terms, and if authors with far more years of experience struggle and doubt how to nuance different terms (e.g., Dernikos et al., 2020), perhaps I could too. Caveat lector.

As I continue later, I have also envisioned this writing for an audience who (like myself) may not already be attuned to the subtle, metaphysical differences among sociomaterial theories and concepts. I contend that far too few pieces have been written for a slow introduction, which allows for messiness and some conceptual blurriness as readers adapt to the vocabulary of the sociomaterial. Like Bennett (2010), I have attempted to collide vocabularies from Latour, Deleuze, Barad, Fenwick, and beyond to take up what might be possible in these research spaces. My focus was not on pointing out tensions or conflict but on finding ways to put them into productive intra-action (Kraftl, 2018). As Jackson and Mazzei (2017) noted,

> in a threshold, things enter and meet, flow (or pass) into one another, and break open (or exit) into something else . . . we argued that theory is necessary in our work because it keeps knowing and being in the middle of things, in a state of in-between-ness, as always becoming. (p. 721)

I have therefore endeavoured to be transparent in my thinking, and the possibilities and limitations of what this study and these articles might do given this in-between conceptual framework. Indeed, there is a great deal of reflexive commentary and careful (read: uneasy) positioning of the content of this dissertation. As Fenwick (2011) suggests, ANT scholars

> need to move as carefully and reflexively as possible, mindful of their own tendency to create obligatory points of passage, cautious in neither totalizing nor ignoring phenomena unfolding,

> and mindful of both their own highly provisional accounts and the entanglement of these accounts in constituting the phenomena being read. But limitations of gaze, as in all forms of research, are matters of caveat, not censure. (p. 123)

For instance, throughout the writing process, I noticed myself (and was caught by reviewers) using only 'materialism' as a… synonym? shorthand? contrasting term? for other theories and theorists outside of those who have (been) identified with sociomaterialism. It was uncomfortable for me to ascribe the term to so many varieties of theoretical approaches that may not ever use the term (socio)materialism. Yet, working within the bounds of word limits (brevity), peer review (intelligibility), and demands for linear 'clarity,' it has been a necessary concession (Vannini, 2015). Even now, when writing sociomaterial research, I find myself bouncing between the many terms that work in and between these traditions (a line of thought I continue in the methodology section).

This dissertation therefore marks where my thinking and understanding have stabilized at this moment. The purpose (and my capacity at this point), to misuse a Latour quote, was not to break concepts "into neat little pots" but to "follow the link they make among those elements that would have looked completely incommensurable" (Latour, 2005, pp. 141–142). As I return to in the last chapter, I expect (and hope) that my thinking will change, continuing to evolve. Whether that leads me to 'more' or 'less' sociomaterialist thoughts cannot be known in advance.

Literature Connections

Working within multiple theoretical and conceptual lineages requires situating my thoughts in relation to the rich histories of these disciplines. The connections detailed below highlight how these strands entered to shape the study – before, during, and after the empirical 'data collection' phase – and how my study may speak back to the vocabularies and understandings in these fields. Beginning first with an overview of FSL, I pivot to technology integration in second language classrooms, before considering how these two fields intersect

teacher professional learning. I then position several sociomaterialist theories, and how these ideas worked to co-produce the questions which guided the study.

French as a Second Language

The teaching of Canada's two official languages, French and English, is promoted and administered in many (though not all) school jurisdictions across the country. The most common program for teaching French, often referred to as 'Core' FSL, is distinguished from more immersive approaches by the fact that French is taught without being inherently connected to other subject curricula. The implementation of FSL[2] programs vary considerably across the provinces, particularly at the elementary level (Early et al., 2017; Turnbull, 2000). The amount of allocated instructional time, the grade at which students begin to learn French, and whether the program is compulsory may change both within and across provinces. In Ontario, the location of this study, FSL is compulsory to Grade 9, where students must earn at least one high school credit in FSL to meet the Ontario Secondary School Diploma requirements. This minimum is often accomplished through Core French programs; however, additional FSL program offering options often exist in local school boards through French Immersion (FI) or other programs (Ontario Ministry of Education, 2020). Following updates to the curriculum in 2013, the OME released multiple resources and documents promoting the use of technology for student engagement in language learning (OME, 2013). Since an estimated 75% of Canadian students learn the language through Core French (Canadian Parents for French, 2021), the potential value and impact of the program is immense (Knouzi & Mady, 2014). Yet, Core programs are frequently marginalized in schools, as seen in the lack of control, integration, and autonomy given to FSL teachers (Lapkin et al., 2009). While studies for decades have repeated these criticisms, shortcomings, and

[2] For the remainder of this document, unless otherwise specified, FSL refers to both Core and Immersion programs.

mistreatments of the Core program (Arnott et al., 2019; Masson, Knouzi, et al., 2021), it feels almost unethical to not acknowledge them once more.

Acknowledging the systems surrounding FSL is essential to understanding current realities. FSL programs across the country have suffered from unstable financial support from federal and province governments for many years (Kissau, 2005). Despite agreements and reports from the Commissioner of Official Languages, the mobilization of resources and attention continues to be sporadic (Wernicke et al., 2022). Moreover, FSL teachers continue to receive the majority of their training in English (Smith, Masson, et al., 2023), and concerns around proficiency, mentorship, and resourcing extend throughout the teacher education and professional development pipeline (Arnott et al., 2023). In schools, apathetic or uninformed administrators may perpetuate these challenges (Milley & Arnott, 2016). These high-level trends shape the starting point for engaging in FSL research and practice.

Among the FSL programs, Core French in particular "is often not given the same consideration in scheduling, timetabling, resource support, staffing, professional development, and level of importance to the general education of the students as other subject areas" (Kissau, 2005, p. 12). Core programs are also associated with particularly low retention after the end of the compulsory period. Roughly 95% of students in secondary Core French programs are estimated to leave after completing their mandatory studies (Office of the Commissioner of Official Languages, 2019). Student boredom and frustration with their language progress are frequently cited issues (Lapkin et al., 2009; Lawrence, 2014). The Core French teacher is also considered to be generally undervalued and marginalized within the school and teaching community; indeed, "the working conditions of FSL teachers" are reportedly "worse than those for teachers of other subjects" (Kissau, 2005, p. 14). Often at the elementary level, Core French is not assigned a designated classroom (Lapkin et al., 2006), instead moving between homerooms and bringing materials on a hallmark cart. This act deprives the FSL teacher of "privacy, board space, and

control over the organization of their classes" (Lapkin et al., 2009, p. 9). These issues can also have an impact on if and how these teachers might approach technology use in their practice (Smith, 2017).

Technology Integration in L2 Learning

Digital technology has become an essential component of L2 learning in both formal and informal spaces (Kessler, 2018). In this dissertation, technology/ies refers to the growing collection of devices, apps, online resources, tools, and so on that have rapidly proliferated in educational spaces over the past several decades. Technology, although frequently discussed as a singularity, "is not one thing but many things that can be woven into the instructional environment by a teacher to assist the teaching and learning process" (Lawless & Pellegrino, 2007, p. 578). Stemming from this understanding, phrases like 'technology integration' refer to the purposeful, (intra)active, and engaged use of these artifacts for/in/as educational experiences (Niess & Gillow-Wiles, 2017). In addition, I believe it is worth emphasizing that "technology is not ethically or politically neutral" (Weller, 2020, p. 188) – the diverse assortment and impact of what constitutes digital products already constrain and enable how and what is possible as they enter classroom activity. For example, I referred to Chromebooks, iPads, projectors, Wi-Fi, headphones, Scratch coding, emails, YouTube videos, PowerPoint presentations, and many more technologies over the course of the study.

Across domains and competencies, "integrating technology into L2 instruction has a large and positive effect on students' learning and achievement" (Chang & Hung, 2019, p. 12). For example, Larsen-Freeman and Anderson (2011) argued technology enhances language learning through "greater individualization, social interaction, reflection on language, and . . . greater student motivation" (p. 201). Additionally, Lawrence and colleagues (2020) identified access to authentic and varied materials, multimodal communication, and opportunities for learning outside the classroom as positive effects of technology implementation. Meta-analyses have shown that

specific language domains – such as reading, writing, listening, speaking, grammar, vocabulary, pronunciation. – can be improved by the use of technology-integrated pedagogies (Chang & Hung, 2019; Grgurović et al., 2013).

Of course, the reality of technology use in classrooms is not so straightforward. Although common discourse positions technology-integrated teaching as inherently more progressive and effective than 'traditional' methods (Sherman, 2021), this supposed binary requires substantial nuance (Tamim et al., 2011). Looking at the criteria above, while technology can enhance teaching and learning, any potential impact is affected by the multitude of devices, pedagogical approaches, students, purposes, attitudes, and supports at play (Levy, 2013). Issues of access, digital citizenship, distractions, technical issues, procedural skills, and many others make technology integration a complex undertaking (Kopcha, 2012; Tondeur et al., 2017). Since "technology inevitably affects language use" in the broader world (Chun et al., 2016, p. 65), teachers must be prepared to navigate this complex interplay in order to reflect the opportunities these tools afford (Lawrence, 2014).

Regardless of the tool, scholars contend that "the future of educational technologies is actually more about the teaching and learning in which the students are and will be engaged" (Niess, 2016, p. 133). That is, tools alone will not improve student learning; technology use is not an end unto itself (Marek & Wu, 2014). It has been long established that using technology does not mean that it is being adopted in a manner that supports improved teaching and learning (Krauskopf et al., 2012). Effective technology integration holds that the tools should be seamlessly integrated, provide a cognitive benefit, and facilitate a participatory, distributed learning process (Curwood, 2011; Stockwell, 2013). In the specific context of the language classroom, I use the term CALL (Computer-Assisted Language Learning) to reference the intersection of technologies, theories, pedagogies, and material processes that co-constitute language learning. While the field of CALL includes the design and creation of language

technologies, as well as the effects of these tools on language acquisition, this project draws upon work that intersects CALL and teacher education (e.g., Bangou, 2020). Helping teachers (re)envision, design, experiment, and engage with technology requires acting within the nexus of their practice (Cerratto Pargman & Jahnke, 2019). This experimentation requires a careful understanding of the opportunities and limitations of these tools, and how teachers can be supported in their journeys (Chun et al., 2016).

As Kopcha and colleagues (2020) noted, "teachers have more access to technology than ever yet continue to enact practices with technology that are largely teacher-centered," and reflect traditional lesson approaches (p. 730). Indeed, Canadian language classrooms do not seem to be adopting technology innovations with great success, and language teachers report ongoing struggles integrating technology effectively (Lawrence, 2014; Smith & Arnott, 2022; Turnbull & Lawrence, 2003). A disconcerting trend in the literature is the pervasive presence of challenges that were identified over 20 years ago (Murphy, 2002). This includes issues of access, time, and training (first-order barriers), and doubts, value judgments, and lack of confidence (second-order barriers) when using technology (Smith, 2017; Turnbull & Lawrence, 2003). Research highlights that language teachers' values and limited technical confidence may be incongruent with students' skills and expectations (S. K. Taylor, 2016), and that even motivated teachers can struggle to achieve their vision for technology-integrated language learning (Smith, 2017). These challenges may be different from generalist classroom literature (e.g., Kopcha et al., 2020), given the undervalued status of FSL (Faez, 2011), as first-order barriers may still be a fundamental challenge for language teachers despite the apparent ubiquity of devices in schools.

These concerns warrant explorations of these teachers' contexts and their experiences with technology and pedagogy, particularly given the unique contexts and needs of language classrooms. For example, both Arnott et al. (2019) and Cammarata et al. (2018) recognized a need for further research exploring the use of technology in FSL settings, despite earlier work

highlighting the importance of this field to language learning in Canada (Turnbull & Lawrence, 2003). In 2009, Lapkin and colleagues posited that "few studies have investigated the effectiveness of using technology in Core French settings" (p. 19); and decades later, this still rings true. Hence, there is a lack of research examining Canadian K-12 FSL teachers' understanding of how to use technology, and the ways in which stakeholders can support teachers in doing so. Since knowledge about technology "does not always translate into changes in teacher practice" (Mouza, 2009, p. 1199), there is a need for classroom-based research designs to investigate teacher professional learning (Kopcha, 2012; MacDonald, 2008).

Teacher Professional Learning

Studying teachers' understandings of their practice requires engaging with structures and processes related to how they think, learn, and do their professional work (Fenwick, 2012, 2014). In recent years, discussions of teachers' professional growth have shifted from conceptualizations of 'continued professional development' to 'continuing professional learning.' Situating professional inquiry as part of everyday work and exploring new knowledge practices are central to this orientation (Fenwick, 2012). This orientation of professional learning "implies an internal process in which individuals create professional knowledge through interaction with this information in a way that challenges previous assumptions and creates new meanings" (Timperley, 2015, p. 797), which translates into changes in practice. Indeed, professional learning literature often draws upon cognition-based terminology – e.g., beliefs, attitudes, experiences, perceptions – to help understand the complexities of the brain, behaviour, and bodies in motion (Borg, 2015). For example, Viswanathan (2019) drew upon these terms to understand FSL teacher practice, and Lawrence (2014) highlighted the role of beliefs in language teacher technology integration. However, sociomaterial theories reposition this claimed internalization of knowledge. In these perspectives, professional knowing is not a contained unit to be transmitted and absorbed into individual cognition, but a continual (re)negotiation and (re)creation of

sociomaterial worlds in the flow between entities (bodies, texts, etc.; Fenwick, 2014). Teacher professional learning is therefore not a linear progression, but rather circulations and entanglements with different actors and knowing-practices (Beighton, 2013; Rice, 2021). For example, working with technology, as described above, can be seen as an ongoing experimentation where educators must "continue to try, to experiment at the edges of their own socio-material worlds of practice, to improvise and to 'tinker'" (Fenwick, 2014, p. 275). Tinkering in this sense is not a superficial or amateurish dally, but a spirited commitment to "continuous, and sometimes significant" change in their professional practice and competence (Fenwick, 2014, p. 275).

Exploring the unexpected therefore requires an impromptu choreography of actors, entities, and often other practitioners, which adds to the list of challenges delaying the normalization of technology use (Levy, 2013). There is a growing focus on the ways in which groups of teachers learn in collaboration, and how these improve that community's "capacity to perform work in ways that are informed, guided by and validated against shared knowledge and established conventions for practice" (Dania, 2024; Fenwick, 2012, p. 3). Indeed, recent work investigating teacher professional learning related to the Maker movement reinforced the importance of shared knowledge, collaboration, reflection, and identity development (Cotnam-Kappel et al., 2022). These goals become the markers for becoming-professional, together in a group, constantly shifting to intra-act (Barad, 2007) in ways that reflect changing notions of professionalism, rather than reaching a singular point of being *a* professional (Gale et al., 2013). This thinking may reflect sociomaterial framings.

Theoretical Framework – Sociomaterialism

Comprised of a heterogenous, interconnected, blurry, and cross-pollinating set of theories, sociomaterialism is one term for theories which bring attention to the lively, entangled relations of actors that shape the world's becoming (Hultin, 2019). These theories share a

fundamental interest in the complex ties among human and nonhuman entities, and how "both material and social forces are mutually implicated in bringing forth everyday activities" (Fenwick, 2014, p. 47). Sociomaterial research attunes to this unpredictable space, which offered possibilities for my doctoral study. These approaches posit that classrooms, language, and technology are complex dynamic systems, and that teaching and learning are vibrant, embodied, and unpredictable processes (e.g., Verspoor, 2017). Indeed, studies have already begun taking up sociomaterial approaches in such fields and intersections as:

- L2 education (Dagenais, 2019; Larsen-Freeman, 2017; Waterhouse, 2012);
- Professional learning (Fenwick et al., 2012; McMurtry et al., 2016; Mulcahy, 2014);
- Teacher education (Bangou, 2020; Beighton, 2013; Keay et al., 2019); and
- Technology integration (Cerratto Pargman & Jahnke, 2019; Marek & Wu, 2014; Matthews, 2019).

These studies not only recognize the complexity of teaching and learning spaces, and the social and material elements that co-constitute them, but they note the importance of orienting teachers to the potentialities, convergences, and the immanent becomings that grow with the initial conditions of classrooms (Davis & Sumara, 2005a; Fenwick, 2014).

Sociomaterialism is informed by posthumanism, a theoretical orientation which (re)frames the relationships and entanglements among human and nonhuman objects (McGregor, 2014). Posthumanist orientations argue that we should no longer position humans as autonomous, detached beings that are distinct from the technologies, forces, and environments in which humans are – and have always been – entangled (Adams & Thompson, 2016). While sociomaterialism certainly does not ignore the human, it decentres the human in analysis and breaks down the boundaries among the human and its co-constitutive elements. As Fenwick and Edwards (2013) note, "the point is to insist upon recognizing important influences in assemblages as emanating from nature, technology, objects and all manner of quarks, which may overlap and

infuse what is human" (p. 58). This reflects a relational ontology, in which entities (re)form and distinguish their qualities only in relation to other beings (Adams & Thompson, 2016). A relational approach similarly contests the view of objects, particularly humans, as discrete actors without acknowledging the other objects that become along with them.

Sociomaterial theories also follow non-representational logic, eschewing the assumption that our experience of the world can be captured through representations. As we engage in the world, our partialities and varying positions create unique entries into knowing events that cannot be transmitted or replicated between knowers – nor can language, separate from its materiality, be used to represent it (St. Pierre, 2013). This perspective "challenges assumptions that a subject is separable from an object, or a knower from the thing that is known …. Matter and meaning are taken to be interwoven" (Fenwick & Edwards 2013, p. 52). This is particularly relevant for studies of education, as the field is often "representational in its assumptions and practices, focused on the development of the human subject and their cognitive acquisition of ideas" (Fenwick & Edwards 2013, pp. 52-53). Indeed, being and knowing are reciprocal entanglements in this flattened onto-epistemology (St. Pierre, 2013) – knowing, being, and doing are entwined (Lenters & McDermott, 2019b). A central focus of non-representational theory is not what an entity *is*, or what we can *know* about it, but what it *does* (Zembylas, 2017). When things are no longer passive, waiting for human interpretation and use, we are pushed to consider the potential for (intra)action and desire produced by bodies in assemblages. The shift reflects the Deleuzian question – 'how do things work?' – and the realities that take shape as a result of these entanglements (Masny, 2014). As described later in this paper, if education is no longer a matter of (re)presenting knowledge to human subjects, teachers must look beyond pedagogies which separate the body and mind, and language from materiality, to see what is produced in learning encounters (Lenters & McDermott, 2019a).

As a result, teaching and learning become knowledge- and meaning-making practices which emerge among the embodied sociality and materiality of doing and being (Mulcahy, 2012, 2014). By entangling meaning and matter, teaching and learning practices are situated within assemblages in motion (Fenwick et al., 2011); learning comprises actors, affects, and forces in the given moment, yet "simultaneously enacts both a present activity, a past for un- and re-learning, and a deferred future, a future of imagined ideals as well as fearful anxieties" (Fenwick & Edwards, 2010, p. 167). Learning involves uncertainty and disjuncture, as well as the multiplicity, potentiality, and capacity of actors (Mulcahy, 2014). Both are similarly affective acts (Lenters & McDermott, 2019b; Toohey, 2019). These performative knowledge practices (Mulcahy, 2012) are produced through intra-activity and co-engagement (Barad, 2007), they are relational and "inseparable from coming-to-being" (Higgins, 2016, p. 188). By attending to the moment-to-moment becomings in these spaces and the affective potential of bodies (Zembylas, 2017), educators are tasked to work with learners "as they appear to be, not as they should be" (Beighton, 2013, p. 1299). The focus for teaching, then, might be framed as understanding how the characteristics of different knowledge practices impact both the material and expressive experience of becoming (Hultin, 2019).

In educational research, sociomaterialism foregrounds materiality and the socio-technical nature of all networks (Kaghan & Bowker, 2001); no system is constituted by humans alone. A strength of this framework is its focus on empirical work, and it is therefore oriented to methodological needs and practice-based analysis (Müller & Schurr, 2016). For instance, ANT prompts researchers to explore but also critique networks: to see the structures, routines, and materials, but "resist falling back on presuppositions about rationally designed and functionally optimized systems" (Kaghan & Bowker, 2001, p. 259). Therefore, what a network does is not bound to established, transferable rules and patterns of what 'should' be. By following the actors,

researchers can trace the networks and relations that produce effects in educational contexts as they evolve and translate (Fenwick et al., 2011).

Of course, research shapes the knowledge it produces, and is indeed specifically designed to do so (Jackson & Mazzei, 2017). Researchers therefore enter into assemblages 'all at once,' and cannot exist as detached, passive observers of the world. In educational research, sociomaterial theory guides scholars to explore the material actors, and their multiplicity of expressions, as well as the movements and disruptions that occur within the assemblage (Beighton, 2013). The actors in assemblages can easily cross structures and scales which other theories might separate into 'micro' and 'macro' level systems (N. J. Fox & Alldred, 2015). This alternative view of space and distance highlights that participants in an assemblage do not need to reside within a similar 'level' in order to be brought into relation (DeLanda, 2016). Furthermore, "unpredictability, contingency, or indeterminacy" are central to working with(in) assemblages (Lenters & McDermott, 2019a, p. 4). Educational researchers must therefore be prepared to live within the messiness and unfolding, rather than attempting to bring order and neat explanation to assembled beings (Bangou, 2020; Beighton, 2013).

Before continuing into specific theories which informed the onto-epistemo-methodology, I present a handful of fundamental concepts that have been used throughout the dissertation. Although these terms may be defined in the articles, I present some here – and more in the glossary in Appendix C – to support readers in engaging with this document.

Affect

Unlike lay understandings of the term, which might refer just to an emotional response or a unidirectional exertion of influence, in sociomaterial writing affect is an emergent capacity (Massumi, 2015). Affect positions how an entity is able to move and intra-act in relation to others; as Ash (2015) notes, "affects travel across and through material environments. In doing

so, affects are translated as they meet and are transformed by the material thresholds of objects" (p. 16).

Put simply, affect is the changing potential of something to transform (i.e., affect) and be transformed (i.e., be affected) in contact with other bodies. What an affect does is not pre-established. Thus, in contrast with traditional definitions of agency, affect positions not just what a thing can do, but what it can undergo, emphasizing production in the moment rather than an enduring trait (N. J. Fox & Alldred, 2015).

Assemblage

A Deleuzian concept, called *agencement* in French, the assemblage is a temporary, non-hierarchical, heterogeneous, dynamic grouping of elements (Gurney & Demuro, 2022). The assemblage centers relations, with the implication that they could (have) become otherwise. The assemblage differs from a quilt, which is a patchwork of discrete elements that form a whole, assemblages are understood through the coming together of human and non-human components for a period of time that creates new functions through the transformations of its constitutive components (Gurney & Demuro, 2022; Strom & Martin, 2022). An assemblage is always more than the sum of its moving parts.

An assemblage is not just the material bodies or entities (i.e., the machinic), but also the acts, transformations, and expressions which give it certain qualities (i.e., the enunciation; Deleuze & Guattari, 1987). In addition, another axis of qualities (i.e., the intensive) implicates the forces of de/re/territorialization which characterize those movements.

Though they share many similarities (e.g., Adams & Thompson, 2016), assemblages differ from actor-networks in their metaphysical positioning. The network is usually taken to be both real and actual, while the assemblage is virtual with actual affects; the network 'exists' and lingers in the material world in a way that the assemblage cannot. For more on that, I refer readers to sources like Latour (1996) and Buchanan (2017).

Becoming

In Deleuze and Guattari's writing, becoming takes on the meaning of constant, untimely, and unpredictable acts of transformation. Unlike 'being,' which is traditionally used to indicate a stable and enduring state, becoming "is never to imitate, not to 'do like', nor to conform to a model . . . There is no terminus from which you set out, none which you arrive at or which you ought to arrive at" (Deleuze & Parnet, 1987, p. 20). Things are never in stasis, but rather in an ongoing unfolding without end; things are always in-between, becoming what they are not (Waterhouse, 2012). Becoming highlights the process of coming-into-being, rather than the 'state' of being (Vasilopoulos, 2021).

In research, becoming disrupts the possibility of transcendent and reproducible methods or practices as becoming is always singularized (Deleuze, 1997). If what things become is unknown, we cannot take predictability and stabilization as a start or end of research processes (Jackson & Mazzei, 2012). I elaborate on this concept more below and in Article 2 (Smith, under review).

Intra-Action

Originating in the work of Karen Barad (2007), intra-action is used in place of the more common "interaction" in order to reflect the entanglement of bodies and agency in sociomaterialist thinking.

The prefix inter- presupposes the existence of individual entities, and acts occurring "between" separable beings, rather than emerging as a result of those confluences where the boundaries of objects are blurred (Barad, 2007). Underpinning the term is the understanding that all bodies are defined by their relations, rather than being considered discrete or autonomous, challenging the taken-for-granted perceptions of what 'bounds' a body (Adams & Thompson, 2016). For example, a teacher's positionality would be formed among the many elements that circulate in their professional context: discursive and material forces and bodies intra-act recursively to jointly produce what this teacher can do, a plurality which emerges among

elements traditionally situated either "in" or "beyond" the teacher's body, agency, etc. (Strom & Martin, 2022).

Actor Network Theory

Though briefly described in both Smith (2024) and Smith (submitted), Actor Network Theory (ANT) has entered the sociomaterial arena as a theoretical/methodological approach which "highlights the elaborate intertwining of human/non-human elements, and the non-linear simultaneous dynamics and conditions which produce emergence" in our world (Fenwick & Edwards, 2013, p. 56). I most prominently engaged the approach elaborated by Fenwick, Edwards, Mulcahy, and other scholars, which develops ANT with complexity, assemblage theory, Deleuzian philosophy, and other sociomaterial tributaries in the context of education and other professional fields. These scholars, and others whose post-millennium scholarship is sometimes known as after-ANT, recognize human and material practices as emergent and distributed in ways which were not as fully developed in the works of ANT progenitors. They similarly engage terms and approaches which reflect this orientation, and reject others, from the traditional ANT[3] canon, and allow for multiple lived realities, partialities, and dynamic understandings (Fenwick & Edwards, 2010). Likewise, as Adams and Thompson (2016) elaborated, human-technology intra-action is conceptualized as inseparable in these specific forms of ANT, as opposed to more humanistic approaches which might have ontologically divided entities as person plus machine.

In education, ANT brings attention to how teacher and student practices emerge in assembled classroom spaces, among the movements, (re-, de-) stabilisations, and materials that are co-producing this becoming. Following the actors traces the multiple participants, flows, and

[3] Briefly, traditional ANT was criticized for representing the most forceful actors in a totalizing network, with limited recognition of the fluidity of weaker connections, partialities, or multiplicities which may challenge those singular understandings (Fenwick, 2011; Fenwick & Edwards, 2010). As an example, Callon's (1984) four moments of translation are generally referenced in historical notes rather than as a contemporary understanding of translation.

forces that are entangled in performing educational activities into being: bodies, digital devices, lesson plans, etc. (Fenwick et al., 2012). By positioning actors as network-effects, rather than independent units, ANT shifts the focus of research towards seeing how "learning takes place between people and their technologies; that knowledge changes hands through interactions between people and their material technologies and is embodied in mechanical devices and in social practices which are networked together acting as one" (S. Fox, 2009, pp. 34–35).

In sociomaterial and compatible theories, knowledge cannot be understood as contained units of information that can be transmitted between actors. Rather, as in complexity theory, knowing is a negotiated, contextualized intra-action (Davis & Sumara, 1997; Fenwick, 2014). Our knowing practices are extended and distributed through actor-networks, and are a relational activity of mind, body, and world (Atkinson, 2011). As knowing acts are built among bodies and activities, they become constituted as practices, circulating and evolving within and across professional contexts (Cerratto Pargman, 2019). Materiality plays a fundamental role in "inviting, prohibiting, and regulating cross-practice relations, as well as in anchoring or softening and sometimes opening boundaries. Important knowledge becomes materialised and mobilised through bodies, substances, settings, and devices" (Fenwick, 2014, p. 278). Since the material landscape of classrooms includes digital technologies, these insights can bring attention to the confluence of entities that exist for different actors completing the same tasks.

Sociomaterial perspectives assert that technology cannot be positioned as "just another tool" in the classroom and in our lives. Adams and Thompson (2016) noted that "our most primal relation with technology is embodiment" (p. 59). Technology is not an inert container waiting to be acted upon, nor does it exist separately from the teaching and learning practices which unfold in educational contexts (Thorpe, 2009). Indeed, Sherman (2021) emphasized that "the capacity of technologies to transform and be transformed is affected in and through relations between multitudes of human and material elements within classroom assemblages" (p. 375). By

purposefully focusing on technologies as actors in the assemblage – seeing the harmony and dissonance, the disruptions and the innovations – researchers and educators can better understand how technologies help and limit learning experiences (Cerratto Pargman & Jahnke, 2019). While ANT research has explored technology integration from a sociomaterial perspective in similar contexts – such as Dagenais et al.'s (2017) work in Canadian Francophone and ESL classrooms – FSL research remains underrepresented.

As I discuss throughout this dissertation, there are incongruences, tensions, and nuances between these approaches which can influence what can be coherently thought with(in) the intersections of these theories. For example, a close examination of Baradian and Deleuzian thinking highlights that entanglement and assemblage will necessarily differ in their philosophical framing (see Hein, 2016); the same is true of networks and assemblages (Müller & Schurr, 2016), becoming and emergence (Protevi, 2006; Weinbaum, 2015), translation and assemblage (Fenwick & Edwards, 2010), and more beyond. By taking different theoretical lines into the three articles, I moved with vocabulary more common or established in those traditions. A document like this however forces me to face how my desire to put concepts to work has led me to see them as more synonymous than perhaps I should in communicating a theoretical framework. As Rosiek and Pratt (2024) noted, "each analytical move entails material-discursive trade-offs whose implications complicate or preclude other analytical moves" (p. 205). Yet, with this entwining of multiple orientations, I hoped to achieve what Müller and Schurr (2016) described as "a careful synthesis rather than an indiscriminate mixing" (p. 218) of these approaches, a cross-fertilisation that allowed the theories to produce new thinking.

Methodology

In sociomaterial studies, researchers take on "attitude of mindful participation" (Davis & Sumara, 2005b, p. 462), attending and responding to the emerging classroom ecology. In brief, a research-assemblage should attend to entities and affect flows, consider how these affects draw

the material and the social into assemblage (N. J. Fox & Alldred, 2022); they "explore the movements of territorialisation and de-territorialisation, aggregation and disaggregation within the assemblages studied, and the consequent affect economies and micropolitics these movements reveal" (N. J. Fox & Alldred, 2015, p. 406). In other words, while educational researchers can be participant-actors in the classroom, we must also attend to the affective flows and emergence of activity in the classroom space. These approaches are well-positioned to investigate how teachers, technology, and other actors mobilize to accomplish their goals in the classroom, and what is produced during that process (S. Fox, 2000).

Sociomaterial data collection focuses on locating actors within their networks, exploring how they affect and are affected by one another, and understanding what these affective flows produce (N. J. Fox & Alldred, 2015). Data becomes "multiplicitous . . . not dependent on being stabilized or known in an onto-epistemic project of qualitative research 'interpretation' and 'analysis'" (Jackson & Mazzei, 2012, p. 114); data cannot be collected and separated from context as if they are independent objects (Beighton, 2013). Actor-networks are therefore mapped through 'data' events, only ever partially actualized through the tools and methods employed in the research process. I used Adams and Thompson's (2016) eight heuristics to guide data collection and analysis processes. For instance, I used their prompts as questions for my interviews and discussions with participants, and in my reflection notes to consider new lines of analysis. Heuristics, being less prescriptive than methods (Adams & Thompson, 2016), made the connection with an action research framework smoother.

Action Research

Action research (AR) theories and methodology have already been 'plugged into,' to use Jackson and Mazzei's (2012) term, by different sociomaterialist scholars in education and beyond (e.g., Gale et al., 2013; Gunnarsson, 2018; Piovesan, 2022). According to these studies, AR supports working with the unpredictability, multiplicities, and materiality that are central to a

performative ontology (Fenwick & Edwards, 2013). The participatory orientation and engaged design also lend AR to flattening traditional hierarchies and dichotomies between 'researcher' and 'researched,' 'person' and 'professional,' 'knowledge' and 'action,' 'research' and 'practice' (Fenwick, 2014; Gunnarsson, 2018). Particularly relevant to this study, AR "promotes new becomings" when investigating professional intra-action (Gale et al., 2013, p. 550). When discussing professional learning from a sociomaterial perspective, AR will shift to emphasize intra-acting and becoming-professional rather than 'building' knowledge or a repertoire within an independent subject. While human agency is foregrounded in the work of AR, these boundaries are dissolved in order to recognize the other actors and materialities in the action research assemblage (Gale et al., 2013). Work at this epistemological nexus also challenges the linear development of participants from 'lesser' to 'greater' knowing, common in some forms of conventional AR, and instead promotes "living in and with the unpredictabilities of responsiveness, of affective, evaluative and intuitive practisings, in relation to our research participants" (Gale et al., 2013, p. 561). Piovesan (2022) further noted that both AR and sociomaterial works knowingly produce partial, context-embedded learnings, and emphasize transparency and pluralistic accounts of the dataset. What, then, is AR? Or, what does AR do?

As I note in Article 1 (Smith, 2024), epistemologically, AR has been theorized and enacted with complexity theory (Davis & Sumara, 2005b; Phelps & Graham, 2010), as well as Deleuzian/sociomaterial thinking (Gale et al., 2013; Gunnarsson, 2018). Although research at the intersection of ANT and AR has been explored in fields such as management (see Piovesan, 2022), this combination has not been as commonly considered in educational studies. While much of the logistical and organizational framework of AR remains the same, the onto-epistemological conceptualization shifts to bring attention to materialities as well, and understandings of teacher learning become a "performative knowledge practice constituted and enacted by people and tools in complex collectives or assemblages" (Mulcahy, 2012, p. 133). By

recognizing the multiple actors that co-produce teacher learning and practice (and like sociomaterial AR, challenging technical-rational ideals for standardizing or imparting bounded knowledge about teachers' work in professional learning), this orientation provides openings to explore how and what this practice produces. Interrupting this flow, however, is a tension between AR and ANT methodologies – while ANT researchers may step aside to allow the actor-networks to unfold, action researchers are more directly involved in co-facilitating and co-designing within the research context. Research at this intersection must therefore navigate issues of control by contributing as one voice in the collaborative project, neither dictator nor passive observer, yet also take note of the many actors that contribute to the emergence of the project over time (Piovesan, 2022). The need for such a 'both-and' positionality is expected in sociomaterial work (Hultin, 2019; Lenters & McDermott, 2019b).

Empirical Entry Points

Many of the empirical processes in the study are presented in Smith (2024), given the focus on the way in which the methodology was actualized and became-different over the course of the study. As summarized in Table 1, I worked with five elementary FSL teachers in an Ontario school board over the course of the 2022-23 school year. As a contextual note, the 2022-23 school year was the first 'normal' one after several turbulent years responding to the COVID-19 pandemic (see Smith & Arnott, 2022). Though the pandemic and its myriad influences were far from over, the classrooms I observed were entirely in-person.

Table 1

Participant Overview

Name	Gender	Years of experience	Grade assignment	Delivery	FSL colleagues in school	Study participation
Aaron	M	12	1-8	Cart	Yes – same grades	Sep-Jun
Freya	F	6	1-8	Cart	No	Sep-Oct

Grace	F	8	1-8	Cart	Yes – same grades, part time	Jan-Jun
Peter	M	5	5-8	Cart	No	Jan-Jun
Vicky	F	10	1-6	Classroom	Yes – different grades	Sep-Jun

Note. All names in the document are pseudonyms.

Teacher participants were recruited with the support of the board's FSL coordinator, who distributed my call via email. I began with three teachers (Aaron, Vicky, and Freya), with Freya dropping out soon after. I continued with the two remaining teachers, meeting with them separately, until the December break. At the start of 2023, I recruited two new teachers (Grace and Peter), who participated until the end. Each participant worked in a different school. While some of these participants had FSL colleagues in their schools, I was not able to persuade them into joining the study. I elaborate on the specific data methods below.

Lesson Co-Design

Working with the teachers in-person and asynchronously via Google Drive, we created lesson plans which would be enacted in the later weeks loosely following an Action Research cycle (see Article 1). These lessons emerged from the overall direction the teacher had for their units, our collective knowledge of existing and alternative resources, and wonderings around what might occur as we tried new approaches with the students. Some lessons were more influenced by the participant (such as the art lesson which Aaron first developed, see Article 2), some by me (the Scratch lesson with Vicky, see Article 3), and others in-between. The later arrival of Paul and Grace meant certain lessons and unit ideas were able to be adapted and tried in a different context. The vignettes are thus inspired by the mashup of utterances, events, and movements between the different classes, as the same lesson structure and activities produced similarities and differences. Sometimes these are shown through their contrast (Vignette 2 in

Article 2) or melded into a hybrid scene (Vignette 2 in Article 3) in the hopes of (re)producing certain affects.

Observation

Classroom observations began in October 2022 (given the chaotic realities of September 'back to school') and continued through June 2023. According to Borg (2019), observation is a fundamental means for understanding change in language teachers' practice. How participants experienced their practice was central to this study, and observation provided opportunities to contextualize and understand the dynamics and emergent nature of their professional practice in its spatiotemporal setting. This process included taking note of the sociomaterial conditions of the classroom environment (audio or video recordings were not permitted, though these would have been welcome data-actors for [re]entering these scenes). I visited each teacher's classroom, on average, two to four times each month, usually for a full day each time. I prioritized observing days in which the co-planned lessons were being implemented, but also observed other lessons planned by the teacher.

Artifacts

I collected a variety of artifacts from the teachers and their classrooms. In addition to the materials related to the lesson co-design described above, I took copies and/or made notes about draft teacher-made materials (e.g., worksheets, seating arrangements, PowerPoint presentations, anchor charts), anonymized exemplars, as well as commonly used pre-made materials (e.g., textbooks, websites). I included digital elements like emails, text messages, or other traces of online activity, such as the Google Drive, which I discuss more thoroughly in Article 1.

The artifacts played varying roles in the research assemblage, for example, they were another source of (re)entry into the classrooms beyond my and the teachers' recollections, prompts for wondering and discussion with the teachers around what could be, and another data-actor that (were) produced (by) affects at play in the world. The artifacts were particularly

important for orienting me to what the students produced that I did not or could not see, or perhaps showed different possibilities than what I recalled, given that I could not engage the students more directly in my data collection.

Thinking with student work creations during the Scratch scene is one notable example. As I note in Article 3, the students' unprompted use of French in the multimodal compositions following the meows caught me and the teacher by surprise. Conceptually, these files prompted me to think about the students' becoming and the power of the 'meow' interruption. Pedagogically, the teacher was interested in what terms and phrases the students decided to include, and what resources they used to produce those additions. Both unexpected lines emerged from engaging the lesson artifacts with new thoughts.

Interviews

I completed individual, semi-structured interviews with participants, excluding Freya, over the course of the year (see Appendix B for the protocols). With Vicky and Aaron, I completed three interviews (one around December 2022, one in April 2023, and the last in June/July 2023 as participants were available). Peter completed two interviews (the winter and summer ones), while Grace only completed the winter interview. The interviews were intended to provide more focused, deeper explorations of the teachers' beliefs, practices, and the connections among the elements within the research assemblage. I referred to prior observations, particular lessons, interactions, or meetings as the impetus for the discussions; moments that seemed particularly vibrant in terms of teaching with technology (e.g., times of tension, surprise, joy) were commonly referenced. The interviews also brought unexpected paths forward as teachers articulated different interests, suggestions, or wonderings as they thought through their practice in combination with the research questions.

The questions were intended to reflect the sociomaterial orientation to what things 'do,' how entities are interconnected, and how practice is co-produced. For instance, I asked what

teaching with technology *does* to better implicate intra-action than asking *why* technology is important. The interview (and observation) protocols were developed in light of questions and wondering outlined in sociomaterial books and articles (e.g., Adams & Thompson, 2016). Some parts of the interviews were emergent, off-the-cuff responses to the happenings in those moments or specific to events with that teacher. The aim, again, was not to use the teachers' responses to (re)present what was unfolding in the classrooms, but to use their insights as insider sources which might prompt me to notice and think differently (N. J. Fox & Alldred, 2015, 2021).

Research Field Notes

As previously noted, AR brings the researcher actively into the research process. My notes were used to document reflections, wonderings, and thoughts throughout the project. They sometimes traced the flows of people and materials over time, caught utterances, described the environment, depicted routine and unexpected happenings, or followed the outcomes of 'bumps' that demanded attention in the space (Mills, 2014; Waterhouse, 2021). I began by formally audio recording my thoughts at home in a think-aloud reflection after each data event (e.g., interview, observation), discussing both the logistical and affective outcomes of the project. I kept this up through December, before switching to more point-form written reflections in the latter half of the study.

Some of these notes included sketching and refining actor network mappings. Mapping an actor-network requires both identifying the complexities of the actors, intra-actions, locations, events, and flows, as well as looking for spaces of contingency, unpredictability, and disruption (Matthews, 2019). By spatially diagramming the materialities, affect, and emergent connections, the entities are constituted by the "potential of their relations to other[s]" (Leander & Rowe, 2006, p. 440). These maps supported analysis of action and how the unfolding of these experiences in these assemblages produced new developments. These maps were developed

alongside the vignettes (described later) and were included in all three articles as points of entry into the data.

Professional Learning Community

As previously mentioned, this study was originally designed to include a Professional Learning Community (PLC), in which all participants would regularly meet and intra-act around questions and experiences of their practice (Rubin et al., 2021). This was not actualized as envisioned (as I describe in Article 1). However, even in the dyad formation, I tried to open spaces where I was learning from and with each teacher, and find spaces where I might be a 'professional troublemaker' and collegial contributor in their contexts. By this, I mean that I was interested in opportunities where I might bring their attention to contentious, potentially taken-for-granted, or unexpected aspects of their practice or school conditions. See, for example, vignette two in Article 2, or scene two in Article 3. By raising question(s) around their decisions, I prompted the teachers to further explain their reasoning, and perhaps to (re)consider alternative approaches.

(Re)Thinking Methods and Concepts

Zigzagging again through these thoughts, I interrupt this flow to emphasize that while I present methods more traditionally in this section, it is important to note that these methods were not static, pre-determined implementations. How these activities were actualized was a shifting and negotiated emergence, in relation to thought and practice (Taguchi & St. Pierre, 2017). The impossibility of using traditional, humanist, qualitative methods and methodology alongside sociomaterial or Deleuzian(-inspired) non-method (Masny, 2016) or anti-methodology (Koro-Ljungberg, 2016) is well established. As St. Pierre (2017) elaborated, "we can't just drop a DeleuzoGuattarian concept like rhizome or assemblage—which brings along with it their entire transcendental empiricism—into a study grounded in a humanist ontology" (p. 1087). These concepts and practices necessarily change as they collide; the functions of the methods and

concepts I described above evolved through the experimentation, creating new from the middle of the terminologies and traditions that accompany them (St. Pierre, 2017). I return to this 'stepping between' in the final chapter.

When putting the different theories to work in combination with these methods, I considered how the differences oriented me to certain aspects of the data and process that is called methodology. In ANT, the methods are sensibilities or interventions to sense, trace, and engage practices and objects within their networks. In contrast to Deleuzian approaches, ANT may stay closer to established methods, though there are scholars who consider such approaches to be inappropriate for the theory (see Fenwick & Edwards, 2010). While ANT tends to occupy itself with the actual, I turned to Deleuzian-inspired non-methods to consider what else was occurring in these spaces. In rhizoanalysis, the purpose is to re/dis/assemble what was and what could become (Masny, 2014); to think with the methods in order to produce different tellings to connect into, question, discuss, and explore the cartography to respond to the project inquiry. In short, shaping my use of method was the desire to:

- Attune to particular practices and their materialities;
- Articulate what was (not) chosen to be followed, and how it was done;
- Consider complexity and myriad pathways that may go beyond taken-for-granted or 'common sense' interpretations of events;
- Reflexively document and engage my position and thoughts as integral to the understandings that were produced.

What emerged is taken up within the three articles.

Data Analysis

My analysis explored the unfolding experiences and transforming practice, as presented during the individual interviews and in the classroom. As Toma (2006) noted, emergent data analysis processes occur simultaneously with data collection, informed by the data and unfolding of the project. Thus, rather than suggesting a 'linear' progression through the research stages (i.e., data collection, then analysis, then synthesis), cycling back, reframing, modifying, and

improvising became part of the project (Leavy, 2014). This design echoed common techniques in AR that interweave data collection, analysis, and reflection throughout (Kemmis et al., 2014).

As mentioned in the previous section on mappings, studies have employed topographical diagrams of data events to support analysis of the connections, disruptions, movements, and relationships among actors (Adams & Thompson, 2016; Leander & Rowe, 2006; Masny, 2014). The relations in these diagrams may be temporary or enduring; accompanied by a strong or weak emotional affect; intricately connected to a wide ecosystem or highly localized; with individual actors or with aggregated groups (Potts, 2008). In contrast with social network analyses, these maps were not created to demonstrate "what or who is connected to something else . . . [rather] what affect is produced and what kinds of becomings ensue . . . as they move through space and time" (Lenters, 2016, pp. 291–292).

For instance, when drafting the second mapping (Figure 3) in Article 1, I began by thinking about the connections and tensions between the collaborative sharing that was possible with the Google Drive and the participants' emphasis on their daily planning. The desire was to produce resources, which inspired the teachers to begin writing to each other using the functions of the platform (i.e., comments, track changes, uploads, hyperlinks). However, the difficulty of that generative process may have been redirected by the time and energy required to collaboratively design new lesson ideas. I then began drawing these rhizomatic connections among the components, adding snippets from the interviews which seemed to provide further detail about the participants' thinking. I also considered how the recent COVID-19 pandemic, and the move to emergency remote teaching, may have also played a role in this shift. While this connection was not expressed consciously by the participants, the Google Doc comments (e.g., "I could use this tomorrow") reminded me of similar sentiments expressed by FSL teachers about teaching online (see Smith & Arnott, 2022). Since creating something together seemed daunting, disrupting the original purpose of the document, these influences contributed to the

transformation of the online space into the more familiar exchange of existing resources. Thus, navigating these flows shaped how these teachers become-professional and how they (might) collaborate in digital spaces.

Likewise, Figure One in Article 3 presents snippets of conversation I transcribed while observing the class working on their Scratch[4] projects. Beginning with my notes, I noticed that the segments of human speech were interrupted and distanced by the text noting the meow sounds (see the shortened excerpt from my research notes below).

> *I'm trying to get the character to go like this*
>
> *MEOW*
>
> *Actually no, it's kinda-*
>
> *MEOW*
>
> *I did it wrong again*
>
> *Wait, how did you do it like- MEOW MEOW*
>
> *I'll do it for you*
>
> *No!*
>
> *I mean like how does it-*
>
> *You gotta MEOW save it*
>
> *How did you do it like that? How do I do-*
>
> *MEOW*
>
> *MEOW*
>
> *MEOW*
>
> *MEOW*
>
> *Look how fast I'm going!*

[4] As a brief preamble, Scratch is a visual coding program that has become popular in schools. The program features a hallmark orange cat sprite. A meow sound is easily accessible in the tool as part of the code blocks, as evidenced by this scene. See Article 3.

Woah! Woah!

Taking the meows as the starting point for the map, I traced some 'paths' of conversation through the interjections. Connecting those moments to what emerged later in the activity, I added elements that were included in the Scratch projects that became possible after the teacher's utterance. I attempted to decentre the chronological, dialogic arrangement of these productions, and highlight the messy simultaneity of these moments and pathways. Many other paths were cut from the scene, and each path could be the focus of further analysis – a way to (re)engage the data in this study.

Sociomaterial research often provides data and analysis in forms that readers might enter into, rather than aiming to provide conclusive, generalizable findings (Sherman, 2021). One common technique is presenting anecdotes through vignettes (e.g., Bangou & Vasilopoulos, 2023; Masny, 2014). These sketches "do more than retell stories about things and relations of practice. They themselves are performative assemblages and (re)creations that reassemble, resemble, resonate, move, animate, fold and unfold" (Adams & Thompson, 2016, p. 31). A vignette might follow actor(s) in a scenario, emphasize contrast or becoming over time, or highlight connections with theories and concepts. As such, a vignette presents "points of entry into experimentations in contact with the real as actualized by the vignettes" (Bangou, 2020, p. 186). These affective connections and circulations take the place of codified thematic trends to disrupt what can be a highly standardized, cut-and-dried procedure to scholarly research and writing (Kuby & Christ, 2020).

Sociomaterial analysis must acknowledge human and nonhuman actors, explore affective forces and relations, and investigate the "capacities produced in bodies, collectivities, and other relations in assemblages" (N. J. Fox & Alldred, 2015, p. 409). This analysis must also de-centre human consciousness, agency, and spoken/written language as the fundamental source of understanding (MacLure, 2013). By acknowledging bodies, affect, and the materiality of research

and practice, what is *produced* supersedes what things *mean* to the human experience alone. Thus, the materials I engage as part of the research-assemblage (N. J. Fox & Alldred, 2015) helped me to "reassemble" the classroom activities and related events (Bhatt & De Roock, 2013) and inspired me to think (differently) about technology integration in Core French.

The data undoubtedly also affected me as the researcher, and I continued to affect the data through the tools, analysis software, and composition of presentations, articles, and other disseminations. Indeed, my own becomings with technology, FSL, AR, sociomaterial theories, and educational research are implicated and offered up throughout this dissertation. Below, I consider how these analyses actualized in the writing of the three articles.

Article 1 – Smith (2024)

The writing of Article 1 was inspired by my struggles to make sense of the data when collided with the AR model. During the turbulent start to my project, I was faced with the question of whether what I was doing was "still" AR. It did not look like the commonly cited, unidirectional, tame spiral diagrams of plan-act-reflect. Would this unfolding "count" when I analyze and submit it? Should I try and "force" the teachers into the sequential steps? Should I only present the data that fit the model and move on? No, that would not sit right with me. Ibid for finding a new conceptual model that fits more conveniently. Thinking instead with sociomaterial questions, I wondered what (else) AR might look like, what else it could become in the complexity of a research project. What parts of the phases am I seeing when thinking with the data, and what is this unfolding producing that the basic tripartite might not allow?

A line of thinking that did not make it in the final version brought attention to the ways in which teachers share resources, and the critique that teachers may become "passive consumers of others' ideas" in this process (Levine, 2010, p. 114). I was certainly disappointed at the time that the Google Drive I created was becoming a repository for exchanging pre-made materials without explicit, collaborative dialogue. This direction was counter to my goals for the project to bring

FSL teachers together to co-create resources (and, selfishly, for me to follow this process). Yet, I felt a tension in framing the sharing and use of existing resources as 'passive.'

The form that collaboration takes is dependent upon "teachers' capacity for creating meaningful and supportive relationships" (Riveros et al., 2012, p. 207). Even though the Drive was not capturing the human-human intra-actions I envisioned, the assemblage of bodies-digital objects-hyperlinks-comments were all co-producing 'collaboration' in that digital space. In sociomaterial theories, there is no collaboration without action, nor action without collaboration (Gunnarsson, 2018). Of course – particularly in light of the trend of isolation in FSL (Lapkin et al., 2009) – there remains a disconnect between the actions that these teachers make work in their context and the benefits of engaging with colleagues that are noted in the literature (e.g., Le Bouthillier & Kristmanson, 2023; Vescio et al., 2008). While there continues to be "a systemic tension between teachers' immediate needs," opportunities for professional collaboration, and the structures of schools (Barab et al., 2003, p. 253), community and collaboration cannot be predetermined by someone or some thing other than the (human and more-than-human) participants in a group. The article explains how this was a hard-learned lesson for me in this project.

Article 2 – Smith (accepted)

Listening to my participants talk about their classes, mixed with my own experience of supply teaching at the same time, made me think about a pedagogical challenge I had not seen discussed in FSL literature. While it is standard for Core French teachers to switch classes after 40- or 50-minute periods, they may be changing rooms (for those moving *à la carte*), students, and grade level divisions at the same time. Particularly for those in eastern Ontario, where Core FSL can begin at Grade 1, teachers may be working with learners as young as six or seven, and as old as 13 or 14 in the same school day. Becoming the kind of teacher who is prepared with the resources, lesson plans, attitude, activities to engage these students in learning based on their

socioemotional and cognitive development, means to relate to students, strategies to promote positive behaviour, etc. seemed an enormous transformation. How they act – or as one participant put it, who they become – can change noticeably in the transition between classes. A chimaeric, shapeshifting mix of identities must be ready to plug in before they enter that space. I was intrigued by how they manage it. What was happening in these moments between periods? What flowed into the next classroom's assemblage? Using the time in between classes as the focal movements took me beyond looking at the activities that unfolded within the walls of the classroom, to reconsider how teachers 'become' in their day.

Article 3 – Smith (submitted)

The experience of these teachers working with digital tools often seemed to contrast how they spoke about technologies in their interviews. Largely positive, general statements about the usefulness of these tools in reflection seemed disconnected from the many exasperated or disappointed comments I heard in the classroom as they worked through technical challenges. In the abstract, the devices work as intended – they fit easily and seamlessly into the lesson plan. In practice, the teachers respond to myriad unexpected trajectories – from glitches, to distractions, to lost sign-in codes. It was not that these teachers, who described themselves as competent and confident with technology, were necessarily 'mishandling' these responses. They worked with(in) the complex conditions at hand to (re)orient what was being produced in their classrooms. How might these moments produce paths the teachers (dis)allowed students to follow? How did they decide to shut down other openings? How many of these different emergent lines might occur within a single lesson? These sociomaterial tensions formed the focus of the article's throughline.

Tracing Ahead

As a brief guide to the rest of this document, what follows are pre-print versions of the three articles described above. The chapter which follows the articles is an epilogue-afterword-parting thoughts. I consider what the articles do as a collective – for FSL, technology integration, AR,

and other domains – and what a reader might continue to think-with as and after they read these articles. It is far from conclusive, in the traditional sense, since it is not intended to close down thinking in this area. As much more remains to be said about the topic, the ideas contained in the frame of this dissertation must be carried forward in other research productions.

Chapter 2

Article 1 – Taproot, rhizome, disappointment, possibility: Action research with(in) sociomaterial perspectives

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Abstract
Inspired by the question 'how might we do Action Research differently?', this article provides an introductory diffractive mapping of the concepts and empirical studies intersecting Action Research and sociomaterial theories. After tracing the roots of Action Research, I zigzag to describing how Action Research has grown differently in prior studies informed by sociomaterial theories. I use these theories to disrupt everyday assumptions about Action Research in education and to make thinking visible and unfamiliar. I offer up a series of short vignettes based on a recently completed Action Research project with French as a Second Language (FSL) teachers in Ontario, Canada. I collide these data events with various sociomaterial concepts to open new opportunities for analysis when engaging in Action Research as a textual parallel of the study as it unfolded – a mix of expectations, worries, and gnawing disappointment before the emergence of new insights. Specifically, I engage the phases of the Action Research cycle and more-than-human collaboration in a research project on educational technology to highlight the ways in which these processes are created and unfold uniquely, and how rhizomatic thinking can further open trajectories for transformation within this work.

Keywords: Sociomaterialism; Rhizome; Collaboration; Elementary classroom; Deleuze

From the taproot…

> *If it is true that it is of the essence of the map or rhizome to have multiple entryways, then it is plausible that one could even enter them through tracings or the root-tree, assuming the necessary precautions are taken*. (Deleuze & Guattari, 1987, p. 14)

In the introduction to their edited book, Black and Clausen (2020) uncover three epistemological offshoots of the Action Research (AR) 'taproot[5]' that have grown within the research tradition over time: positivist, interpretive, and critical approaches. Nourishing this botanical metaphor, these shoots collect and link studies that share philosophical traditions, which guide the 'who, what, why, and how' of different AR projects. Yet, these are not the only approaches to AR

[5] The primary root of a plant that grows vertically downward, producing smaller lateral roots.

germinating in the field. As the opening quote implies, here I present possibilities for entering the rhizome - a continuously growing, horizontal plant stem from which other shoots develop - from this taproot. To do so, I call attention to a contrasting, adventitious root system: the rhizomic collection of theories known as sociomaterialism, sometimes called new materialism. Although sociomaterial approaches are only more recently beginning to grow within the AR landscape, these studies provide a series of 'and-and-and' openings for researchers to think *with* these theories and explore new possibilities for AR.

In this article, I provide an introductory diffractive mapping of different sociomaterial concepts and theories, their sites of connection with the facets of AR, and how they might produce this work differently. I draw upon previous work with tendrils in both AR and sociomaterialism, and offer up a selection of short vignettes inspired by my own experiences with AR. These vignettes are intended to disrupt everyday assumptions about AR, its contexts, its language, and its processes - to make it 'intentionally strange' (Sherman, 2021, p. 385). In doing so, I hope to make thinking and acting visible, to consider how it could become otherwise, and to examine the different lines of flight made possible through sociomaterialism.

AR[6] is positioned as 'a participatory, democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory worldview' (Reason & Bradbury, 2008, p. 1). Particularly in current scholarship, though seen throughout the field's history, AR processes are designed to engage stakeholders as participant-researchers and team members, collaborating 'with' participants rather than conducting research 'on' them (Bergmark, 2020). This approach therefore supports authentic, situated, and shared findings with the goal of enhancing and better understanding how change unfolds in different contexts (Black & Clausen, 2020). Phases of AR studies are typically structured around a 'spiral of self-reflective cycles' (Kemmis & McTaggart, 2008, p. 276), in which the repeated progression of planning, action, and critical reflection (with some variation) shape the research design in response to the changing conditions of the environment. Findings are produced in and through these moments, informed by the thinking and experiences of those involved, weaving theory, reflection, and practice together as praxis (Brydon-Miller & Maguire, 2009).

In education, AR has long been recognized for its potential to engage and guide teachers in (re)considering, (re)shaping, and (re)focusing their everyday practice (Mills, 2014; Stringer, 2014). Indeed, Kemmis and McTaggart (2008) noted that 'classroom action research typically involves the use of qualitative interpretive modes of inquiry and data collection by teachers (often with help from academics) with a view to teachers making judgments about how to improve their own practices' (273-274). In fact, educators may already collaborate in AR-like processes with colleagues as part of their day-to-day interactions (Kemmis et al., 2014). This work can be undertaken by individual educators, teams of teachers, and/or alongside researchers (McNiff, 2013). Participation may be voluntary and informal, formed by groups of teachers in-person or online over a shared inquiry, or formalized and required as part of professional learning programs (MacDonald, 2008). Yet, regardless of form, these efforts are intended to make meaningful change in ways that are relevant, participative, and empowering in classrooms and schools – situating that educational 'research is always and already a site for learning' (Sumara & Davis, 2009, p. 11), which echoes into other forms of AR.

[6] Though there are important distinctions between AR and related approaches (e.g., Participatory [PAR], Critical [CAR], etc.), I refer to AR more generally to reflect the terminology used by sociomaterial scholars in and beyond education.

…To the rhizome

Reading across existing studies, AR designs have already been intersected with various conceptual and theoretical frameworks, methodologies, and onto-epistemologies which guide the work (Black & Clausen, 2020; Davis & Phelps, 2005). As we zigzag through these connections towards sociomaterialism from sociocultural approaches, complexity theory is a helpful node to enter through, as it has shared roots in both sociocultural and sociomaterial traditions (see Fenwick, 2014). Existing scholarship which engages the synergistic nature of complexity and AR – such as Davis and Sumara (1997) and McMurtry (2013) - acknowledged that the systems in which we work are irreducibly complex and cannot hope to be contained or controlled by research processes. Yet, engaging with this shifting unpredictability offers 'collective possibilities' (Davis & Sumara, 2005b, p. 454) for learning among AR participants. As Sumara and Davis (2009) elaborated, 'neither action research nor complexity theory arrive "complete." Rather, both are understood as plastic and open to elaboration' (366). This focus on emergence and provoking change within a dynamic network of relations is one link to sociomaterial theories.

Briefly, sociomaterialism is interested in the inextricable relational ties in and among human and nonhuman entities, as well as the ways that 'both material and social forces are mutually implicated in bringing forth everyday activities' (Fenwick, 2014, p. 47). While sociomaterialism certainly does not ignore the human, it decentres the human in analysis, dissolving the perceived boundaries between the human and its co-constitutive elements. As Fenwick and Edwards (2013) noted, 'the point is to insist upon recognizing important influences in assemblages as emanating from nature, technology, objects and all manner of quarks, which may overlap and infuse what is human' (58). This position establishes a relational ontology, in which entities (re)form and distinguish their qualities in relation to other beings (Adams & Thompson, 2016). The focus is therefore not on what things *are*, but what they *do* or *produce* in a particular context. In this view, the world and all objects are constantly 'becoming;' that is to say, things are always in an endless emerging and changing of state, condition, and capacity (N. J. Fox & Alldred, 2021).

In Actor-Network Theory (ANT) – a commonly employed theory within sociomaterial AR – the impetus for research is to heed Latour's (2005) call to 'follow the actors:' to purposefully explore how different beings transform and are transformed when they engage others in their context. As a very brief history, ANT's inception in sociology and science studies brought attention to the material aspects of the social, and vice versa. Germinal scholars such as Callon (1984), Law and Mol (1995) have explored how these material-semiotic relations can describe and upturn assumptions around activity and actors in the world[7].

While sociomaterialism is a more recent extension of the educational AR root, scholars in fields such as business management, urban planning, and health sciences have been exploring this intersection since the 1980s (Lewis, 2007; Piovesan, 2022). These studies used ANT to challenge trends in their field of separating system- and human-oriented studies, drawing attention to knowledge transfer, practice transformation, and the importance of the material context in shaping systemic AR projects. In education, scholars have engaged sociomaterial AR along two different trajectories. Studies like Arena et al. (2009), Appleby and Hillier (2012), and Kamp

[7] For those familiar with the ANT-ish term 'actant,' the use of 'actor' in this article may, ironically, seem to reinforce the anthropomorphism of nonhuman entities and the dominance of human beings over their material counterparts (S. Fox, 2000). However, I agree with Fenwick and Edwards (2010) that the distinction seems less prominent and less necessary in recent ANT scholarship as the ontological division between the terms is de-emphasized; this is particularly the case in the Deleuzian and sociomaterial thinking used here (Müller & Schurr, 2016).

(2018) used ANT concepts to analyze emerging projects and networks related to education broadly. These studies were particularly interested in how the differing roles of participants, leaders, policies, materials, and practices shape the outcomes of AR projects. In contrast with these network-oriented designs, scholars have engaged different branches of sociomaterial perspectives in their classroom-based AR (e.g., Frid, 2021; Kane, 2015; Villacañas de Castro et al., 2021) and on professional learning (Gale et al., 2013). Given the resonance of these approaches with this study, I briefly describe a few of them here.

Gale and colleagues (2013) reconceptualized their practice through the thinking of Gilles Deleuze and Diana Masny. In their collaborative writing project, the authors reflected on the delivery of professional learning workshops, and how the concept of the assemblage provided 'both a motif for practice and the methodological basis for inquiring into it' (Gale et al., 2013, p. 560). As their thinking shifted towards the relational enactments of their project, they were increasingly caught by the need to 'see between' the actors and the 'intra-actions' (Barad, 2007) that co-constitute AR. Similarly, Gunnarsson's (2018) reflection on her own teaching in a Swedish secondary school draws upon ANT to centre the more-than-human engagements which defy human intention and action. Her creative and critical investigation of gender and schooling raised questions around the ways in which AR can move to decentre language, social patterns, and the independent subject in favour of 'questions about how to include movements, multiplicities and transformative processes' (668) in AR. These studies highlight the challenges and potential of rethinking AR projects with sociomaterial theories.

The sociomaterial orientation towards constant becoming offers rich opportunities to reconceptualize AR and professional practice (Amorim & Ryan, 2005). Shaping the AR journey in light of unexpected occurrences requires participants to consistently grapple with how a project might emerge differently; the need to move with new opportunities cannot be ignored in a sociomaterial approach. This shift is particularly important in contexts like North America where AR may at times be co-opted as a tool for institutional control and conformity, or to reductively advance predetermined goals (Gale et al., 2013; Miller, 2017). Sociomaterial AR, in contrast, therefore always 'involves putting at risk of what could happen' (Gunnarsson, 2018, p. 676) – hesitating, wondering, disrupting, and experimenting with the (dis)ordering of research and practice. Here, the rhizome is helpful for thinking with the connections, possibilities, and outward movements of AR studies (Waterhouse, 2012).

Having explored some of the theoretical roots of (educational) AR and sociomaterialism, I turn to a recent AR project to serve as an example of how these concepts collided. Through the vignettes below, I hope to offer a textual parallel of the study as it unfolded – a mix of expectations, worries, and gnawing disappointment before the emergence of new insights. These moments are only glimpses into the months-long study, yet they might serve as a 'launching point' for thinking about these concepts in action.

Empirical and theoretical entry points to this study

From a qualitative perspective, this study was designed as a 10-month AR project with '5' (more on that below) French as a Second Language (FSL) teachers in a school board in Ontario, Canada. Two participants worked in the same school, while the others each worked at different schools. The participants responded to an open call which proposed a professional learning group focused on the integration of digital technology in the second language classroom. The teachers would meet monthly to discuss and co-design technology-enhanced lessons; these lessons would then be enacted by the teachers and unpacked during subsequent meetings, following a typical AR cycle. I would enter these meetings as a collaborator, critical friend, and instructional coach -

given my own experience teaching FSL and as a school-based educational technology mentor. I would also conduct regular classroom observations and individual interviews with the participating teachers to gain further insights into their practice. However, this design was not to be, though it continued to influence the later unfolding of the study. In short, the first group meeting became the only group meeting, and the work splintered into a series of simultaneous one-on-one projects with the participants for that school year.

As I mourned the 'failure' of my AR project as conceived, I continued to work with each teacher in a dyad arrangement. Yet, several months into the project, I began to worry about the 'mundane' findings and a general feeling of disappointment with what my original research questions were producing. Following that wondering further, I began to consider what really mattered in this context. What was I missing? What was I not seeing in my pursuit of pre-existing questions and outcomes? What could I find in the disruptions, the breaks, and the unexpected? After weeks of research journaling, documenting thoughts and feelings, lines of thought emerged about the process of AR, rather than the content.

What follows are examples drawn from diverse aspects of the project. One common technique for presenting these anecdotes is using vignettes (Masny, 2014; e.g., Waterhouse, 2012), that provide data and analysis in forms which the reader can productively engage (Sherman, 2021). These lived-through accounts 'do more than retell stories about things and relations of practice. They themselves are performative assemblages and (re)creations that reassemble, resemble, resonate, move, animate, fold and unfold' (Adams & Thompson, 2016, p. 31). Rather than attempting to codify and categorize data, analysis via vignettes presents 'points of entry into experimentations in contact with the real as actualized by the vignettes' (Bangou, 2020, p. 186). A vignette might centre a particular actor 'at play' in a scenario, show contrast or movement over time, or put theoretical concepts and terminology to work in relation to the data. These methods, designed to convey affective connections over thematic trends, can collide, disrupt, and trouble expected procedures to research and writing (Tulinius & Hølge-Hazelton, 2011); as Amorim and Ryan (2005) suggest, they can provide a more experimental and experiential approach to writing about AR concepts and processes as they were engaged in this study.

For instance, the rhizomatic mapping in Figure 3 was not created to demonstrate "what or who is connected to something else . . . [rather] what affect is produced and what kinds of becomings ensue . . . as they move through space and time" (Lenters, 2016, pp. 291–292). The items were chosen as I looked for interconnections around the Google Drive, and I began mapping the practices and materialities that are implicated in producing those instances (Fenwick et al., 2011; Sherman, 2021). The quotes were associated with online practices, the Google Drive, sharing resources, and collaboration; they were considered for their capacity to affect and be affected by other elements in the research vignette. The decision to draw lines was a balance between following thematic or material connections and operating within the limits of presenting this image in a journal. Based on earlier feedback, many recognized lines were removed to improve the 'readability' of the image, so what is left is only the 'major' resonances that might be engaged by readers.

Stuttering the AR cycle

As we enter the first vignette, I return to the idea of the AR cycle. The concept of the 'spiral of steps' can be traced back to Kurt Lewin (1997, p. 38), which has echoed through AR guidebooks and research articles since. Visualizations of this process commonly take the form of looping, cycling, continuous swirls with phases that move in a largely linear, downward flow (e.g., Kemmis et al., 2014). Some scholars, like Mills (2014), have adapted the cycle into a closed

system, while others, like McNiff (2013), inverted the graphic representation to highlight the potential for multiple new directions and possibilities within an AR project.

The traditional AR model has been critiqued as having become reified, a received idea, in its unquestioned adoption (McNiff, 2013). The predefined sequence becomes prescriptive rather than creative in its function, as though each project will or must stay within the lines to 'be' AR. For sociomaterialist scholars, there is already dissonance between a philosophy focused on becoming and the use of a fixed model (Gunnarsson, 2018). The spiral is not used in this rethinking as a stable entity, but seen as a performative agent in the project, a plan to keep tinkering with (Kane, 2015). This reconnects it with the messiness of real-life unfoldings (McNiff, 2013); and this thought zigzags us back to my project:

I don't have a strong feeling about where it's going right now. It feels like we've started, stopped, and restarted this one cycle a thousand times already. There's constantly something that derails my plans - we lose someone, we get someone. Schedules change, classes change, unit plans change. What have I managed in six weeks?
(Personal research journal, November 14, 2022)

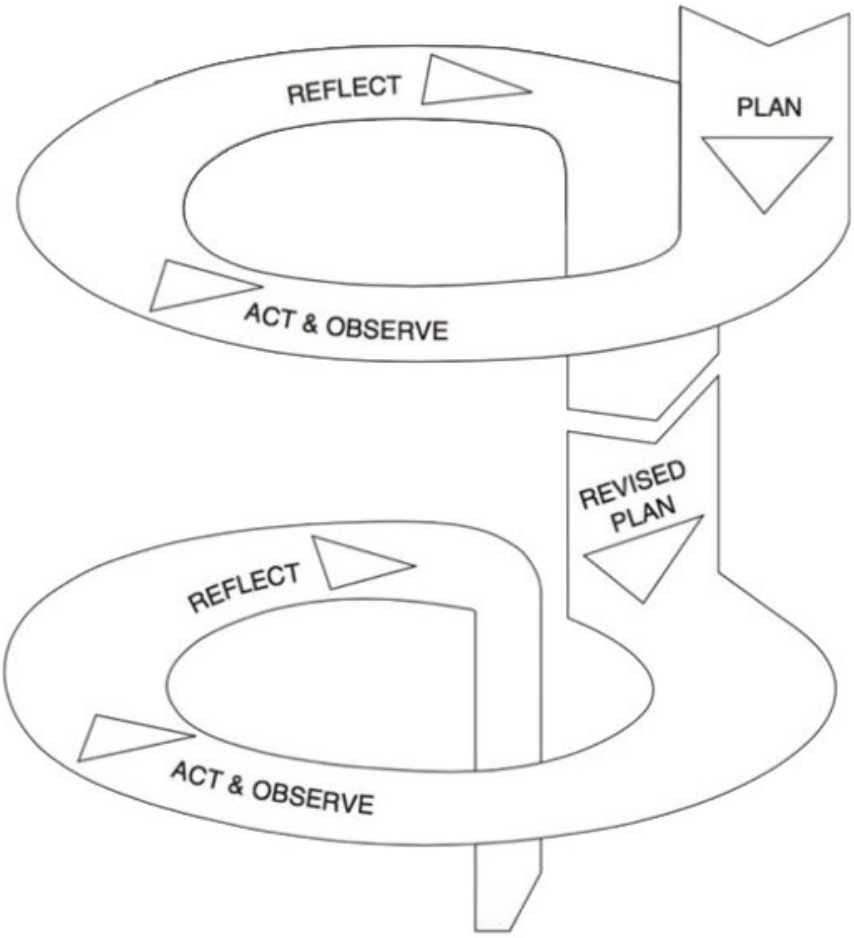
In reflecting on my project after the first six weeks had passed, I looked back on the AR plan I had devised. What had played out with the participants was nothing like what I had envisioned. Four teachers responded to the initial call and completed the ethics consent form, and I had started observation sessions with three of them. One teacher had already stopped responding to my emails by week four and would disappear without further contact. Another had challenges in her personal life that meant she no longer had the time to commit to the project. Even into October, classes were changing and the initial lesson plans with each teacher were being cancelled or shifted around; it felt chaotic. I could feel the project unravelling before it had even begun. Only three teachers completed the communally developed lesson.

Looking back, it's like there were several (partial?) cycles at once. Or maybe no cycle at all. It went something like Reflect, Plan-Plan-Act-Act-Plan/Act, Plan-Act-Act-Act-Reflect. And then the group fizzled out as we were trying to plan again, so I just stuck to the individual meetings.
(Personal research journal, March 29, 2023)

Later in March, while reviewing my research journals, I was caught by the start-stop of the AR spiral that I was not used to seeing described in the research. I noticed how focused I was on how I was going to write up my research in a way that was authentic to the process that occurred. Certainly not with a contained loop, then; these models all felt too complete, too… smooth? to engage for my own project. As I re-read the research critiques, I continued thinking with the idea of those disruptions. It was not just the cycle that was shaken up, but also the phases and the ordered terminology used to define the cycles that did not seem to work. I went back to the other models I had seen and was struck by the space between the cycles in Kemmis and McTaggart's (2008) diagram (see Figure 1) – a point of discontinuity that was unusual, yet intriguing. Thinking with the Deleuzian concept of stuttering, I began to consider the breaks as a moment of production and creation, and how these breaks became central to understanding my project.

Figure 1

Figure 10.1 The Action Research Spiral (Kemmis and McTaggart 2008, 278). Redrawn with permission.



Deleuzian Stuttering

Unlike the clinical definition of a speech impediment, Deleuze's approach to stuttering centres the 'creative operation of making language stutter as such' (Siffrinn, 2021, p. 320). Briefly, stuttering can be thought of in the form of both word choice and action, or content and expression (Deleuze & Guattari, 1987). In its physical manifestation, stuttering disrupts the routine of speech. It is an act of resistance; stuttering produces a line of flight escaping the grammars of language that seek to cement it, producing new words rather than affecting words which already exist (Deleuze, 1997).

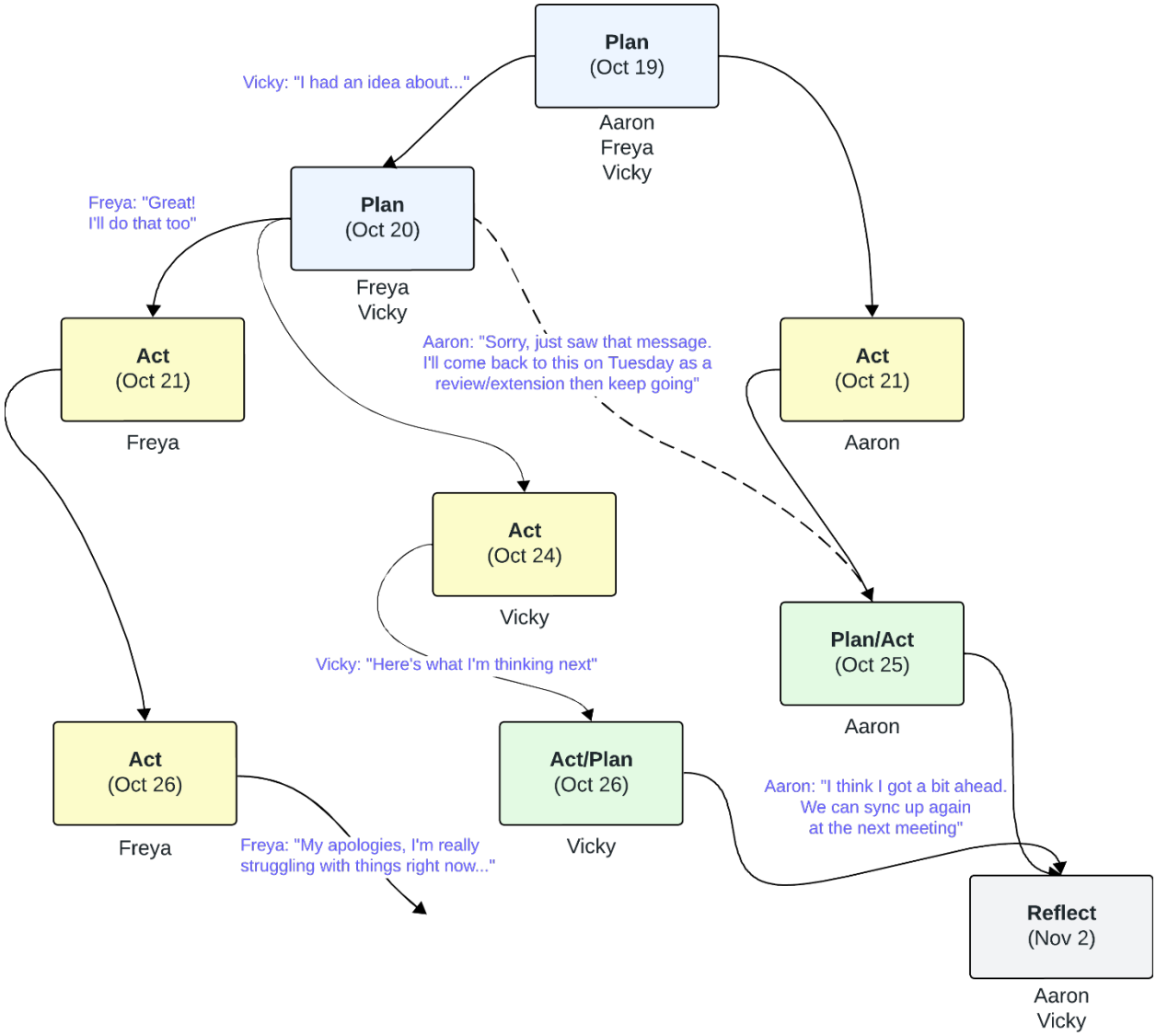
Beyond the act of stuttering, the idea of making language itself stutter brings our attention to overflowing the capacity of conventional speech. Beyond the words themselves, there must be 'an atmospheric quality, a milieu that acts as the conductor of words … [that] makes the indicated affect reverberate through the words' (Deleuze, 1997, p. 108). The expression and affective resonance give force and energy to the language. The speech event becomes a-signifying; the attention no longer on the meaning of the utterances, but on what these instances do and what language is capable of producing. The creative stuttering of language grows from the middle, ever outward (Deleuze, 1997).

Applied to the AR cycle, the looping of the spiral is already repeating, perhaps even stuttering. The named phase returns but manifests differently. That repetition is therefore not sameness, but a difference: 'to repeat is to behave in a certain manner, but in relation to something unique or singular which has no equal or equivalent' (Deleuze, 1994, p. 1). Indeed, whether a little or a lot changed between the participants physically, the body of the project transformed with each stuttering (re)start. There was a unique feel to each new attempt. To use Deleuze's (1997) words, the instances were continuously 'singularized out of a population rather than determined in a form' (1). The speed of the cycles varied, passing quickly or slowly; progress (or what seemed like regress) was sharp, choppy, and disjunctive as changes poured in, yet there were calmer moments where the phases seemed to move stably according to the predetermined plan. The stuttering was at times so intense that it was difficult to continue one phase because another had already started; at other times, the faltering life of the project was barely palpable.

The phases were defined less by what makes them 'a signifying thing' and more 'by what causes [them] to move, to flow' (Deleuze & Guattari, 1983, p. 133); the energy, activity, milieu, and movement become the focus, as these are what gave the project its shape and vitality. As an example, tracing the path of the collaborative lesson, I attempted to capture the messiness of the unfolding in my research notes as *Plan-Act-Act-Plan* (see Figure 2). While one teacher (Aaron) was already acting on the collaborative lesson plan, it was still being (re)formed through planning between the others (Vicky and Freya). The phase grew from the middle, stuttering beyond itself and bifurcating into new potentialities. Vicky and Freya initially moved together, separate from Aaron, after Vicky suggested a different approach from what they initially planned. Aaron then stuttered through a (re)plan and (re)act in response to the new development, working in the co-developed content simultaneously with his other planned activities. The immediate needs of classroom pedagogy – to have a functional lesson plan for class that day – further cut the logical line of the AR cycle. Vicky continued to push forward, having completed the planned series of lessons, while Freya's classes progressed slowly through that content. Aaron, unsure of the group's plan and hesitant to accept Vicky's suggestion, also moved forward in a new direction – he instead offered to re-group at the next scheduled meeting. The ensuing reflection meeting was then focused on talking through the multiplicities that had unfolded, with the intention of doing things more 'in sync' the next time.

Figure 2

Stuttering act-plan of the collaborative lesson – tracing one AR cycle



Looking at the methodological phases of act, plan, and reflect, the titles of the traditional AR cycle could no longer contain the events through representation and language – the coming and going of participants, the co-development of lesson plan, and the passage of time. Plan, act, reflect – as a singular cycle – could not represent that unfolding through words. Within and beyond the phase, the system stuttered with the simultaneous movements of the teachers; the titles did not 'exist independently of the stutter' (Deleuze, 1997, p. 107). Despite my efforts to pull the group into the expected pattern, planning was not always a pre-phase for action, nor did action immediately lead to reflection. At times, this order seemed to work, other moments required a different order. As Vicky later noted, 'we really went in on the acting, but weren't so good at planning together. I know I didn't help that.'

As Deleuze (1997) reminds us, language has a forward momentum – things must be chosen to be said in order; they cannot be communicated all at once. The AR phases are much the same. In the abstract, the phases are intended as refrains (Deleuze & Guattari, 1987), providing stability and comfort in their return. Here, their return moved the cycle towards 'its limit, to its outside, to its silence—this would be like the boom and crash' (Deleuze, 1997, p. 113) where it becomes-other. In this instance, the boom and crash of the project's collapse left silence for the original group of participants while creating new openings in the form of the dyads.

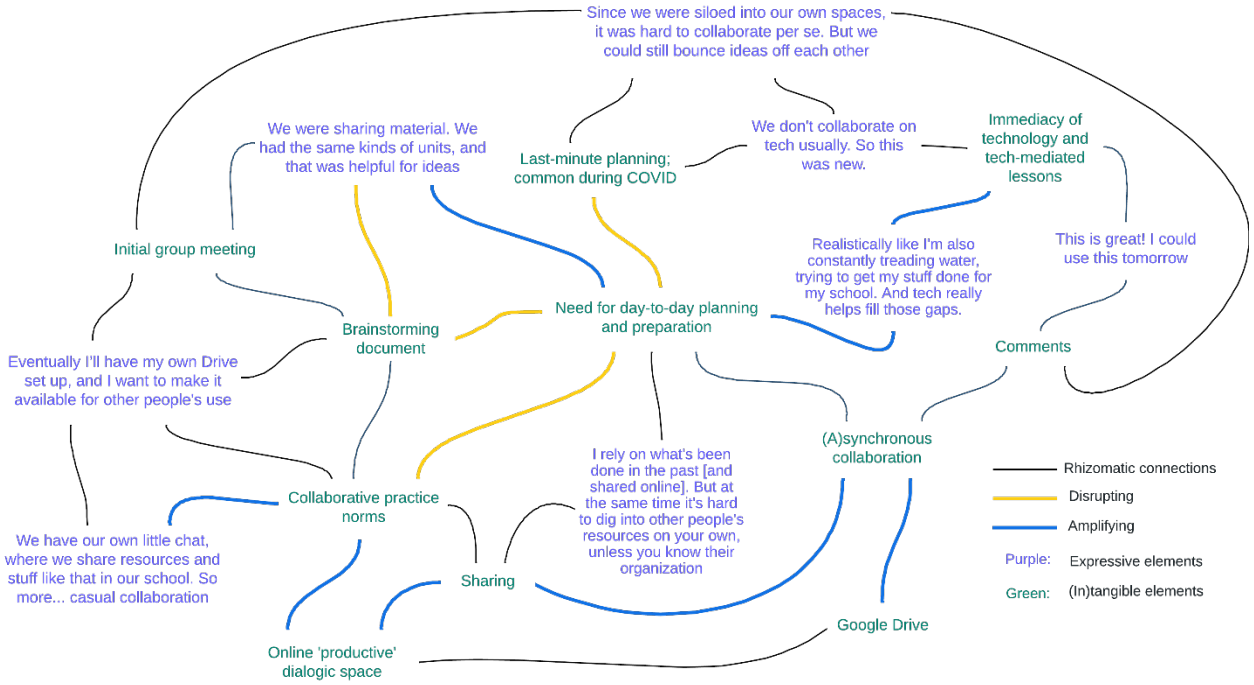
How might we take up the messiness of how AR phases are actualized? Considering the AR cycle in this way might push us towards thinking the process with Deleuze and Guattari's rhizome, escaping the possible linearity of traditional AR (Gale et al., 2013). The AR rhizome opens new possibilities for what is and what could be in an AR project (Amorim & Ryan, 2005). Working rhizomatically, rather than linearly or cyclically, calls attention to the multiple connections and movements at each phase (Waterhouse, 2012). There is no hierarchical progression from one phase to the other, no 'right' shape to the unfolding, nor a marked beginning or end point. Connections are constantly made in the moment, where the unfamiliar and the new emerge again and again (Bangou & Vasilopoulos, 2018). Rather than seeing the phases as stages where the action takes place, these findings point to the merit of looking to what happens in between these nodes. For instance, rather than framing Reflect, Plan, and Act as discrete steps, a crosscutting reflect-plan might better position what happens during a kick-off session. Likewise, multiple connections – e.g., act-reflect-act-plan – might exist within a teacher's in-the-moment pause that they then bring to the group meeting. The movement and unfolding give shape to the phase, and the actions collide and continue, rather than being contained in time by the function of the name. This rethinking promotes play and responding to the opportunities and constraints of each design (Kane, 2015).

Rhizomatic Collaboration and Participation

Zigzagging to another opening, the concepts of collaboration and participation in AR similarly become-different within the AR rhizome. The benefits of collaborative approaches to teaching and professional learning echo throughout educational research (McMurtry, 2013; Patton & Parker, 2017). The underpinning logic is that collegial support 'has the potential of transforming teaching practices in ways that will bring about higher rates of student achievement' (Riveros et al., 2012, p. 204). The same is said for AR (Black & Clausen, 2020; Frid, 2021).

Sociomaterial scholars have brought attention beyond the human collaborators in teaching and AR, and who researchers consider as 'participants' (Gunnarsson, 2018). The material, expressive, nontangible, the liveliness of space and so on all have a role in the production of the project. To extend McNiff's (2013) assertion, all participants – human and more-than-human – 'can tell me what is going on. I need to find different ways of asking them' (p. 110). The vibrancy and dynamism of materials is reflected in the relational ontology of sociomaterial theories, whereby material objects are active participants in the world's becoming (Bhatt & De Roock, 2013). Particularly when it comes to digital actors, 'technology convenes a unique environmental ground or atmosphere, and it mediates—conditions, translates, and even transforms—our experience of the world' (Adams & Thompson, 2016, p. 17).

Figure 3
Rhizomatic mapping of collaboration with Google Drive



Thinking with Adams and Thompson's (2016) heuristics for interviewing digital objects – i.e., 'what is a technology inviting (or encouraging, inciting, or even insisting) its user to do, think, or perceive? What is a technology discouraging (or constraining, or even prohibiting)?' (40) – I began to follow intra-actions with a Google Drive folder (the 'Drive'), which had been set up for brainstorming and collaborating throughout the project. The Drive was shared following the initial group meeting. Almost immediately, the processes of collaboration were transformed, cutting a new path from the intended co-creation. Figure 3 provides a rhizomatic mapping of some of these elements, visually representing the connections, transformations, and enabled relations that emerged through reading this vignette (see Bangou & Vasilopoulos, 2023 for more on this style).

> *Following what happened from the 'perspective' of the Drive has got me thinking about what came together to make this all unfold. I had put the prompts from our conversations in the brainstorm document, we had discussed the purpose of the doc; but the first time someone linked a resource they already have created, the focus and direction shifted . . . they made it what they wanted right now, rather than for later.*
> (Personal research journal, December 18, 2022)

Acting with the affordances of the Drive, the teachers began to make it their own. Instead of becoming a space of organizing and co-planning for the AR project, the Drive facilitated practices of sharing pre-made resources and lesson plans – similar to how they usually collaborate with colleagues in their schools or the board. Files, subfolders, and links were created and shared related to the brainstormed topics. They commented and tagged each other, writing back and forth with their suggestions, advice, and thanks. The Drive was not 'in the background,' but facilitating

the engagement that was possible between the teachers. How collaboration unfolded, and what the Drive did alongside these teachers, disrupted the potential of (a)synchronous collaboration. Rather than an inert tool with a predetermined purpose, the collaboration that became possible with the Drive shifted. The commenting and file sharing features in particular helped cut this new path (see Figure 3).

Curious about this unfolding, I asked the teachers – what had the Drive become? The responses echoed that the majority of intra-actions were focused on responding to the immediate needs of their day-to-day teaching, something other FSL teachers had become accustomed to during the COVID-19 pandemic (see Author, 2021). The teachers expressed that they did not have the time and energy to regularly co-design lessons, even with colleagues in the same building. Such co-designing was no longer something that their school administrators provide time for, which left it to fall on their personal time. The teachers shared that they sometimes compensate by chatting through social media to quickly send ideas and links during the school day; however, that was often the extent of their connections.

Here, collaboration became a form of sharing resources that already exist – engaging with Google Drives, websites, and repositories. Sharing with a small team in this project meant that the participants were able to access specific files and resources, rather than sifting through large folders that might be posted online. As most of these teachers were, or have been at one time, the sole FSL teacher in their school, the Drive was a chance to connect and accomplish the sharing they desperately wanted (see Knouzi & Mady, 2014). While studies have pointed out the ways that these digital programs can facilitate collaboration (e.g., Yoon et al., 2020), the technology could reshape the project away from this potential.

Another intersecting line, the focus of the project – i.e., technology-mediated lessons – was also at play in shaping the intra-actions with the Drive. Digital tools were identified as stop-gap options, able to meet an immediate need, and work 'as expected.' The teachers were not used to collaborating on technology design, and engaging a digital tool beyond its plug-and-play capacity. These affective forces pushed the collaborative goal to meet this need. The Drive simultaneously became a site of connection, a facilitator of dialogue, an intermediary colleague, a path to ideas, a stop-gap lesson provider, and repository. While this grew far beyond the expected function, the Drive continued to produce both materials and affective forces in conjunction with the participants.

Action-research-in-becoming? An inconclusion

Thinking again with Deleuze, I can see a pull towards arborescence in the project: the decentralized rhizome of the initial collaboration cut off by the more vertical tree structure of the pairs. Is it just because the dyads are more familiar, and we couldn't get away from that? .... But there were still little cracks and connections between the participants – like when they used the lessons the others had created – so it's always and-and.

(Personal research journal, April 20, 2023)

To exit near where we began, I return to Deleuze and Guattari's (1987) contention that 'there are knots of arborescence in rhizomes, and rhizomatic offshoots in [tree] roots' (20). This article began with the aim of discussing new and existing rhizomatic connections between AR and sociomaterial perspectives, as well as offer some examples from the unfolding of one project. This article was not an attempt to 'pin down' meanings; nor is it a rejection of conventional AR with a new paradigm that will 'resolve' prior shortcomings on the road to a more-perfect future for AR. These vignettes are only partial glimpses into what became, and could have become, in

this project. Yet, it is another line to engage and perhaps incite further collisions between AR and sociomaterial theories; another 'and-and-and' way of thinking with and through AR.

To think rhizomatically is to enter 'in the middle' – without beginning or end (Waterhouse, 2012). If we push beyond the traditional linearity of AR models, when does 'action research' begin? If it begins with the completion of the phases of the cycle, how do we make space for the kinds of stutterings and disruptions described here that do not fit the tripartite cycle? If it begins with the initial movements - the pre-observations, meetings, and discussions - how do we extend our understandings of the 'actions' that constitute AR? Similarly, how do we continue to make space for forms of collaboration that are unconventional – in the intra-actions that emerge in relation to more-than-human actors (as in the Google Drive)?

As Tulinius and Hølge-Hazelton (2011) discussed, the 'collapse' of the AR cycle is not the end of the project; it may be the impetus for the project to become-other, beyond the capacity of human intentionality alone. Our practices must respond to the various actors and conditions that are at play, reconfiguring and adapting, rather than expecting sociomaterial entities to be subsumed by predetermined, human designs (Fenwick & Edwards, 2010). When we as AR researchers can no longer guarantee the understandings, goals, and processes, we are forced to become-with the AR project as it unfolds. Might this thinking push us towards conceiving an action-research-in-becoming? In each instance, the AR process is created and unfolded uniquely. The point is not to forego planning but to resist constraining action to the act-plan-reflect phases. It creates an approach that is 'open to playing with' and 'being played with so as to allow for the unexpected' (Kane, 2015, p. 362); one 'that lives with a growing rhizomatic awareness of fluidity, transmutation and transformation' of these projects in action (Gale et al., 2013, p. 561). To work with action-research-in-becoming is to embrace the complexity of the unexpected, the everchanging, the contingent, and the 'entangling of subjectivities, encounters, contexts, desires, and shifting relations of power, among myriad other exigencies' (Miller, 2017, p. 500). If messiness and change are the norm, we must follow the rhythms and actors to map the AR project as it expands rhizomatically, rather than expecting a spiral.

Declaration of Interest Statement
The author reports there are no competing interests to declare.

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Chapter 3

Article 2 – Becoming-FSL-Teacher: A sociomaterial exploration of language teacher identity in Core French

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Abstract

This article draws upon a 10-month study of five Core French as a Second Language (FSL) teachers to explore the professional identities that are produced in their work. Adopting rhizoanalysis and the Deleuzian concept of becoming, I position the ways in which these teachers both affect and are affected by the multiple material and discursive practices that circulate within their local context and in Canadian FSL education. Engaging data from classroom observations, interviews, and lesson artifacts, I offer several vignettes as empirical examples that extend insights into how the status of FSL, the material components of the school, and the teachers' identities are co-constituted. These data entry points are possible lines to think differently about the intricacies of becoming a Core FSL teacher in day-to-day practice, and the ways in which these educators are constantly (re)shaped in relation with the material, human, and affective elements in their classrooms. These affordances can disrupt existing understandings and suggest how (re)imagining FSL teachers from a sociomaterial perspective might further nuance discussions of retention, support, and identity.

Keywords: French as a Second Language; Teacher Identity; Sociomaterialism; Becoming; Deleuze

Introduction

French as a Second Language (FSL) programs in Canada are commonly positioned as being caught in a dichotomous state between promise and actuality. While bolstered by national discourse and funding for bilingualism, the turbulent reality of these programs belies their

seemingly privileged status (Lapkin et al., 2009). Research over the past several decades has highlighted the important confluence of relationships, space, discourse, practice, and school culture that shape how FSL programs and teachers work (Arnott et al., 2019; Masson, Knouzi, et al., 2021). Given the growing focus on the recruitment of FSL teachers (e.g., Government of Ontario, 2021), there is a pressing need to address the tensions and opportunities that affect the efficacy of FSL (Knouzi & Mady, 2014). However, nuanced and contextualized understandings of these teachers' work remain scarce (e.g., Masson, 2018; Smith & Arnott, 2022).

This article explores what might be produced if we (re)consider how we approach FSL teachers' work through a sociomaterial frame (e.g., Hultin, 2019). I begin by situating how I have come to engage the theories associated with sociomaterialism, and the implications these have for understanding teacher practice. After presenting the methodology, I then plug these concepts and theories into a series of vignettes drawn from a 10-month study with five Core French teachers in Ontario.

Connecting in

Following the 'affective turn,' theories like sociomaterialism offer alternative conceptual orientations to explore the realities of teacher practice; Authors such as Dagenais (2019), Guerrettaz et al. (2021), and Fenwick et al. (2011) provide some examples of other engagements with sociomaterialism in classrooms. Though presented here simplistically as a single term, sociomaterial research is produced by a varied and intricately connected field that relates to theories like: feminist new materialism (Barad, 2007), posthumanism (Braidotti, 2013), post qualitative or postfoundational inquiry (Jackson & Mazzei, 2024; St. Pierre et al., 2016), assemblage theory (DeLanda, 2016), non-representational theory (Vannini, 2015b), and Actor-Network Theory (Fenwick & Edwards, 2010), to name only a few. What these perspectives share is a fundamental interest in matter and materiality. This materiality includes human bodies, while equally considering other (in)organic matter, space, place, forces, concepts, thoughts, and other

elements that have the capacity to affect and be affected by their relations with other entities (Fox & Alldred, 2022). In contrast with sociocultural or constructivist approaches, in which human meaning making and practices are seen as mediated by materials, the separation of subject and object is no longer thinkable to situate what 'is' in the human mind and reality (Sheridan et al., 2020). Instead, rather than seeing humans and material intermediaries as distinct, the focus in sociomaterial research shifts to the "mutual constitution of entangled agencies" (Barad, 2007, p. 33). Things emerge together, in differing relationships, which upends traditional notions of agency and who (or what) is considered to be acting in these spaces (Fox & Alldred, 2015). As Ennser-Kananen and Saarinen (2023) indicated, this "queering of the familiar implies acknowledging the political and ideological interests embedded in the material world, not merely acknowledging the material as operated by humans" (p. 12).

Empirically, sociomaterial studies are concerned with considering the effects of all actors – both human and non-human – and their engagements with the world. By attending to bodies, behaviours, and becomings, the research is attuned to the everyday activity which constitutes life (Vannini, 2015a). In the language classroom, these approaches consider the forces that operate with language use (de Freitas & Curinga, 2015). More precisely, sociomaterial research in the language classroom attends to "the ecology of practices (and their contestations, impasses, breakthroughs, etc.) . . . to see how sociomaterial relations are assembled and their realities (such as class work, assignments) are done" (Bhatt & de Roock, 2013, p. 6). This decentering of the human does not equate to neutrality (Edwards & Fenwick, 2019), nor ignoring markers of social issues (e.g., gender, race, ability). Instead, sociomaterial approaches consider the way in which power and inequality are materially enacted (Ibrahim, 2015). This understanding of the role and capacity of the human in language classrooms has implications for engaging teacher identity.

Teacher identity

Teachers' identities gained notable attention in research literature in (language) education and applied linguistics towards the end of the 20th century and have remained a popular topic in these fields since the early 2000s (Darvin & Norton, 2017; Norton & Toohey, 2011). Predominantly investigated through sociocultural perspectives, current research positions individuals and their identities in relation to social worlds. Rather than centering a fixed, internal, and decontextualized construct, identity is theorized as dynamic and multiplicitious expressions and affiliations that frame how a person sees themselves (Norton, 2013). In language learning, identity is theorized alongside concepts like investment, motivation, and community which nuance the ways that identities flow in the world (Byrd Clark, 2008; Norton & McKinney, 2011). For teachers, identities are often sites of struggle and performance between the imagined and lived realities of the profession as it intersects with curricula, school norms, community contexts, and so on (Cheung et al., 2015). Increasingly, researchers have begun exploring how identities are shaped and performed in language classrooms through sociomaterial perspectives. Dagenais (2020) provided a pertinent exploration of this topic. Studies in this area include, for example, a focus on students and technologies (Forte, 2021) and on teacher productions in education courses (Bangou & Vasilopoulos, 2023). Here, identity is positioned as a matter of relation between multiple affects and actors; far beyond the property of an individual, identity is the expression or production of this collaborative coming-together. According to de Freitas and Curinga (2015), this sociomaterial "approach allows us to imagine an identity that is radically unstable, open to modification and alteration, and even empowered by its encounters with otherness" (p. 252). By constantly emerging through relational events, the focus on having to use language to convey identity is shifted: identity, practices, and resources are inextricably linked and mutually constituted (Toohey, 2018). Stated differently, identity is both tactile and imagined, fragmented and connected, partial and extensive, fleeting and enduring. Identities may be (per)formed through language, but are always in relation to material entities, and reiterated with changeable

boundaries (de Freitas & Curinga, 2015). Identities are therefore potentials – the capacity to become different in new assemblages of material conditions (Norton & Toohey, 201). The idea of 'bridging' sociocultural and the many 'post' (e.g., poststructural) frameworks underpins the approach to FSL teacher identity and analysis used in this article.

French as a Second Language

Recent meta reviews of FSL[8] research across programs have highlighted the challenges and opportunities in the field, exploring implications for teacher practice, identity, and experience (Arnott et al., 2019; Masson et al., 2021). The longstanding shortage and low recruitment of French teachers continues to feature prominently in academic, government, and K-12 education discourses (e.g., Government of Ontario, 2021; Jack & Nyman, 2019; Masson & Azan, 2020). According to Arnott et al.'s (2023) pan-Canadian survey of FSL teachers, a majority of responding teachers considered leaving the French teaching stream, or the profession entirely, despite identifying themselves as committed and passionate language educators. The factors contributing to this desire are not new to FSL: feelings of isolation (Knouzi & Mady, 2014), lack of mentorship and connection with experienced colleagues (Culligan et al., 2023; Jack & Nyman, 2019), limited professional learning and preparedness for the field (Arnott et al., 2023), and deprecated status of the subject (Lapkin et al., 2006, 2009) each play a role.

Although Core French is the most common route through which French is taught across the country (Canadian Parents for French, 2019), research has consistently decried its systematic devaluing (Knouzi & Mady, 2014; Lapkin et al., 2006). These programs are considered underfunded, under resourced, inconsistently supported, and met with apathetic leadership (Kissau, 2005; Smith & Arnott, 2022). Core French is delivered in short periods, usually

[8] Unless otherwise specified, FSL will be used to refer to all French second language programs - i.e., core, extended, and immersion programs (see Early et al., 2017). Core French – also known as basic French – will be the term used for the program of focus in this article.

scheduled to cover other teachers' planning time, with teachers traveling between classrooms rather than being assigned a dedicated space (Lapkin et al., 2006; Milley & Arnott, 2016). In this inimical structure, it comes as no surprise that Core French is often associated with teacher dissatisfaction, low student achievement, and student disengagement after the compulsory period (Canadian Parents for French, 2019). Yet, these challenges do not mean that Core French educators are condemned to be passive, 'small' actors in their spaces; nor is every story of FSL negative (Masson, 2018). What is important to consider is what these factors do in shaping the contextual realities and identities of FSL teachers – and what stakeholders can do with this understanding.

Professional identity is a key aspect of teaching and is perhaps even more important for second language educators compared to their generalist counterparts (Kanno & Stuart, 2011). Facets of language teacher identity influence perceptions and enactments of who or what an FSL teacher is, can be, or should be. Tensions between envisioned and enacted practice can be particularly turbulent in FSL, where compounded doubts around pedagogy and identity are seemingly commonplace (Culligan et al., 2023; Le Bouthillier & Kristmanson, 2023). Yet, few studies have formally explored FSL teachers' professional arenas, and particularly how Core French teachers' identities are positioned and enacted (Arnott et al., 2019; Masson, 2018). In addition to the intersecting factors discussed above, studies of FSL teachers illustrate the ways their identities are shaped by being a second language speaker, their language proficiency, pedagogical knowledge, and access to professional learning (Culligan et al., 2023).

Much of the existing work in this area is rooted in critical, sociocultural, and poststructural perspectives (e.g., Byrd Clark & Roy, 2022; Le Bouthillier & Kristmanson, 2023; Wernicke, 2018). Although Knouzi and Mady (2014) took up Activity Theory as a framework to explore Core French teachers' experience beyond the bodies of teachers, using sociomaterial concepts can extend this alternative analysis. The focus here is not on using concepts like the

marginalized status of FSL or the teacher shortage as explanatory factors, but exploring what these concepts *do* in these teachers' practice: what they produce together in and as the day-to-day work of FSL (Fenwick & Edwards, 2010; Jackson & Mazzei, 2017). The Deleuzian concept of becoming, prevalent in sociomaterial thinking, is one entry into this line of inquiry.

From identity to becoming

Becoming is a particularly apt, if not somewhat ironic, concept for investigating teacher identity. Deleuze (1994) considered becoming to be an antithesis to the euro-western obsession with 'identity' and 'being' as attempts to capture, (re)present, and calcify the essence of things. In contrast, becoming is the process of constant and unending transformation – understood with another cornerstone Deleuzian concept, difference – whereby things are always in the act of becoming-different rather than staying the same (Braidotti, 2013; Deleuze & Guattari, 1987). Seen in this way, who we are becoming is always shifting – dynamic and lively: "a unique instant of production in a continual flow of changes" (Stagoll, 2010, p. 26). Dispelling perceptions of ourselves as neatly bounded and static, our focus shifts to the multiplicities that work (within) this flux (Strom & Viesca, 2021). Identities cannot be reduced to binaries with cause-and-effect linearity – good/bad, novice/expert, staying/departing, etc. Becoming highlights the unforeseen nature of this unfolding. We cannot predict in advance what will be produced, only that it opens up new possibilities for that emergence (Deleuze & Guattari, 1987).

When thinking about identity – or perhaps, more appropriately, we might refer to it as becomings – "one's self must be conceived as a constantly changing assemblage of forces, an epiphenomenon arising from chance confluences of languages, organisms, societies, expectations, laws and so on" (Stagoll, 2010, p. 27).

Sociomaterialist approaches to the concept of becoming are already present in research on teacher identity development (e.g., Rice, 2021; Strom & Viesca, 2021). These studies

emphasized that identity is not a stable trajectory, but a context-sensitive, forceful, and (un)timely production. Teacher becoming is therefore not contained to Bachelor of Education programs, certification, or securing full-time employment, where the identity of 'teacher' is achieved, but experienced differently throughout their professional journeys. These becomings, too, are constantly changing (Stagoll, 2010). What this understanding offers is a recognition that we must consider the fluidity and messiness that results from the entangling of different factors, whether mundane or extraordinary. The question becomes how teachers engage these different possibilities, and how they might work (differently) through the untameable complexities of their professional practice. This leaves the empirical task of following these doings in each new moment (Waterhouse, 2012).

Methodology

The exploratory study from which this article derives involved a series of Action Research projects with five elementary Core French educators in eastern Ontario. These teacher participants had between five and 12 years of experience, mostly in FSL classrooms. Each taught a combination of grades one to eight, usually one class per grade offered in the school. One teacher had a dedicated classroom in a portable, while the others moved between homerooms using a cart. The three female-identifying participants completed their bachelor's degrees with a teachable focus in FSL, while the two male-identifying participants initially "ended up" in French due to their prior linguistic proficiency (see Table 1).

Table 1
Portrait of Participants

Name	Gender	Years of experience	Grade assignment	Delivery	FSL colleagues in school	Study participation
Aaron	M	12	1-8	Cart	Yes – same grades	Sep-Jun
Freya	F	6	1-8	Cart	No	Sep-Oct
Grace	F	8	1-8	Cart	Yes – same grades, part time	Jan-Jun
Peter	M	5	5-8	Cart	No	Jan-Jun
Vicky	F	10	1-6	Classroom	Yes – different grades	Sep-Jun

Note. All names are pseudonyms.

During the 2022-2023 school year, the teachers met with me (author) individually to discuss current practices and co-design lessons. I entered into this project as an FSL teacher myself, who was currently supply teaching in that board, to be a collaborator and (critical) friend in their classrooms. The teachers then taught the lessons, which I usually observed and/or supported as a co-teacher. Two participants completed the full study, while others either joined later (two participants joined around January 2023) or stopped early (one participant completed the initial two months of the study). I conducted full-day classroom observation visits with each participating teacher two to four times per month. I collected artifacts from the classrooms, as well as files related to the lesson plans. Additionally, three semi-structured interviews were scheduled throughout the year as dedicated times for reflection and exploration of the process thus far.

Rhizoanalysis

The research followed the participating teachers through their sociomaterial experiences, and the ways in which becoming is co-produced within these contexts. Inspired by Deleuzo-Guattarian philosophy, Fox and Alldred (2022) suggested possible functions for sociomaterial analysis, including:

(1) to identify human and non-human relations that assemble around particular events;

(2) to disclose the affects (capacities to affect or be affected) that draw these relations into assemblage. These affects might be physical, psychological, social, economic, etc.;

(3) to identify the capacities produced in bodies and other matter by these affects – what they can do;

(4) to assess if there are micropolitical consequences for bodies or other non-human elements in the assemblage, in terms of how capacities are either constrained (specified) or enabled (generalised), or if bodies are aggregated by particular affective flows in the assemblage. (p. 632)

One way to perform these processes is through rhizoanalysis. Drawing on the concept of the Deleuzo-Guattarian rhizome – a connective structure "that allows for propagation in all directions" (Waterhouse, 2012, p. 135) – rhizoanalysis emphasizes relationships within and across data in order to open up thinking and discussion. Rhizoanalysis is positioned as a relational analysis practice which centres asking questions to explore, disrupt, and think with the data (Bangou, 2020). This approach promotes experimentation and thinking about connections in the study, rather than classifying, representing, or describing experiences. In the rhizome, similar to Vannini's view of empirical narratives, "it is no longer what happened that matters so much, but rather what is happening now and what can happen next" (Vannini, 2015b, p. 11). The focus on working within ambiguity and multiplicity deny any one actor from giving 'complete' or 'essentialized' understandings of their realities (Miller, 2017). Instead, mapping the materiality in the co-production of practice can orient us towards the gaps, silences, and assumptions that develop within the lives of participants and in our inquiry. It is impossible to say when a becoming "starts" exactly, yet we might take particular moments as entries into understanding these flows (Dania, 2024).

In this study, I explored the data components (interview transcripts, observation notes, and lesson artifacts) to consider how different moments produced thoughts, disruptions, and

affective encounters – both in-the-moment, and while reviewing the files. Taking the lead from Nikula et al. (2023), I looked for terms that repeated in the different participants' data as my entry into their data assemblages: admin, collaborate, luck, time, cart, etc. Unlike qualitative coding, which might then seek patterns or themes to structure the analysis, reading in and across the connections brought various elements of the study to the fore in my thinking, which served as the basis for the vignettes and quotes below. The scenes presented in this article emerged out of a desire to resonate with, trouble, question, and inspire thinking around FSL teacher becoming. Connections in this large data set were made as a result of their actual and perceived capacity to affect (and be affected by) the participants, the study questions, the author's thinking, other researchers, scholarly literature, the journal audience, etc. In short, they are intended to be taken up – used, discussed, taken apart, reinvented, and so on.

Vignettes can be anecdotes, excerpts, or reimaginings that serve as points of entry into the rhizoanalysis (e.g., Masny, 2014). In sociomaterial studies, vignettes become part of the research assemblage – simultaneously, they are affected by the data, researcher, theoretical perspectives, etc., while also becoming part of the data themselves. Additionally, the vignettes affect the analysis and writing of the project, rather than just being a product of it, and thus co-produce the accounts of teacher practice (Adams & Thompson, 2016). They are a way of (re)connecting with the data and experiences in a project which cannot be sensed directly, but open new possibilities for analysis with which the reader can engage (Sherman, 2021). Here, vignettes are a way to experiment with affects, concepts, and questions in different combinations. My aim is to provide snippets of what emerged that "are inspired by and feel coherent with the world as encountered – while simultaneously underscoring the situatedness, partiality, contingency, and creativity of that sense-making" (Vannini, 2015a, p. 318)[9]. The current article was guided by thinking with the following questions:

[9] Certain details in the vignettes have been adjusted to maintain participants' confidentiality.

1. What connections emerge when teachers discuss and do FSL education? What do these connections produce?
2. How might Core-French-teacher-becomings be materially enacted?

Interrupting this flow, I take a moment here to explore how this analysis emerged. In this article, I lean more on the side of qualitative analysis than might be possible in other rhizoanalysis in order to produce a gentler on-ramp for those readers who might not be familiar with the style. While generating the vignettes, I sent drafts of the scenes to some of the teachers. This choice was not intended as a form of member checking, but to see what it did for them and their thinking. Since the participants can see vignettes from their immediate context, as well as those of other Core French classrooms in the local area, I wondered what resonated with them and how I might use those understandings to (re)frame my writing going forward. Unsurprisingly, the vocabulary and mannerisms of sociomaterialism made the framing of those scenes difficult to engage for the practitioners. And, as described above in the literature on Core French, their main concern was communicating the realities of their classrooms and feeling as though their voices were being heard (e.g., Knouzi & Mady, 2014)., I suddenly felt doubly bound by the demands for theoretical coherence and commensurability and the possibility of these educators being able to enter into this article meaningfully.

This disjunction was amplified by early reviewers from journals who were also not familiar with sociomaterialism. Responding to their feedback, I found myself increasingly (re)presenting the scenes with more description than intersecting them with rhizomatic concepts and questions – I was asked to provide clearer 'thematic' links and implications, more explanation of sociomaterial concepts, and limiting the amount of perceived 'researcher commentary' in the scenes. This was later troubled again by a different set of reviewers who suggested I reverted some of those changes. Thus, I offer the following vignettes as one

instantiation of this process – an example of what it might be – while acknowledging the tensions at play in this current framing.

Vignettes

The following vignettes were inspired by a participant comment which positioned FSL as "scattered" across anglophone school boards – a reference to Core French teachers typically being the sole French language teacher in a school. Taking this thought further, I wondered about the ways in which Core French was scattered within classrooms, schools, and the board. Moreover, given the resonance of that 'scattered' nature with rhizomatic thinking, I considered what this inquiry would mean for the ways in which the subject is materially distributed and performed in these different assemblages. Vignette one explores the process of becoming-different as Core French teachers transition between classes. Vignette two considers the boundaries and in-between-ness of Core French within space and peer relationships. Finally, vignette three positions the tenuousness of Core French teachers within school culture. These varying scenes provide entries into the realities of these participants, with each vignette juxtaposing multiple experiences.

Vignette one: "Who I'm going to be for the next 40 minutes"

Quickly flipping through loose papers and plastic folders on her cart, Freya muttered to herself "I need to figure out who I'm going to be for the next 40 minutes," as she prepared for the upcoming period. In the switch from teaching grade eight to grade three, the phrasing stood out as passing beyond 'what' she was going to do into a more encompassing transformation of 'who' she was going to become as she entered that space. At play in these transitions was a sense of becoming different with each class: I considered how the teacher-student-classroom-lesson-

materials assemblage affords new possibilities and constraints as she physically moves through the school space (Dania, 2024).

This becoming is produced within a complex assemblage of entities – material, discursive, technological, expressive, etc. Not only are the grade levels different, but the dynamics of the group change within and across classrooms: the energy, interests, number of students, personalities, learning needs, norms, room setup, resources, pedagogical approaches, and, and, and… Thinking with the materials in these spaces, this first scene explores what these entities co-produce with the different teachers, and how the teachers become-with them.

> *10:35-11:25 – Grade 7 – Aaron stands waiting outside the closed classroom door, clearly visible through the glass panels, staring up at the digital clock which displays 10:36 in bright red strokes. The class should have begun at 10:35. The homeroom teacher glances up briefly from the novel they are reading aloud to the class. A few students point at Aaron and turn to each other to comment or laugh – likely acknowledging the shared joke: Aaron never enters this class on time, even when he could. This is not out of disorganization, but to performatively lampshade the transition to French that happens each day. So, nothing changes. Aaron continues staring; the homeroom teacher continues reading. It isn't until the clock flicks to 10:37 that Aaron suddenly enters with a casual "*Bonjour tout le monde [Hello everyone]!*" The homeroom teacher smiles amicably, closes the book, and begins collecting items for their break. Aaron opens his laptop and launches into an explanation of the day's activity.*
>
> *11:55-12:45 – Grade 6 – Students remain quietly seated while Aaron enters the room. The homeroom teacher nods a silent goodbye as she passes. Once positioned behind the teacher's desk, Aaron asks the students to move their chairs into a circle around the centre of the room. The sounds of chair legs scraping and bodies moving fill the space. The atmosphere is uncomfortable; a palpable tension strains the normally upbeat atmosphere. Aaron leads the students through a choral reading of the script they are practising, pausing occasionally to ask clarification questions or to have certain students model saying difficult words. At the end of the script, he addresses the room: "I'm sorry we had to do this. It was quiet and it was boring – but our last class was unacceptable. However, today, you were focused and your pronunciation was great. So, bravo to you. Let's do better next time."*
>
> *12:45-1:35 – Grade 3 – Aaron opens the classroom door slightly, sliding a fuzzy orange hand puppet through the opening so only its large head is seen. The puppet, named Gui, scans the room quickly before turning its head to where Aaron is standing behind the door. He projects a gruff, surly voice: "*C'est pas vrai [You're kidding]! *Not these kids again!" The classroom echoes with laughter; they know Gui 'dislikes' the class. "Do I have to?" Gui asks in a whiny tone. The class begins to excitedly chant "yes, yes, yes," but Gui cuts through with a loud "*Quoi [What]?*" After a moment of pause, the students take up repeating "*oui, oui, oui!*" Aaron steps into the class, puppet still attached, before taking a seat in the corner of the carpet area.*

As presented through Aaron's experience, this transition as an itinerant teacher with a cart provides openings for dramatic shifts in tone, tact, and becoming. In the first scene, he leans into an ongoing joke about his lateness to class. The gag, which originated early in September after a late handover from the teacher in the previous class, becomes a routine part of his entry to the grade seven room that includes the students, the homeroom teacher, and the digital clock. What could be a joke at his expense – having to move between classes and be a visitor to the classroom – is recast in this co-produced performance to position Aaron as a humorous, engaging member of the community. We might wonder how Aaron (un)consciously takes these factors into consideration as he participates in those different classroom assemblages. He could have rejected this joke, for instance, as a slight against his professionalism that amplifies his already complicated legitimacy as an FSL teacher (e.g., Knouzi & Mady, 2014).

When entering the grade six classroom, in contrast, Aaron becomes noticeably different. His stern demeanor and lack of a cheery greeting convey his disappointment and frustration about the previous day's antics (Aaron-affect). Having debriefed with the homeroom teacher, she enters this production by mirroring his serious attitude as she exits the room (Aaron-affect-teacher). His normally active and communication-oriented lesson is replaced with a highly structured and controlled activity (Aaron-affect-teacher-lesson). The tone softens over the course of the period – conveyed in his parting words – shaped by the students' behaviour within the revised expectations (Aaron-affect-teacher-lesson-utterances). For the grade threes, the puppet enters to produce yet another becoming. For Aaron, this class's high energy is reflected in his entrance (Aaron-students-affect-puppet). For Aaron, this becoming is physically performed through his entry to the class – in combination with the puppet, door, characterization, etc. Aaron's comedic and charismatic character shines as he tries to transform out of the atypical harshness of the grade

six period, and step into his usual persona for the grade three class (although the severity of Gui's interjection may expose some lingering affect).

Like Aaron, Vicky used these transitions to form differing boundaries around what she, and the class, could become. After several weeks of altering her response to disruptive or off-task behaviour, she created a seating chart for the grade four and five classes in December. While other classes were still permitted to select and move between different seats, as she considered choice important to her teaching philosophy, she cuts off certain becomings "even though I don't like that approach." Thus, her becoming was affected by the conditions in-the-moment and those that repeated, shaping how her (idealized) practice is performed under different circumstances (Strom & Martin, 2022).

The teachers with varied schedules also approached their becoming differently in response to the time of day and environment. Peter worked with the grade eight class during first period on Monday morning, but at the end of the day on Friday. On Mondays, the lights would be left low or off, a PowerPoint outlined the learning objectives for the week, lesson activities were more individual, and Peter would circulate to chat quietly with students about their weekends. On Fridays, students were usually up and moving – performing, filming, dialoguing, making. The room was filled with chatter, and Peter would be gesticulating broadly, (over)acting with students in their groups, and calling out instructions to the room. He explained that "my lessons have momentum over the week. We start slow, with concepts and patterns, then get them into practice. The older students are tired at 9 a.m., but the fact that they don't moan about French is a win." These routines build flexible structure in response to these changing dynamics; these simple choices extend beyond what might be traditionally considered pedagogical may influence how these teachers become through those flows of affect (Dania, 2024).

Vignette two: "I'm here to help everyone else deliver their curriculum"

As in vignette one, for all but one participant, the transition between classes involved moving their materials to other rooms. Even Vicky, with her assigned classroom in a portable, entered the main school building to collect and drop off students in their homerooms. While she had more control over the norms of how students entered her classroom, the way the space was arranged, and so on, the transition time still brings French (temporarily) beyond the portable and connects her with colleagues and homerooms. For those on a cart – whether it was just a few doors down, or across the entire school premises – the ongoing relocation collides the Core French program with different spaces, becoming within differing boundaries.

> *Research journal. October 7. I parked Freya's cart at the back of the grade two classroom, while she ran to the bathroom, just before the end of recess. I was setting up the laptop when I heard her come in. "No, no, no. Mrs. Galloway doesn't want me to put that there." She grabbed the sides of the cart and pushed it into the corner where the teacher's desk met the whiteboard. Turning back to face the room, she spotted another issue: "Ah. And I try to just avoid having things on the reading table."*
> *"Oh, I'm sorry!" I exclaimed. "Let me grab those handouts." Catching her eye, I quietly asked, "is that… normal here?"*
> *"Just this class. We don't get along." Freya's face was set in a forced smile.*
> *I gestured to the reading table. "So you can't- "*
> *"No. These are the 'terms' for me when I'm in this classroom" she added, making air quotes.*
> *"…. And the principal?" I continued, even more softly, after taking a breath.*
> *She sighed. "This is what it'll be for this year, without a grievance. Anyway, she's retiring."*
>
> *Research journal. March 1. Peter and I entered the grade eight classroom, which had been routinely rearranged for the start of the new month. A student came up to me, excitedly bouncing and pointing: "[Author]!* Regarde l'art [Look at the art]*!" Two of the walls exhibited a collage of canvas paintings the students had been working on in the interdisciplinary unit over the past three weeks. The names of the elements of art, printed in English and French, filled the remaining space on the display boards. "*C'est impressionnant, n'est-ce pas ? [Isn't that impressive!]*" I respond to the student, who nods and skips back to their desk. Peter explained, "Mr. Grey did that after school. He said he owed me for basically leading the unit. It looks great!" "What was he doing in the art periods?" I asked. "Mostly what I told him to do," Peter laughed. "He's not confident in art, so I got him to do some 'intro to the elements' mini lessons and work periods to finish things up. So, it really worked out. And you know I'm good with running the show, ha!"*

These contrasting scenes position the ways that these teachers, and their programs, might become in differing spatial and relational assemblages. While the FSL curriculum is theirs to produce, the

unfolding is deeply entangled with the ways in which the homeroom teachers co-produce the program.

The participants noted the hybridity of becoming within a space that is not their own, and how that influences each class. For the French period, the room is theirs to use, but not entirely. Some things in the room – like the cart and any anchor charts – "belonged" to French, but these stood out among the materials that were more strongly associated with the homeroom teacher and the students. Some teachers "allowed" varying amounts space and access to the French teacher, with Freya's case a more extreme example of becoming in relation to these permissions. Yet, hers is seemingly not an isolated occurrence; Aaron recounted a similar story: "luckily not the case at this school, but I've had teachers refuse to give up shelf space, or even a drawer. I couldn't leave something on the countertop, the board, or hang something on the wall. It was wild." Spatiality, then, is inextricably relational.

Differing relationships with colleagues and spaces shape what can be produced by these teachers. The participants described the impact of colleagues who were "supportive" and "respectful," those who tolerated or were "neutral" to them, and those who would – consciously or not – disrupt or "undermine" the work of Core French. As in the vignette, what Peter is able to do and become (e.g., through collaborating on an interdisciplinary art unit with Mr. Grey) stands out from what Freya "must" do to minimize conflict with her colleague, hoping to reduce the effect of collegial conflicts on student learning. In a similar vein, during a November observation session, Aaron recalled that he had recently confronted a teacher for handing out forms while he was instructing: "that was not okay. She was sorry, and just wasn't thinking about it – the optics, I mean – but still." For Grace, being asked to "give up" class periods to allow the homeroom teacher to rearrange plans was another example of this: "if it's once or twice a year, then it's fine. But I don't want to be seen as optional, or less important than the other subjects." Thinking again

with the status of the subject, Core French teacher becoming therefore implicated defending and advocating for their work (Knouzi & Mady, 2014).

Becoming within this balance seemed to require, as Vicky put it, "a lot of give, for a little take." As the vignette title quote suggests, Vicky took up interdisciplinary work to make French curriculum more "relevant and engaging" for students. Yet, this collaborative effort was often not reciprocated by her colleagues. Vicky timed her units to coincide with topics in art, social studies, and physical education – asking what her colleagues were doing and building on their curricula – but found the other teachers were intimidated by or disinterested in the idea of bringing French into their classrooms. She explained, "there's so many ways we could manage it. I just haven't had any uptake yet." Vicky continued to position herself as a 'helper,' however, in order to build common ground with her non-FSL colleagues. She likewise made efforts to eat lunch in the staffroom, rather than staying in the portable, to "be part of things." While French teachers might have close physical proximity with other teachers when entering their classrooms each day, their connections with colleagues and the school culture generally may be quite tenuous. Since assemblages as made up of connections strong and weak, enduring or fleeting, and so on, we cannot assume that appears to be or what "should" be connected indeed are (Fenwick & Edwards, 2010).

Vignette three: "I'm very lucky to have my own classroom this year"

While working within the temporality, spatiality, and changeability of their schools, these teachers were also aware of the trends and discourse surrounding FSL education in Canada, and the ways these intersected with their experience. For these teachers, the female participants in particular, the 'threat' of their conditions becoming (more) unfavourable could surface unexpectedly in their work.

In advance of moving offices over March Break, Grace – along with her colleague Derya – is packing up her desk. The French office contains four modular cubicles, a large whiteboard, and mismatched shelving units. As the teachers move items into boxes over lunch, the vice principal leans through the doorframe:

> *Vice Principal: "That shelf looks pretty rickety, eh?" pointing at a four-tier wire unit in the corner.*
> *Derya: "That one was only put in this year."*
> *VP: "Ah. Why are there so many shelves in here?"*
> *Grace: "Because we had to take everything out of the French resource room."*
> *VP: "I thought this was the French resource room?"*
> *Derya: "Then what's the room beyond the labs?"*
> *VP: "The science resource room."*
> *Grace: "The room that's still half empty? That used to partially be the French resource room?"*
> *VP: (stammering) "I..."*
> *Grace: "We're just kidding! It was mostly full of old stuff we didn't use anyway. We threw a lot out last year – VCRs, cassettes, CDs. Plus, we got those books into the library where they belong. So we don't have a storage problem in here. For now."*
> *VP: "I don't feel strongly about it. Who asked you to take stuff out of there?"*
> *Grace: "This has been in the works for… two years? Before any of our time here. But the principal, and you I guess, have echoed that plan."*

In this vignette, the French teachers seemed to toy mischievously with the vice principal – smiling and laughing, perhaps given their positive relationship – as he stumbled into the topic of storage. The history and impact of the decision to dedicate the large storeroom to lab equipment was unknown to him, since he was new to the school in September, yet that tension was visibly at play in the French office-cum-resource room. The full, mismatched shelves around the office contrasted with the deep, built-in wooden ledges that lined the science resource room. The folders, posters, textbooks, dictionaries, games, and supplies were normally piled around the office, overflowing the shelves, yet the vacated space in the storage room was still not repurposed nearly a year later.

For the vice principal, the science resource room was simply that, whereas for the Core French teachers the undertone of "always making do with less" echoed. Grace did not press the point, and switched tone unexpectedly in the dialogue. She later explained that the resource room was much less important than her amicable relationship with the administrators. For Grace, it was simultaneously a nonissue (since they did not immediately need more room), and a point of

contention (that the program continued to be overlooked). Grace admitted that neither teacher had brought this subject to the administration directly, accepting it as "normal." Instead, she reflected on the event in relation to the "wins" they had made: the reading books were in a dedicated carousel in the library, they had received funding for their Carnival, etc. Her becoming in these moments involved an interplay between the expected negativity surrounding Core French, and hope considering the success they had in the school.

Indeed, over the course of the project, the participants frequently associated "luck" with the positive features of their work, such as having: their own classroom, compassionate school administration, students who enjoyed French, etc. They seemed keenly aware of a confluence of opportunities, approvals, and serendipity that allows them to plan and function successfully. As a result, there was a tenuousness to becoming in relation to these circumstances – as though they were temporary, that they could be taken away. For instance, Vicky had repeatedly lost her classroom over the years, Aaron had dealt with openly antagonistic leaders, Freya had her office desk moved into the photocopying room, etc. The teachers hesitantly become-with any promising steps forward, as they seemed to recognize a pervasive norm that this progress may only be provisional: subject to change as their context transformed.

Discussions

The goal of this article was to explore how a sociomaterial sensibility might extend understandings of FSL teacher identity and the ways in which teacher becoming is entangled within their professional assemblages. The sociomaterialist orientation moves beyond descriptions of the person and their identity, with a focus on what is produced within the material and affective flows (Forte, 2021). With the human decentred in analysis, the fact that most of these participants use a cart is not the focus, but how this movement throughout the school highlights different boundaries and becomings in Core French. While these vignettes are only

"snippets of what are actually large and complicated webs of relationships, agencies, and power dynamics in nests of communities" (Rice, 2021, p. 535), they serve as a means to engage the affects specific contexts to FSL and its teachers. We cannot understand or tinker with the becomings of these teachers separately from the sociomaterial conditions which give them shape (Dania, 2024).

In terms of the connections that emerge when teachers discuss and do FSL education, the first vignette presents how Core French teacher becoming might move within as well as between classroom periods. The successive changes in classes every 40- or 50-minutes entangle these teachers in different material conditions that co-produce their becoming. These teachers (re)acted to unpredictable and uncontainable events in the moment, and prepared themselves for situations that repeated – articulating, trying out, and developing different identities in response to these unfoldings (Johnson & Golombek, 2020). Some of these identities were (un)consciously incompatible with others (Borg, 2009), yet emerged within and as a product of different sociomaterial assemblages. These contextual and multiple becomings reinforce that teachers are always acting *with* other entities (Zembylas, 2017).

Vignette two opens up the contingencies that are produced as Core French teachers intersect with spatial and collegial relationships. While the FSL teacher is charged with delivering the language program, the realization of this curriculum in practice is far more complex. These FSL educators continue to perceive themselves in relation to the majority – the generalist, English teacher population (Smith & Arnott, 2022). The teachers became-different through accepting and rejecting their position as marginal in their schools, and the desire to bolster their professional identities (Le Bouthillier & Kristmanson, 2023; Lapkin et al., 2009). Perhaps these participants were seeking to claim space and legitimize themselves as equals in their schools – with students, teachers, parents, and administrators – yet they do so within the limits of what was possible with different actors. Freya and Peter's contrasting examples might prompt us to consider the material

realization of the perceived hierarchy and relationality between teachers, and how these discourses flow throughout the school community (Knouzi & Mady, 2014).

Vignette three continues this exploration through 'broader' connections with school leaders and administrative practices. While the teachers generally had positive relationships with their administrators, unquestioned decisions could still reinforce marginalizing experiences. While it is not uncommon for FSL teachers to lack administrative support or not feature prominently in school priorities (Lapkin et al., 2009), the situation is not an either-or exchange. What seemed to be at play for these teachers is the 'normality' of disenfranchisement in schools; an established reality that may no longer inspire (pro)action (Milley & Arnott, 2016). Grace's change in tone in vignette three, and her later insistence on the positives that had occurred that year, embody this contention: she is simultaneously frustrated with the status quo, yet anxious that her 'luck' might change if she pushes too hard. She could have used this conversation to vent those frustrations, but her desire is cut off by other forces in the moment – this might include her concern for their collegial relationship, awareness of the presence of colleagues and myself as an outsider, a subtle change in body language, or a student passing in the hallway. The dynamic organization of these becomings must be considered as we attend to the differing force producing these moments (Dania, 2024).

Wonderings

Core French teacher becoming is therefore materially enacted through a coming together of discourse, affect, materials, and bodies (Toohey, 2019; Waterhouse, 2020). The changeable conditions that co-produce these teachers and their practice may "not always or necessarily reflect the pedagogical choices or beliefs of the teacher and can be more of a response to other non-pedagogical variables" (Knouzi & Mady, 2014, p. 76). They may take up identities that are contingent and context-specific – a result of the regular transformations in the material

composition of their day. The frequent shifts in becoming are perhaps more accessible to itinerant French teachers, as their schedule allows them to produce themselves in ways which might differ from one class to the next. Yet, teachers may also be drained emotionally and physically by this unending change – future research might investigate the intersections of this becoming with wellbeing, for example.

These data vignettes continue explorations of Core French teacher experiences (e.g., Lapkin et al., 2006), grounding them in the sociomaterial assemblages of current classrooms and schools. What is increasingly clear is that "the success of [FSL] programs in Canada depends upon the success of its FSL teachers" (Masson, 2018, p. 78), yet their conditions seemingly remain "worse than those for teachers of other subjects" (Kissau, 2005, p. 14). The materiality of their experience provides insights into the messy simultaneity of hope and frustration, opportunity and contingency, legitimacy and disenfranchisement, and, and, and… that characterizes Canadian FSL education. These teachers do not only have negative experiences, nor are they resigned to the status quo - these complexities remain woven into their professional realities. In light of these experiences and potentialities, we can (re)shape our approach to FSL teacher support – including teacher preparation, identity development, and retention (Masson & Azan, 2020; Wernicke et al., 2022) – with particular attention to how the unique position of FSL provides new openings for teacher becoming, and simultaneously closes others (Deleuze & Guattari, 1987).

When researchers and educators consider Core French teacher identity beyond the confines of the human body, we are oriented towards the entanglements at play in the rollout of these programs. While this is not in itself a revelation in FSL literature, the sociomaterial framing of this work redirects our efforts to experiment beyond a neoliberal, humanist lens. These non-human factors are not sideline players or effects to be tamed through further training for individual teachers; these challenges are simultaneously spatial, relational, material, and systemic.

In line with sociomaterial analytical practices, this thinking produces questions, connections, and disruptions for both the context of Core French, and research conducted within it. Rather than decontextualized recommendations, I offer these parting thoughts as provocations for reflection and for potential action – a tentative experiment "on the threshold of knowing, from which something unexpected might issue" (MacLure, 2013, p. 181). What do we want Core French to become? How can we engage with(in) these assemblages to change the way these teachers are able to work within their contexts? How do we ask questions which reflect the sociomaterial (im)possibilities for teacher becoming theoretically, methodologically, and pedagogically? If we continue to overlook these forces and affects, I suggest that we will continue to make little headway on addressing the challenges of this program and its efficacy. Such sociomaterial reorientation is thus not just a hopeful reflection, but an "ethical imperative" (Strom & Viesca, 2021, p. 222) for improving the state of Core French.

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Chapter 4

Article 3 – Technologies and sociomaterial tensions in the second language classroom

This is an Author's Original Manuscript of a submitted article draft.

Smith, C. W. (submitted). Technologies and sociomaterial tensions in the second language classroom.

Abstract
This exploratory study was inspired by the question 'what do digital tools (un)expectedly produce in the second language classroom?' Examining the experiences of two focal French as a Second Language teachers, this article uses sociomaterial theories to explore how the confluence of students, teachers, technologies, and other materials produced disruptions and new possibilities for language learning. The analysis, presented through vignettes of lessons involving Scratch coding and WordReference.com, maps these tensions and the ways the various actors respond to the (un)expected outcomes. These moments reinforce that technology integration in language learning is not simply a manifestation of the teacher's pedagogical planning, but an unfolding with multiple possible becomings and unanticipated trajectories. The article contributes to the growing corpus of studies employing sociomaterial approaches, and considers the importance of other materialities in understanding the role of technology in language learning.

Keywords: French Second Language; Elementary; Coding; Translator; Dictionary; Sociomaterialism

Introduction

Although digital technologies such as laptops and web-based applications are relatively new arrivals to classrooms as materials, they have already established a foundational place in school ecologies (e.g., Burnett & Merchant, 2020). So much so, in fact, that these devices and their uses have become naturalized – their absence from a classroom seemingly more remarkable than their presence (Kessler, 2018). This digital era has brought a proliferation of devices, resources, and opportunities for participation in language teaching and learning, some of which would be impossible without them (e.g., Kern, 2021). For scholars, the potential use of these devices requires renegotiating longstanding pedagogical routines and processes as the needs, concerns,

and responsibilities of students and teachers are revised in light of these new capacities (Adams & Thompson, 2016). Yet, the swift, practicality-driven adoption of educational technology has been criticized for largely entrenching existing methods and precluding "theoretical reflection, imaginative mis/appropriation, or un-preprogrammed agency" (Thumlert et al., 2019, p. 141).

A focus on the predetermined capacity and impact of the tools (technological determinism), and the counter narrative that technology is passive and controllable by the user in achieving their goals (technological instrumentalism), collide in a messy dichotomy in teacher discourse (Anwaruddin, 2018; Psaros, 2022). Particularly visible when technologies are framed as 'tools,' "technologies are seen as things that are fixed in nature, as neutral, or perhaps adaptable, flexible or multifunctional, but nonetheless devices waiting to be 'applied' in different activities" (Burnett & Merchant, 2020, p. 19). Despite the complexity of this entangling, classroom technology integration from such perspectives is positioned as finding and selecting the right tools, and ensuring teachers and students can operate them efficiently, rather than addressing the dynamic activities of teaching and learning (Cerratto Pargman & Jahnke, 2019). In these cases, the influence of shifting values, discourses, and material conditions is lost (Kopcha et al., 2020).

In an effort to look beyond conventional roles and routines in educational technology, scholars (e.g., Bhatt & de Roock, 2013; Guerrettaz, 2021) have engaged sociomaterial approaches to consider how "actions and pedagogy are shaped by the space, the technological artefacts in it, and the relations between them" (Sherman, 2021, p. 384). While functions like machine algorithms contribute to what unfolds in classroom spaces (Bhatt & de Roock, 2013), we may not be able to understand or follow all the co-constitutive parts of complex technologies, such as generative artificial intelligence (AI), which remain black-boxed (Bearman & Ajjawi, 2023). For teachers and students to succeed in language education with technology, there is a need to work within ever-changing conditions – amidst ambiguity, disruption, and uncertainty (Bangou &

Vasilopoulos, 2018). The goal for research and practice is to better understand what is unfolding in classrooms when technology is used, rather than what is expected to occur (Jahnke, 2019).

Sociomaterial studies are interested in the intersections of the social, technical, cultural, pedagogical, discursive, textual, and other forces and (im)material bodies that emerge as part of technology integration (Nichols & LeBlanc, 2020; Psaros, 2022). This orientation offers insights into the complex forces and movements that shape possibilities in educational spaces (Kumpulainen & Kajamaa, 2020). Within this complex network, research highlights that teachers often feel unprepared to tinker and respond productively to unanticipated moments in technology integration (see Bangou, 2020; Thorne et al., 2021). Students, in contrast, are often accustomed to the interactive, playful, and variable side of digital tools and games from in- and out-of-school experiences (e.g., Beavis et al., 2015). As just one potential site of tension in the classroom, a sociomaterial framing might investigate how humans, texts, technologies, intentions, practices, and other factors enter and leave these dynamic networks, and what they produce together with(in) language education (Adams & Thompson, 2016).

The focus of this study was on what these sociomaterial entanglements produce in the second language classroom. While initially centred around the pedagogical implications of technology in the language classroom, I was caught by the ways in which the teacher participants might simultaneously seek control, but also overlook the ways in which they were already working with the unforeseen in their practice. During their interviews, the teachers focused on the ways in which technology could be used to consistently predict effects – 'causing' motivation, on-task behaviour, resource sharing, etc. While the participants might prioritize these pre-set outcomes, they also responded to some glitches, distractions, and interruptions in ways that opened up new opportunities for engagement with(in) language learning. These disturbances can provide openings into 'seeing,' questioning, and engaging technology in critical ways (Adams & Thompson, 2016).

Inspired by Dagenais and colleagues' (2013) questions, this inquiry was reoriented to consider: what do digital tools (un)expectedly produce in the second language classroom? What sociomaterial tensions and disruptions do they make visible? My impetus was to take a purposefully unusual look at unusual moments: to see the tensions as both ordinary and exceptional, and to follow what they produced. I position these tensions as emergent, relational, and complex intra-actions among the various actors (teachers, students, materials, affects, activity, etc.). These moments reinforce that technology integration in language learning is not simply a manifestation of the teacher's pedagogical planning, but an unfolding with multiple possible becomings and unanticipated trajectories.

Literature Connections

Part of the ontological turn (St. Pierre, 2013), sociomaterialism is a term for a confluence of 'post' approaches that gained attention through and since the 20th century: posthumanism, poststructuralism, non-representational theory, feminist (new) materialism, complexity theory, assemblage theory, and many others (see Bangou & Waterhouse, 2021; Edwards & Fenwick, 2019). What these theories share is an interest in matter in action: how human and non-human entities bring forth our everyday activity together. The human element is not disregarded, however, the centrality of human cognition and agency as the be-all in understanding our realities is displaced (Hultin, 2019). Our worlds are seen as emerging as heterogenous elements meet. Following Barad (2007), the perceived boundaries between bodies are also blurred, such that the focus on individual beings is similarly shifted to emphasize the relationship between objects; rather than inter-action, which maintains this bodily delineation, the interest is on acting-with(in), or intra-action. For education, this thinking entails that teaching and learning activity is embedded and networked, continuously performed into our reality through intra-actions among dynamic,

shifting contexts and conditions (Strom & Viesca, 2021). Technologies are one such material in these networks.

As (digital) technologies are an established part of our personal and professional lives, they "can no longer be adequately thought through the lens of 'extension' but must instead be understood as profoundly implicated in our being" (Cecchetto, 2013, p. 5). Language teachers often have access to a wide, ever-evolving range of digital devices, applications, online resources, and other tools that have rapidly proliferated in educational spaces over the past several decades (Lawrence et al., 2020). Not only are classroom contexts changing, but so are the popularity of different tools, school infrastructure, the digital skills of students and teachers, and so on. Relevant for the context of this study, recent work by Boreland et al. (2022) and Smith and Arnott (2022) explored popular tools and platforms used by FSL teachers during the COVID-19 pandemic. These options included productivity and collaboration tools (e.g., Google Classroom, Zoom); language learning and translation apps (e.g., Duolingo, Google Translate); media (e.g., CBC RadioCanada, TV5Monde); teacher planning websites (e.g., Idéllo); educational games (e.g., WordWall, Blooket); and student-oriented resources (e.g., 1jour1actu, Boukili).

Understanding how learning takes place within these networks requires reframing assumptions around technology use (Rice, 2021). The capacity of digital tools to transform and be transformed within classroom assemblages is commonly framed in terms of affordances; in sociomaterial accounts, this term implicates perceived properties and creative possibilities, and how these affects are (not) actualized in the conditions of the classroom (Sherman, 2021). What is produced with these affordances and constraints, however, cannot be known in advance – practitioners cannot assume *a priori* that the technology is progressing students towards predetermined goals (Anwaruddin, 2018). Rather, these potentialities may cut unforeseen paths which might run counter to the imagined outcomes. Hence, there is a need for ongoing skepticism

around the use of terms like affordance and technology 'enhanced' learning in research and practice (Psaros, 2022).

For sociomaterial scholars, digital technologies are themselves complex assemblages that emerge from cultural-historical systems (Latour, 2005). Technologies are designed, marketed, and deployed by humans, with each step bringing new influences and partialities to the process. The tools are therefore already 'distributed,' never fully contained in their immediate physical and digital forms (Adams & Thompson, 2016). Technology is thus neither ethically nor politically neutral (Weller, 2020) – it simultaneously limits and enables in ways which require critical attention throughout the process of integration. Rather than assuming what a tool will do when it is 'plugged into' the classroom (Jackson & Mazzei, 2012), the focus is on responding to what unfolds.

Methodology

This exploratory study was conducted over a 10-month period in five elementary French as a Second Language classrooms in Ontario, Canada. In this program, commonly known as Core French, teachers provide around 40-50 minutes of language instruction to students each day; in contrast with immersion-based programs, the Core French class is the only time of the day in which students in most anglophone schools are expected to formally engage with that second language content. Briefly, research in this context has long identified challenges related to student achievement and disengagement; program status; as well as teacher wellbeing, recruitment, and retention (Arnott et al., 2019; Lapkin et al., 2009).

I worked with five Core French teachers in Action Research cycles to collaboratively design lessons and reflect on their teaching practice (see Author, 2024), though only two will be highlighted in this current article. I observed their classrooms and took part in activities two to four times each month, collected artifacts, and organized three semi-structured interviews throughout the year to prompt for feedback, reflection, and exploration of the experience. Since

recording in the classroom was not permitted, I relied on frantic typing in my research journal to note utterances, actions, and feelings to serve in my later analysis.

Technology was a frequent topic in my formal and informal discussions with participants. When asked about using technology in their classroom, the teachers highlighted what technology does for them and their students – noting that students are more engaged, that it is easier to find resources, etc. Contrasting these 'positive' aspects were mentions of distractions, online safety, and the threat of glitches in their lesson plans which made them wary of relying on technology. Over the course of the study, these disruptive moments started to draw more of my attention. I took up the heuristics and practices associated with Actor-Network Theory (ANT) to explore these unfolding events.

Actor-Network Theory (ANT)

Like other sociomaterial theories, ANT is not one, but a plurality of principles and wonderings configured as a methodology. Researchers are not concerned with what ANT *is*, per se, but what ANT sensibilities *do* when employed to explore happenings in the world (Fenwick & Edwards, 2019). Originating in the work of Callon, Latour, and Law, ANT has made an increasing presence in educational research since 2010, and the intersection with a variety of contexts, methods, concepts, and theories has created broad spectra of 'ANT-ish' approaches in the field (Fenwick & Edwards, 2010).

ANT inquiries often begin with interest in "something happening" (Sørensen, 2009, p. 22) – how events, processes, spaces, networks, and other phenomena are (un)made and the effects they produce. ANT studies are deployed in ways that follow questions through contradictions, mess, uncertainty, and multiplicity – the purpose is to map relations, and to find openings to intervene and engage these realities differently (Latour, 2005). Researchers may therefore investigate elements that seem disconnected conceptually, yet are deeply entwined in practice

(Bhatt & de Roock, 2013). ANT research is interested in the assembling, (re-, de-) stabilization, mediation, negotiation, and transformation of relations between human and non-human entities.

A common ANT saying is to 'follow the actors' (Latour, 2005): to see the movements and circulations within a network. This is not an aimless wandering, but a response to doings that draw our attention for diverse reasons (Bennett, 2010). For example, researchers might begin by 'zooming in' to a certain moment and traveling with the event: the movement of an iPad between a group of students, the scrolling of thumbs on a touchscreen, the back-and-forth attention between paper worksheets and a digital projector, etc. It is important to remember that actor-networks can be endless, with a multitude of entities and connections involved (Dagenais et al., 2013). In order to make this immensity approachable, 'cuts' and excerpts become part of the research process to temporarily stabilize events, while recognizing that they are only partial pictures of what (else) might be emerging in these contexts (Barad, 2007).

It is not surprising that technology has been a consistent feature of ANT inquiry, given the field's beginning in Science and Technology Studies. As Thumlert et al. (2019) noted, "one of the reasons ANT focuses on technical innovation is because a novel mediator reminds us of, and critically re-sensitizes us to, the environment(s) at large" (p. 145). This potential has been slow to connect into studies of educational technologies, though Psaros (2022) offered an overview of several recent studies in higher education. In another example, Dagenais et al. (2013) drew on work with children's videomaking in the elementary classroom using an ANT-ish sensibility. The authors highlighted the possible transformations that emerge for understanding students' language learning experiences, redefining the actions and roles that students took up in the learning task with other material actors.

Like these authors, in this study, ANT and sociomaterialism provided a philosophical and conceptual toolkit for engaging technology in the language classroom. The purpose was not just seeing students or teachers engaging with a tool, but also the "host of interrelated behaviours,

including talk around the task, and interactions with actors (human and non-human) across different spatialities and temporalities" (Bhatt & de Roock, 2013, p. 6). I present two such moments through the vignettes below, connecting first through rhizoanalysis.

Rhizoanalysis, vignettes, and mappings

While ANT provides the tools to inquire with(in) networks, it is not equipped to theorize or guide scholars in what to think about the nature of those relationships (Latour, 1996). Rhizoanalysis, drawn from the work of Deleuze and Guattari, provides openings for thinking with different concepts, theories, affects, and so on in relation to the data. This approach engages the "multiplicity, connectivity, heterogeneity, rupture, and non-linear mapping" of elements at play in these contexts (Bangou & Vasilopoulos, 2018, p. 155). Maintaining, not reducing, the complexity of these relations is essential to sociomaterial analysis (Bhatt & de Roock, 2013). Therefore, these vignettes and figures are not presented as 'complete' or exact recountings, but rather scenes that "are inspired by and feel coherent with the world as encountered" (Vannini, 2015, p. 318); they are provocations that push us to think about what could become otherwise. Among the many entities and concepts plugged into this analysis, as explored below, include CALL, language pedagogy, electronic dictionaries, program coding, FSL, etc.

Like other scholars (e.g., Bangou & Vasilopoulos, 2018; Waterhouse, 2020), I employed actor-network mappings and vignettes as methodological acts with this analysis (Adams & Thompson, 2016). I offer these mappings and vignettes to explore configurations and practices as they were distributed among human bodies, discourses, technologies, and materialities. Like Waterhouse (2020), I position these tensions as "emerging from the rhizoanalytic process, thereby producing new problems and questions at the intersection of materialist theory and language pedagogies" (p. 143). Viewed in this way, the data provide possibilities for movement, change, disruption, and wonder in understanding technology integration in the language classroom.

In shaping the vignettes and figures, I took the lead from Leander and Rowe (2006) to "look for bits that seemed to be engaged or interjected in such a way as to make new relations possible" (p. 440). As previously mentioned, I considered these sociomaterial tensions as engaged among various actors (teacher-curriculum, student-software, text-activity, etc.). There are multiple circulations happening all at once – both within each scene, and in the play between the scenes – and I chose to provide contrasting vignettes, and figures made in differing styles, to highlight these possibilities.

In the first scene (Figure 1), inspired by the diagram in Leander and Rowe (2006), I began working with the transcribed data, laying out different utterances and actions in relation to the meow sounds. I traced connections between the different activity in the classroom and noted how certain actors intra-acted over time. Some of these convergences, for example, brought students and materials together which continued as an ensemble for some time afterwards; in other moments, the activity bifurcated into multiple paths, scattering the actors. These moments prompted me to follow more than the expected path of the activity, permitting a more complex and multifaceted engagement with the actors. Like de Freitas (2013), in reviewing the data, I noticed "a proliferation of entry and exit points . . . that erupt outward and often loop back" (p. 290). Thus, unlike more descriptive vignettes, the moments are not a linear progression and reaction to what came before: some of these paths (re-)engage with other moments, many of which were interspersed with the meowing from the Scratch program. The concept of flow and the (un)expected among the entangled relations was prominent in thinking with the data and shaping the vignette (Masny, 2014). The different styles of lines in the figure follow some of these flows around the classroom in the moments before and after the teacher's interjection.

In shaping the second scene (Figure 2), I recalled the way in which the act of submitting lines formed a queue of students at the teacher's desk. The bodies converged, waiting to engage with the teacher while holding their worksheets and laptops, forming a bottleneck in the activity. I

considered how this clustering became, in ANT terms, an 'obligatory point of passage' – a connection that separates the 'loops' of activity between the students and the goal of providing their translation for display via the projector. Looking back at my research journal, I noted how intra-actions beyond the assigned pairs were limited, and discussions with the teacher were also brief, despite texts that were communal (i.e., projected) and distributed (i.e., used by the pairs) (Guerrettaz, 2021). This configuration meant these conversations remained largely isolated from the activity around them, unlike in the Scratch activity. Hence, in the creation of the figure, I chose to leave the spoken elements outside of the activity flow, rather than embedded in the shapes. Of course, activity did pass 'around' the teacher's desk, for example, when students looked up at the projected translation and commented on its progress, or if a student yelled out for the teacher's attention from elsewhere in the room. Yet, the stability of the loops seemed to endure with the structure of the lesson. These thoughts served as a loose structure for analyzing the data, as explored below.

Vignettes

Scene #1: Scratch

Scratch is a visual programming language and software, available in over 70 languages, developed by the MIT Media Lab. The use of Scratch in schools has grown such that a dedicated community, guides, and resources for educators are available on their website. In addition to learning computer code and '21st century skills,' the potential for Scratch and other coding software to support second language education gained attention in the early 2010s (see Stevens & Verschoor, 2017). While peer-reviewed publications on the topic are few, proponents of introducing coding in the language classroom build parallels with general design elements for technology in language learning and digital literacy (like those offered by Chun et al., 2016). Coding activities might allow students to engage with vocabulary and syntax – both that of the

programming language, as well as the additional language. Moreover, the program is adaptable for use in creating and presenting artefacts of learning through project-based oral and written activities – e.g., creating visual novels, making games, recording dialogue, etc. – requiring pragmatic skills like following instructions (Sarasa-Cabezuelo, 2019). These ideas influenced the decision to use Scratch in this unit.

"What's with the meowing?"

Vicky described her grade five class as "busy." A majority of the 21 students were performing below grade level in English, with many also struggling in French. After attempting to find a routine using her regular units for the first several weeks of the term, Vicky was looking to try something different. Her reported purpose for using the technology was "engagement. 100 percent. Plus, [coding] is a really good skill to have. And if I can give them opportunities to practice French too, I think it's a good idea to try."

Tying into the coding lessons that were underway with the homeroom teacher, Vicky opted to pair Scratch with her usual unit on directions. Though concerned about the amount of French that students would be producing, she created activities related to giving and following directions, the going-to (*je vais*) future form, and local travel vocabulary. Even when laptops were not available during class time, the coding blocks were printed for use in 'offline' lessons. While working on a formative assessment task towards the end of the unit, I noted the following tension:

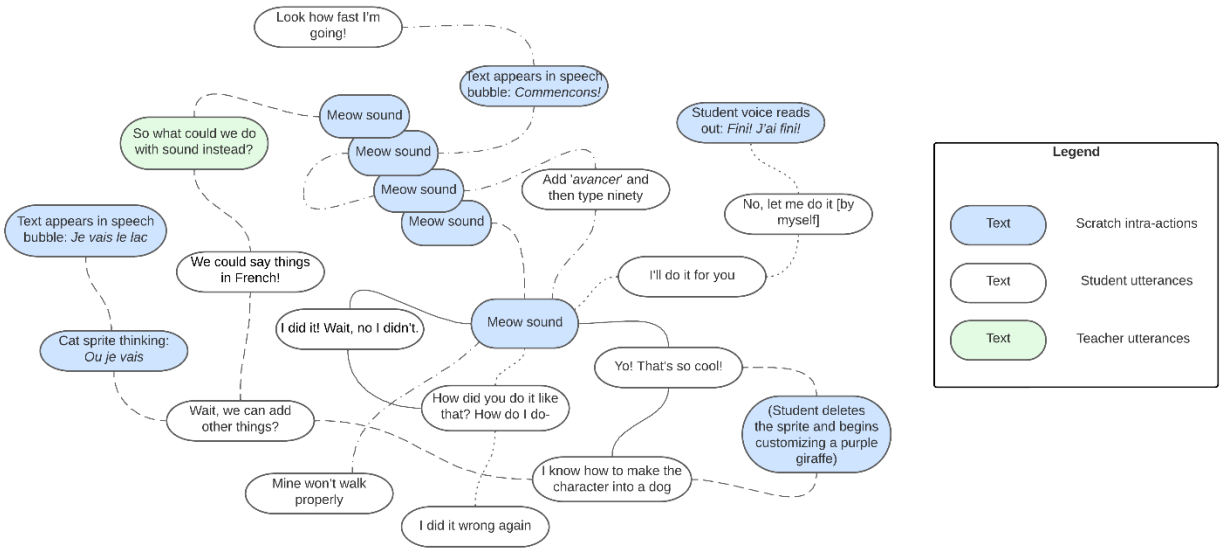
> *The first meow occurred around 20 minutes into the class. The sound cut through the chatter of the room. Some students – and the teacher – looked around for the source. A student grinned sheepishly at the sudden attention, but the class seemed to return to normal for another 90 seconds. Then the meow began again. This time, it erupted, it repeated, echoing from different devices around the room. The sounds overlapped such that the next had begun before the previous one finished. The teacher quickly interjected,*

*catching herself as she spoke, seemingly recognizing an opportunity to reshape the activity. She added, "*Non*. Let's not…. Well, what could we do with sound instead?" Students took up the opportunity for creativity and began exploring other elements of the program.*

The meow continued to be played at different intervals throughout the class, a kind of intermittent chorus. It could be caused by a repeated 'mashing' of the sound button, as well as incorporated into the code (e.g., when the sprite reached its destination, the meow played). Students laughed, fiddling with the settings and options. Yet, towards the end of the class, hearing the meow produced groans, and calls for the device volume to be lowered. The 'moment' of the meow had passed into something new – something less desirable.

Following the meow sound as an actor in the space, I considered what the meow produced in the classroom – what did it become? What did it do in/as a sociomaterial tension? Initially, the meow sound was novel and comedic, reverberating as a creative and galvanizing disturbance in the students' collective experience (Waterhouse & Arnott, 2016). Students were excited by the newfound options, eager to play with the possibilities. Later, the meow became part of the soundscape of the classroom – it blurred into the environment, as much part of the work as the keyboard clacking, discussions, bodies shuffling, etc. Yet, by the time the students were wrapping up the activity, the sound was a nuisance. Voices complained about the volume and repetition of the meow, as one student exclaimed: "whoever's doing that is annoying. Stoooooop!" Some students began to disparage those who might still be (over)playing the meow, even though it was popular just minutes before. Within this one 40-minute period, the affective force of the meow noticeably changes the events that unfold with it (Siffrinn, 2021).

Figure 1
Mapping intra-actions with the Scratch 'meows'



Note. All uses of French in the figures and the manuscript are presented as produced by the students or teachers.

Both the teacher and the students responded to the swelling sound and the invitation to transform the task. Vicky's initial call to get students "back on track" highlights a moment of tension in her thinking with the activity as it was envisioned. Rather than telling students to stop the sound, her question invites new paths forward for the activity. The students then took up this redirection to use the sound in line with the goal of using French. Vicky even surprised herself: "I don't know why I said it, but I'm glad I did!" The teacher later admitted that, not being very familiar with Scratch, she was not sure what was possible with the tool. She was aided by her students' experimenting and knowledge of those options: "I didn't know you could record your own voice, that's great for building in speaking assessment."

The tension the meow produced among the students and the activity provoked opportunities for multimodal composition (Lotherington & Jensen, 2011). Students took up the meow sound to expand beyond the initial parameters of the activity by adding new elements, which included the use of spoken and written French, which was an initial worry for the teacher.

Students began typing phrases and vocabulary they learned (e.g., "*Ou je vais*"), using pre-formed text blocks (e.g., "*Bonjour*"), as well as recording their voices (e.g., "*Fini! J'ai fini!*"). These elements were not required as part of the original task, but entered as additions that students wanted to use given the revised parameters that Vicky offered; the leeway to create seemed to motivate the students to (re)engage with the socio-pedagogical purposes of the activity. Students played with the tool rather than seeing it as confined to the pedagogical task, which contrasts the more transactional operation that the teacher envisioned (Strom & Viesca, 2021). These events highlight different sociomaterial tensions in relation to the second vignette.

Scene #2: WordReference.com

Prior research with online dictionaries has taken up the design and use of these tools by language learners, alongside pedagogical activities which build competence in effective use (Levy & Steel, 2014). Online dictionaries are praised for their flexible, hyperlinked, layered structures, providing fast and efficient access that is functional for consumer needs (Hamel, 2012). Particularly in recent years, these dictionaries exist alongside online, machine translators as tools for learners' use. Students may be as using translators in lieu of dictionaries, even when translators are expressly prohibited by the teacher (O'Neill, 2019). In a world where AI and machine translation are readily accessible (Bearman & Ajjawi, 2023), students are thus constructing themselves and their learning through the available tools (Levy & Steel, 2014).

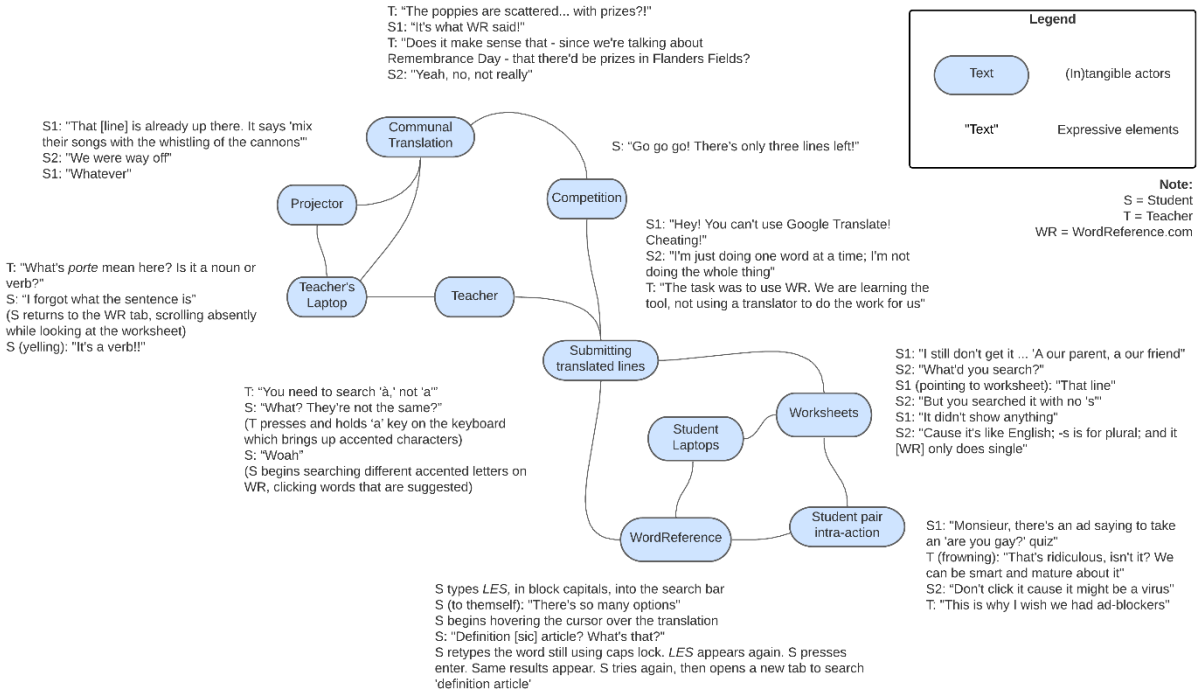
Taking up the framing of "learner-task-dictionary interactions" (Hamel, 2012, p. 356), I noticed how engaging WordReference.com in this scene expectedly produced discussions, bodily movements, and intra-actions with devices related to finding translations for the words in the poem. Students were clicking, scrolling, typing – fingers moving up and down the webpages in search of a translation. Beyond the expected, I wondered what (else) does WordReference.com do in relation to the activity? What becomes alongside?

“They need to use an online dictionary; it’s a curriculum expectation.”

In the weeks before November 11, there is always lots of activity in David’s school around Remembrance Day. David uses this time to explicitly teach students about using online dictionaries. While these tools are used by students throughout the year, David designs learning tasks around the vocabulary, features, and search strategies using the website WordReference.com. This year, the grade 8 classes completed a translation activity based on the poem In Flanders Fields. To “ramp up the fun,” David creates a competition in which pairs of students vie to translate assigned lines of the poem quicker and more accurately than other pairs. Students must complete their translation and bring it up to the teacher, who sits at the front of the class with a laptop. If a translation is accepted, it is entered into a projected copy of the template, with the names of the ‘winning’ students attached.

Entering first through the pedagogical design, the intersection of the competition and the translation activity motivated some students (“Go, go, go!”) and discouraged others (“We were way off.” “Whatever.”). For some students, the goal was to produce translations as fast as they could to vie for recognition, and the content of the translation is sidelined by the affective forces at play in the competition dynamic (“The poppies are scattered... with prizes?!”). For other students, the purpose of suitably translating the poem warranted more careful consideration of word choice, making for a slower process. Some of this deliberate attention may have derived from the cultural significance of the poem, whose heavy themes contrasted with David’s goal of “fun” through competition. While revered texts and objects need not be reserved only for ‘serious’ study (see McDermott & Lenters, 2021), the tension produced trajectories which contrasted with David’s purposes for the activity.

Figure 2
Mapping flows in the WordReference.com activity



The use of the online translator is particularly contentious. The loud proclamation that a student was using a translator instead of the WordReference.com dictionary set off a series of interjections from other students around the room. The interruption of the translator highlighted further tension in the assemblage. There is the concern for David that the translator "does the work for them." Machine translators were perceived as a threat to learning (Kessler, 2018), while the dictionary is seen to function alongside students as a support (O'Neill, 2019). Yet, multiple pathways also emerged which did not engage the dictionary within the goals of the activity: a student began playing with accented letters, another opened a search for 'definition article,' students discussed the content of the ads and viruses, etc. Despite the tangential connections with curricular content, they are regarded more favourably in connection with WordReference.com. This belief perhaps reflects a practical narrative surrounding the 'inherent' benefits of online dictionaries and their uses (O'Neill, 2019).

Conversely, the teacher closed down the possibility of using the translator, despite the fact that it was 'working' to accomplish the task one word at a time. Though not allowed within the boundaries of the activity, in combination with the competition, students were aware of the contrivance of not being able to use translators ("Why not? It's faster."). The tension emerged as the procedural activity, the competition, and the teacher's intended use of the selected tool took precedence over students' language practice (Beavis et al., 2015).

David later reflected on the multiple lessons that might be built around the encounters students had with WordReference.com: "it's great because those are easy ways to keep them interested in French. Sometimes I don't like that we've gone **pew** off in another direction, and I have to get them refocused. Other times, I'll encourage them to explore more." This retrospective openness was also complicated by David's flat refusal to allow machine translators into the classroom:

> *No, Google Translate is the bane of our existence. Even if the students generally understood what they were writing, they'll use a tense that they've never learned, or a lot of vocab words that they wouldn't know - so it doesn't really give a great example of their abilities.*

As the vignette title suggests, David's decision to focus on only WordReference.com was also influenced by the curriculum expectations and his beliefs around what is possible with machine translators – namely that students are not demonstrating their language competencies by translating text. Working between the two quotes, we see a tension in David's claimed acceptance of the possible trajectories that technologies allow, and his view of *certain* pathways and the ways in which they emerge in relation to *certain* programs being innately more favourable than others.

Discussion

These scenes are intended to make visible the multiple, shifting tensions that (were) produced (in) the learning activities. These moments are both typical and unique to everyday classroom practice. In both vignettes, there is a simultaneous mix of confusion and excitement as students

traverse the borders of being ‘on’ and ‘off’ task (Lenters, 2016). The technology plays a notable role in (re)connecting students with language learning in and beyond what was envisioned by the teacher (Kessler, 2018). Key differences emerged among the ways in which the actors, particularly the teacher, worked with unanticipated moments, and how they reshaped those intra-actions.

Here, “ANT's resources provide an entry point . . . to empirically trace precisely how [affects are] produced through numerous mundane material relations, and where are the interruptive possibilities” (Fenwick & Edwards, 2019, p. 7). No one entity – technological or otherwise – directed these activities, they functioned as “a result of a confluence of bodies and forces that could not have been predicted in advance” (Siffrinn, 2021, p. 325). We might expect the meow to become a distraction from the learning goal, but the meow engages it in a new way, with new connections and affects, through the sociomaterial ‘movement’ in the class (Kumpulainen & Kajamaa, 2020).

These scenes provide a glimpse into what is being negotiated, improvised, discouraged, etc. with these technologies in the classroom (Adams & Thompson, 2016). The opening up of possibilities in the Scratch scene contrasts with the shutting down of the translator (and the associated possibilities) in the second scene. The invitation to re-imagine what is possible in the Scratch activity provokes creative explorations and multimodal compositions as students work with(in) the program and activity assemblage (Dagenais et al., 2013), as well as prompting ongoing reflection for the teacher.

David, in contrast, looks back on the moment and supports his rejection of the translator in the classroom and in re-envisioning the task. David adheres more strictly to the technology and activity as envisioned. There is a wilful avoidance of the way that AI could be used, both in the moment and following the scene. Students in the class knew that Google Translate and other AI tools existed (O’Neill, 2019), and some pushed back against an activity that ignored this reality.

Taking this lesson as an example, how do we step back from these assumptions, and focus on building the critical skills to engage in world that includes AI and machine translation (Bearman & Ajjawi, 2023)? For instance, by offering both an AI-generated version and the official French translation (Au champ d'honneur), could students be encouraged to think about the language choices they make as humans when working with an electronic dictionary (Hamel & Séror, 2016; Loucky, 2010)? Or, by comparing and evaluating the quality of the translation output, could the students reflect on what role translators might play in their independent learning (Niño, 2020) or in a pedagogical activity (Tsai, 2019)? Such directions may better align with sociomaterial approaches regarding the use of technology in education (e.g., Burnett & Merchant, 2020; Thumlert et al., 2019).

In sociomaterial theories, digital technology in education is not an additive process of technology plus social factors, and thus requires renegotiating how these forces meet in potentially productive entanglements (Kumpulainen & Kajamaa, 2020). There is a complex interplay among these actors – the human, technological, material, cultural, and so on – in these learning activities. The experiences in these vignettes were not just a result of the abstract affordances of these tools and activities (Sherman, 2021), emerging instead in the messy collision with different entities in the language classroom. In these scenes, student wonderings and dialogue emerged as a result of the activity and technology use in combination. These disruptions opened up the inclusion of additional elements, which (re)intersected language learning outcomes in unexpected ways, emerging within that relational practice (Thumlert et al., 2019).

Helping teachers re-envision how technology 'works' in the classroom and how they can engage productively with this complexity is central to sociomaterial visions of educational technology (Bangou, 2020). This shift requires working among learning objectives, technological capacity, and the emergent conditions of the classroom (Nichols & LeBlanc, 2020) – such as with the tools and their possibilities in (and beyond) the current learning task, as in the first vignette –

as well as (re)considering what is possible as unexpected transformations emerge among envisioned pedagogical designs, like in the second vignette. Engaging these connections challenges what is traditionally considered worthwhile, expected, and valid in research and practice with educational technology – suggesting how messiness with technology in the language classroom can still be productive, but not in a linear fashion (Rice, 2021). As Adams and Thompson (2016) suggested, what follows "in the wake of a breakdown, accident, or anomaly" can be particularly illuminating for understanding actors and their practices (p. 49).

Parting Thoughts

It was possible that the teachers could have dismissed any and all of the connections that emerged in these scenes as distractions from learning whenever there was a perceived deviation from the envisioned activity. Yet, by following these moments further, we see how they may precipitate creativity and production beyond the bounds of the original task, or conversely, close down these emergent pathways. This decision-making required them to engage and assess many complex entanglements and what they were producing in light of their professional judgment (Sherman, 2021).

Language teachers must be prepared to navigate these sociomaterial tensions to engage the opportunities different technologies offer in their classrooms. Drawing on the perspectives of sociomaterial thinking, this shift means taking up technologies as relational entities, co-actors in our classroom, that are deeply entwined in our daily becoming (Adams & Thompson, 2016; Bearman & Ajjawi, 2023). In terms of pedagogy, we must also reconsider what 'successful' technology integration requires – in terms of both pedagogical and conceptual reorientations (Rice, 2021). Addressing "inadequate language learning means changing what the assemblage produces" rather than waiting on the 'perfect' tool to be a plug-and-play solution within the existing structure (Sherman, 2021, p. 386). Teachers must work with what is produced with the

tools, rather than by what the tools are perceived or 'ought' to be (Bhatt & de Roock, 2013; Kumpulainen & Kajamaa, 2020).

How then do we as stakeholders help teachers feel confident and competent in making decisions around technology integration, particularly when navigating the unexpected (Bangou, 2020; Rice, 2021)? How do we help them make reasoned decisions in these turbulent moments without resorting to the predetermined plan? There is therefore a need for the ecologies of schools and systems to have the opportunity for teachers to reflect and feel supported in making changes: to begin by wondering "what *could* it do" rather than "what *does* it do." Approaches to professional learning with technology must therefore "to attend to effectively modelling strategies to explore, develop, and implement complex and innovative digital pedagogies for agentive language learning that has evolved past anachronistic language learning [and technological] principles" (Boreland et al., 2022, p. 20).

With only a limited body of research on technology integration in language learning from sociomaterial perspectives, this work is just one example of what is possible through these connections. Further studies will help (re)consider the ways in which teachers and students engage and negotiate language learning, in order to "multiply alternative routes in thinking, to take seriously the potential of assemblages to experiment differently and to contribute to the vitality of applied linguistics, language, and literacies research" (Bangou & Waterhouse, 2021, p. 299). This work might further illuminate language learning experiences in diverse spaces and contexts, with different flows among students, teachers, technologies, and other materials.

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Chapter 5

Conclusion – Zigzagging Out

Like the introduction, this bookend chapter explores additional lines of thought within the dissertation, as well as multiple exits into what else might become. My aim is not to offer a single or a complete encapsulation of the study – but to continue to consider what further (dis)continuities, distortions, and diffractions are possible, and the countless others that were not contained by the structures of this dissertation. Some of these comments were gathered from the cutting room floor, others were suggested by colleagues, reviewers, or attendees at conference presentations. Some pieces are thoughts that I have had since writing the articles that I wish I had incorporated into the original pieces. Alas.

As a kind of recap, and to vastly oversimplify the research framing, the study was oriented by the onto-epistemology of sociomaterialism (what exists and can be known), the methodological toolkits of actor network theory and action research (how we can engage in empirical inquiry), and actualized in a project centred on digital technology in Core French (who the actors are, where they are located, and why it warrants exploration). These aspects shaped the start of the inquiry, with the project growing in multiple directions. I take up some of these possibilities in the following section.

I was inspired by Vasilopoulos' (2021) conclusion vignettes to consider further and-and-and connections among the articles that comprise the main body of the dissertation. Though they are drawn from the same study, the different foci, concepts, journal requirements, reviewer feedback, temporality of the writing, and, and, and, within the bounds of the articles make them stand apart in certain respects. I wondered what I might see happening when I collide (with) the texts in combination. Of course, these are only some of the possible intersections that went into the writing, what is emerging now, and what I might not have considered (yet).

Articles 1 & 2: Becoming+research+intra-action+agency+linearity+professional+...

Thinking with these two articles, I began re-viewing what it might mean to become-teacher and become-professional (Gale et al., 2013). All the forces and concepts in this section's title were/are emerging as part of this study – for myself, the participants, fellow PhD candidates, educational research communities, etc. – which implicate how we understand ideas like expertise, professional knowledge, and practice.

Particularly relevant to the field of FSL, framing teachers as continuously becoming in their language development and professional learning trajectories has taken root in recent literature (e.g., Masson, Knouzi, et al., 2021; Smith, Masson, et al., 2023). These discussions have emerged in response to the challenges (and failings) related to the recruitment of FSL teachers, which researchers have suggested has been prioritized over the more long-term views of teacher learning and retention (Wernicke et al., 2022). In more Deleuzian terms, the shift in perspective is shaping how we might see becoming-teacher as continuously emerging in relation to innumerable sociomaterial confluences over the span of their careers. It seems increasingly difficult to talk about FSL teacher recruitment without acknowledging the systems in which this work takes place, and the forces which go beyond the teacher and "their" classroom (Arnott et al., 2023; Knouzi & Mady, 2014).

The field, however, has largely stayed within the realm of human intention and action in terms of how we conceive the drivers of these experiences, how pedagogy unfolds over time, and how we research (with) them. What these dissertation articles, and the influence of sociomaterialism, might bring to the discussion is a glimpse beyond the agency of humans alone (Dagenais et al., 2021; Gunnarsson, 2018). In the example of the Google Drive in Smith (2024), we see the liveliness of the Drive and its features in shaping what becomes possible in the collaboration. While I thought I was ready to consider the Drive an actor in the project, I was not

prepared for how the teachers would take up certain intra-actions with the Drive (i.e., sharing existing resources) rather than others (i.e., co-creating lessons within the documents). I saw the potential for these asynchronous collaborations transferring directly from traditional face-to-face planning sessions with colleagues into the digital space. However, when looking at the entanglements among the effects of COVID, the immediacy of lesson planning, the teachers' assumptions about technology (Rice, 2021), and the working conditions of FSL teachers (Smith & Arnott, 2022), I learned what might become is not a simple manifestation of human desire.

Research

In educational research, the flattened ontology prompts reformulations of the processes of inquiry (St. Pierre, 2013). For instance, considering how data shape (and are shaped by) the research(er) completely reoriented my project from its initial design. To consider the data as active, as agentic, upends the qualitative foundation that data are lifelessly awaiting human analysis in a one-way relationship (Barad, 2007; Bennett, 2010). This reframing was particularly prominent in my thinking as I considered Deleuze and Guattari's writing on order-words (Deleuze & Guattari, 1987) and the forward momentum of language (Deleuze, 1997) in relation to my research design (see Article 1).

In the early months of the thesis study, I was very much concerned with finding the most direct path towards my envisioned goal for the project. I believed that if I could get the participants to act with(in) the loose framing I had intended, they would benefit in their practice, and I could get the "right" data for my analysis. If we followed the stages of the action research model in order, we would end up with a neat downward or centripetal motion for the diagrams. But the data-events quickly moved me and the project away from such possibilities. Rethinking my approach, my goals were incompatible with the outward, unpredictable movement of the rhizome I was trying to engage (Deleuze & Guattari, 1987). To consider an action-

research-in-becoming, as I suggested at the end of Smith (2024), would be to take fluidity and change as the norm, rather than the traditional AR cycle. This framing might prompt us to experiment more, and lessen our focus on control, where the emergence compels us to "follow the rhythms and actors to map the AR project as it expands rhizomatically, rather than expecting a spiral" (Smith, 2024, p. 13). When the productions within the AR cycle overflow the capacity of the language and intended activity of the phases, how might researchers respond to the unexpected and what might emerge differently?

These feelings emerged again in writing the articles and the dissertation chapters. I felt mired by the linearity of the written word, when I was bursting to say so many things at once in the analysis. At least in the articles I had experimented with mappings and vignettes where the multimodal juxtapositions might allow for a snapshot of many different flows. While I was reading about the style of the plateaus (Deleuze & Guattari, 1987), I was struck by the idea that readers could jump between ideas or (re)start from any of the threads at will. I considered making multiple columns to write simultaneous narratives down the pages – weaving the voices of literature, events, and researcher throughout. I quickly realized the time and effort required to make that approach functional for any other reader would further delay my dissertation. So here, linearity seems to have prevailed overall, although I hope some lines of thought "leave one plateau and proceed to another like columns of tiny ants" (Deleuze & Guattari, 1987, p. 22).

Professional Learning

Zigzagging back to the teacher learning I mentioned at the start of this section, these questions of linearity, agency, intra-action, and practice might inform how we think about teachers' professional experience and growth. Rather than the linearity of the daily schedule, the regimented start/end, or even professional development over time to be a 'better' teacher, I

wondered how could rhizomatic thinking help us attend to how these events grow continuously from the middle?

In Articles 1 and 2, I see the simultaneity of multiple, sometimes competing, discourses and affects in the flows of these teachers' work and learning experiences. In addition to the Google Drive example, in Article 2, thinking about agencies beyond human implicates how we position teacher professional learning. As Rice (2021) noted, "recasting teacher work as on-going becoming seems most empowering when teachers are able to situate themselves within entangled agencies" (p. 535). Teachers' work and learning is produced together with students, technologies, colleagues, and the conditions of their classrooms and schools (Mulcahy, 2012; Strom & Martin, 2022).

Thinking about the flows of agency among and-and-and material connections in FSL provided new openings for thinking in this project (de Freitas & Curinga, 2015). For Core French teachers like Freya, their potential becomings are shaped by their relationship with different actors, such that (within) every day they become-with those conditions. Although I was unfortunately not able to formally inquire about how Freya navigated the rest of that year, I was curious about what these contrasting conditions would do for her practice, her professional learning, and how she situated herself in the school. As I discuss briefly in Article 2, what the marginalized status of FSL 'looks like' or 'does' in a school is also complicated by the actors within different spaces. These factors may take shape in uncooperative or hostile colleagues, apathetic leadership, a lack of classroom or office space, disinterested students, and a host of other consequences that have been noted in the literature (Knouzi & Mady, 2014). But even then, the experience of one obstructive colleague in an otherwise supportive school may produce differently than a school with no culture of collaboration at all. These elements must be tracked as they are found in context, rather than assumed based on proximity or scale – just because entities are physically close does not mean they are intra-acting in the ways we might expect them to

(Boylan, 2021). It is perhaps not sufficient to state only that Core French is undervalued, but rather to further explore how these challenges materialize to approach and intervene in the complexities of these teachers' becoming.

I also see these contrasting discourses in Vicky's quote about adopting an approach that she does not fully support in order to realize her practice in a way that controls the co-productions that are possible. She brings multiple, contradictory 'ands' to her becoming. The same could be said of Aaron's very rigid, sedentary lesson with the sixth graders in Article 2. He found it necessary, at least for a limited time, to produce his action-oriented practice differently in order to respond to classroom behaviour concerns.

As de Freitas and Curinga (2015) noted, "we need to trouble the binary between structure and action, and look closely at the actions in interaction as both constraining and creative" (p. 252). Forms of professional knowing (Fenwick & Edwards, 2010) still circulate within these scenarios. Both teachers have come to work around behavioural challenges with increased controls, yet still maintain aspects of their desired teaching methods within this new production. For instance, Aaron used choral reading as a way to support pronunciation and understanding of the script during this time, while Vicky paired stronger students with those who were struggling. Their practice becomes a hybrid of old and new pedagogies (Cuban, 2013). How might we prompt their thinking around what else is possible in those moments, how they tinker in the aftermath of 'disappointing' lessons, and what collaborations and re-envisioning would support them in who they want to be (Rice, 2021)?

Articles 1 & 3: Complexity+mappings+technologies+affect+learning+digital+...

I have recently been thinking about how complexity theory might be engaged along a spectrum between traditional qualitative, humanist perspectives (looking beyond the human to systems, but ultimately people remain at the heart of the analysis) and more sociomaterial

thinking (flattening the ontological distinction and distance between human and non-human elements; e.g., Fenwick & Edwards, 2013). Neither complexity nor sociomaterial theories are unified in their conceptualizations, which means they might be "more" or "less" coherent in different instantiations. For me, complexity theory offers several concepts – the presence of other (non-human) actors, non-linearity, the porosity of bodies, and so on – that can be points of connection between the two styles. These ideas were certainly a gateway, an opening into sociomaterial onto-epistemologies for this study, and I continue to wonder about how these theories might continue to cross-pollinate.

Mappings

One way I collided these approaches is with actor-network mappings. These momentary slices of elements in motion served both epistemological and methodological functions – the making of the map being as much a part of the study as the 'data' it engaged. I found numerous mentions of mappings, tracings, and cartographies which caught my interest within actor-network theory (e.g., Adams & Thompson, 2016), Deleuzoguattarian work (e.g., Castro-Varela, 2021), and beyond (e.g., Sefton-Green, 2015). I was particularly inspired by Leander and Rowe (2006), whose rhizomatic diagram of classroom literacy performances traced multiple paths among the possible relations in the space. Drawing on the rhizome, I was intrigued by data-events that were purposefully designed to be entered through differing paths, that make "way for new structures and novel thought connections" (Waterhouse, 2012, p. 130). Yet, I found that these mappings – whatever they were called – were not often presented in the form of a graphic (though see, for example, Bangou & Vasilopoulos 2023 as an exception). With no clear answer as to why not, I decided to attempt visual mappings.

In Article 1, I started more traditionally with a temporal grid for Figure 2. I thought the layout was simple enough to convey details about the project logistics, as well as highlight the

movement of the human participants within the action research cycle. I found it useful to see where the disruptions emerged which troubled the boundaries of the plan, act, and reflect phases; what happened between the stages was essential to understanding the data-events. The same thinking oriented my approach to figure one in the third article. Engaging the meow as an actor in that space rather than background "noise" brought my attention to how the disruptions were seemingly as integral to the unfolding lesson as the teacher's redirection. Thus, rather than start with the teacher, I started with a meow, and followed the streams of conversation and intra-actions around the room. Initially, I had several other elements in there – bodies moving, descriptions of software animations, other sounds, etc. However, with the feedback I received, I chose to simplify the graphic. Beyond their functions within the articles, I hope that these graphics produce a sense of what is possible for visually mapping data without "closing" thought via representational means (Adams & Thompson, 2016) as a kind of methodological contribution.

Digital Practices

The idea of what teaching and learning can become in digital spaces emerged for me when thinking with Articles 1 and 3. While these topics could be dedicated projects in themselves, I touch on them briefly here from a sociomaterial perspective. As I mention in the introduction chapter, sociomaterial conceptualizations of teaching and learning situate both processes in particular circumstances; they are entangled mobilizations which cannot be separated "from the networks through which they are themselves enacted" (Fenwick et al., 2011, p. 6). Particularly when collided with the dynamism of digital technologies, these practices are fundamentally experimental and experiential (i.e., bodily) acts (Cerratto Pargman, 2019). Having previously discussed the unexpected form of professional collaboration between the teachers in Article 1, I turn to how the teachers chose (not) to consider teaching with digital tools in Article 3. Vicky, despite not considering herself the most confident and competent with

technology, stumbled into an opportunity that made her teaching "visible, problem-solving oriented and adaptive" (Cerratto Pargman, 2019, p. 47). Her teaching in this moment took on a collective emergence, what is possible realized through purposeful intra-active engagements through her students' knowledge, the software, the learning goals, etc. In contrast, the same elements at play for David led to quite different outcomes. The curriculum expectations as written are more forceful in shaping the activity, as were his prior views on what constituted acceptable practices with digital technologies. What these vignettes highlight for me is that teachers are themselves multiplicities working between competing affects and forces "with multiple human, non-human, discursive, and material elements that simultaneously influence and mediate what the teacher is able to do" (Strom & Martin, 2022, p. 4). They must navigate the realities of day-to-day planning demands, and the co-productions of digital technologies in the "real world" – both glitches and potentials. Again, how these teachers see themselves as agents embedded within their contexts plays into the unfolding of these moments (Fenwick & Edwards, 2013).

For the students, I see multiple instances of productive play (Bhatt & De Roock, 2013) that take their learning beyond the imagined bounds of the activities. In sociomaterial perspectives, learning might be made visible through "new ideas, innovations, changes in behaviour, [and] transformation" (Fenwick & Edwards, 2010, p. 22), a means to intervene and experiment with the world that implicates body and mind in becoming-other (Frid, 2021). Teaching and learning are produced differently as the bodies, affects, and forces in the assemblage change (Strom & Martin, 2022). This possibility is pivotal in the first scene of Article 3. Sound – the meow, singular and then multiple – initiated a series of reactions which took the learning experience down an unanticipated path. The disturbance moved with the actors, and the creative response to it was distributed throughout the space. Students began responding to the sound(s), building off each other in a flurry of vocalizations and movements, bringing an altered event in each new actualization (Siffrinn, 2021). Particularly important for this teacher were the

ways in which students were (re)engaged with French language content by the inclusion of the multimodal elements that emerged from this intra-action. Students were better able to express their linguistic and technological skills as an outcome of the redesign, accessing and mobilizing different resources through the architecture of the program (Toohey et al., 2015).

Of course, in contrast, some of these possibilities were not followed, some even decisively cut short, as in the second scene. Reading the space with a relational focus (Leander & Rowe, 2006), despite the shared projection and common purpose (Guerrettaz, 2021), the flows of activity are constrained. The structure of the WordReference activity dampened communal engagements. We see moments of disruption emerge: the use of the translator, the disengagement from the competition, the ads, and so on. Yet, David's insistence on the predetermined vision, during and after the activity, severed these paths before they could take flight. Though I did not ask David about his response to uncertainty directly, I wonder about what role this might have played in this scene.

Articles 2 & 3: Identity+ becoming+hybridity+assemblage+uncertainty+FSL...

Articles 2 and 3 prompted myriad pathways for thinking with the factors which shape these teachers' identities, that is to say, becoming-professional (Gale et al., 2013). Becoming is a relational process (Springgay & Truman, 2018). These becomings are (per)formed with(in) discourses, social contexts, institutional structures, material bodies, pre-personal affects, etc. (de Freitas & Curinga, 2015). By virtue of those localized relations, what is possible may not be actualized in any given moment; Rosiek and Pratt (2024) use the simple example that we cannot remain sitting if we stand up. This difference is important when we consider how the actors in these classrooms constructed themselves in relation to these entities, digital or not (Levy & Steel, 2014; Rice, 2021). I take up some of these possibilities here.

Hybridity

When working with the teachers, I began wondering about the notion of shared spaces and relations characterizing the work of Core French. As I mention in the articles, Core French teachers often travel between homeroom classes rather than being assigned their own space (Kissau, 2005). As the teachers mentioned in Article 2, each classroom had established idiosyncratic expectations around the use of the space – storage, technology, anchor charts, whiteboards, etc. There were also less visible norms, like behaviour management "point" systems or student "job" rotations (that determined which students were supposed to or allowed to perform certain tasks). I saw multiple occasions where the French teacher would unwittingly transgress these norms – which are well known to the students – resulting in a sudden uproar. The French teacher, however, had to familiarize themself with many such routines that they had little or no influence in designing or establishing. They therefore connected into pre-existing networks while shaping what practices could become in the time allotted to FSL. This both-and consideration for material assemblages that are simultaneously theirs-and-not-theirs oriented me to the hybridity of FSL.

Hybridity is a fundamental concept in some branches of sociomaterialism. While the term has received attention in the post-pandemic world generally to refer to work spanning in-person and online modes, all things are already hybrid, continuously (re)constituted by their "materials, ideas, symbols, desires, bodies, natural forces, etc." (Fenwick & Landri, 2012, p. 3). Hybridity in this sense is understood in the same way that actors are actor-networks, and that actor-networks are actors: as Callon (1987) stated, "an actor network is simultaneously an actor whose activity is networking heterogeneous elements and a network that is able to redefine and transform what it is made of" (p. 87). This definition perhaps resonates more with Deleuze and Guattari's (1987) term *haeccity*. It is not to suggest that the mashing or splicing together of elements (A + B = AB) maintains their prior ontological distinction, nor that what becomes of that hybridity can be

predicted. Bodies are translated as they intra-act (Barad, 2007). The relations which make up our "becomings" and "doings" might be consistently (re)producing similar affects, or unstable and contested leading to unpredictable results (Fenwick & Edwards, 2010). This mess, however, makes for interesting research (Fenwick & Edwards, 2013)!

Freya and Peter's vignettes in Article 2 provide an example of what the hybridity of space can produce. In the former case, there are strict boundaries around what FSL pedagogy can become – where materials can go, what can be used, the timeliness of her departure at the end of the period. Freya opted to use a variety of "centres" with this class – i.e., small activities that students would rotate through, which were often contained within a large resealable bag or set of clear page protectors. In contrast, her other classes might have physically larger projects (e.g., dioramas) or duotangs and plastic bins of work which were left in the class. While not physically present in the room during the Core French period, the classroom teacher was still active in co-producing Freya's approach to FSL. So, too, was the indifferent principal. If I had the chance to follow Freya throughout the year, I might have looked for how she worked through this dissonance – was this compartmentalized as an unfortunate one-off, or did this have a lasting impact on her professional practice? For instance, would she continue to tinker with centres? What else would endure in her practice that she tried out in this context?

In Peter's case, the collage gives French an ongoing presence in the homeroom space. I thought about the ways that hybridity might bolster the reputation of the subject and how students felt about French being "part" of their classroom that is not always a given (e.g., Lapkin et al., 2009; Milley & Arnott, 2016). The potential disconnects between FSL and homeroom subjects are well documented in the research (e.g., Knouzi & Mady, 2014); indeed, Vicky and Freya's experiences seem to reflect that possibility. However, Peter was able to foster a common curricular purpose. The display was the homeroom teacher's idea and undertaking, including the use of French. While I could not officially ask Mr. Grey about his feelings, it seemed instinctive

for him to include the FSL teacher (and French) in the classroom space. He was also cognizant of the Peter's explicit efforts to include French throughout the school. Mr. Grey saw that his classroom was also Peter's classroom, to some extent.

An audience member at a recent conference presentation commented that, particularly in the elementary panel, teacher candidates are praised and primed for making the classroom their own. Framing the classroom as a shared space, rather than the sole domain of the grade-level teacher, then, may smooth these inroads for collaboration. What might positioning the classroom as a fundamentally hybrid space through which myriad actors pass (e.g., FSL, ESL, grade-level co-teachers, ECEs, community members) do to facilitate these relationships?

Uncertainty

Working with and through uncertainty is echoed in the many fields this study engages: knowing (Biesta, 2015), teaching and learning (Mulcahy, 2012), identity (de Freitas & Curinga, 2015), technology (Bangou & Vasilopoulos, 2018), action research (Goodnough, 2008), complexity theory (Larsen-Freeman, 2020), and sociomaterialism (Guerrettaz et al., 2021). This ubiquity in the research may explain why these concepts were so prominent in my thinking throughout the project.

In Article 2, I position the ways in which unpredictable working conditions co-produce the becoming of these FSL teachers. Research highlights that teachers (particularly those early in their careers) may struggle with the lack of control and replicability of strategies they may have imagined during their preparation (e.g., Strom & Martin, 2022). Connecting through the findings of another FSL study (Arnott et al., 2023), these teachers' use of "luck" in this study to describe successes, (unusually) positive occurrences, or lack of certain adverse conditions prompted me to juxtapose their stated beliefs with how they responded to ambiguity. Although I cannot say whether this perspective made them more or less prepared for things to go wrong in their practice,

I could see attentiveness to changing circumstances when they discussed their pedagogy. For the teachers using a cart, preparedness seemed fundamental given that the available resources they could use to pivot were limited to whatever could travel with them. Backup plans and materials were needed to support them in "making something [pedagogical] work," as Grace put it. Otherwise, the teachers might have chosen to "fill time" with unrelated games or DPA (daily physical activity) when a lesson had failed to play out satisfactorily. Again, resources are actively shaping the potential and status of FSL.

In unpacking these moments with the teachers, I spoke with them about the prevalence of negativity as the baseline, the prevailing culture, in FSL: deficit-thinking and powerlessness are possible ruts that FSL teachers experience, particularly as they begin (and quickly end) their careers (Masson, 2018; Masson & Azan, 2020). This "bottom rung" mentality and status has been decried since the 2000s (Knouzi & Mady, 2014; Lapkin et al., 2009); yet it endures as a "poison" that sits at the core of the FSL profession (Smith, Arnott, et al., 2023). As I mention in the introduction, there are socio-politico-historical influences which have made the field of FSL inhospitable for language educators. Some of these conditions extend far beyond the control of the teacher, certainly, but these discourses may also minimize their agency and capacity in shaping other parts of their work.

In my research journal, I had a note that Grace and Peter ascribed having engaged students – students who enjoy French – to chance. This is one instance where I eagerly attempted to trouble their thinking. I asked them how their approach to teaching Core French would build, or at least continue, the positive reception of the subject. Both teachers acknowledged their efforts to design enjoyable and effective lessons, but were hesitant to connect their own contributions and mobilizations in their networks to those outcomes. A more dedicated exploration of Core French teachers' beliefs in relation to these circumstances might reveal the contradictions and provide suggestions to help teachers work through them.

Technology + Uncertainty

The potential for disruption is also amplified by the inclusion of digital technologies, which require "tech-savvy" competencies to navigate platform capacities, logistical challenges, unexpected breakdowns, device functionality, and so on (e.g., Morsink et al., 2011; Nichols & LeBlanc, 2020; Thoma et al., 2017). There were times when the teachers were pulled towards creative adaptation in response to (un)foreseen technical challenges, leading to either new variations or a return to the lesson as envisioned.

During my observations with Aaron in January through March, we started our sessions with a humorous check in about the state of (dis)repair of the technologies in the classrooms he visited. Aaron would normally use the projector and his laptop to introduce the lesson, and have students use the available Chromebooks or iPads to complete reading/writing tasks or games. At one time, Aaron had a different mental note for almost every classroom causing him to pivot some aspect of his intended lesson. According to my journal in mid-February, there was no computer sound in the Grade 6 room; the projector had been down for two weeks and instead a document camera was available in Grade 3; and multiple Chromebooks had been sent for repairs from the Grade 7 and 8 classes. Aaron decided to read part of the closed captions of a video aloud in the Grade 6 room (and move on to the remaining activity); use a Bluetooth speaker and angle his laptop screen such that it could be seen through the document camera for the third graders; and have students in Grades 7 and 8 write their responses on paper rather than through Google Classroom. His decisions emerged among the flux of what technologies remained in the room, how extensively he would need to revise the existing lesson, and whether he was able (or motivated) to find an alternative setup.

I also see some of this thinking in action in the scenes that inspired Article 3. As I previously discussed, both Vicky and David had times when they promoted alternatives that were

in line with the envisioned path. David's vignette in particular highlights numerous examples of trajectories he deemed sufficiently close to curricular content to warrant those students pursuing in greater depth. Further inquiry into how (in)consistent this practice is with his beliefs might help David take up these paths more explicitly in his teaching program (Viswanathan, 2019). Elsewhere in Vicky's scene, students were paired up to work around devices that could not connect to the Internet or to help each other troubleshoot display errors. Collaborating for solutions, particularly drawing on the technical skills of her students (and mine when I was present), did not seem to pose a threat to Vicky's perception of her expertise in the classroom (Curwood, 2011). In fact, such an approach is positioned as a beneficial means to not only resolve the practical challenge but also to promote 21st century skills whereby such obstacles are expected opportunities for creativity (e.g., Meneses et al., 2023; Shafiee et al., 2022).

Becoming-Sociomaterial-Research(er)

Education research is (still) a predominantly humanist field, built on quantitative and qualitative empirical foundations (St. Pierre, 2024). The process of conducting research from a sociocultural perspective, and therefore being a researcher, is predicated on the search for an ordered, comprehensive explanation of the world that is knowable through processes and data which can be (to differing extents) distanced from the experience of the researcher (N. J. Fox & Alldred, 2015, 2021).

Sociomaterial research challenges established conceptual orders and onto-epistemic structures, though how this plays out in different projects will vary. The work may be a total rejection of the vocabularies and processes of method (St. Pierre, 2015, 2024), or it may amount to the "plugging in" of metaphors into otherwise traditional research systems (e.g., García, 2016). Whatever the case, the purpose of sociomaterialism is not to be glib, farcical, or satirical in approaching research (Fenwick, 2011), nor is it intended to launch empty critiques for the sake of

standing apart (Latour, 2005). Rather, these theories offer alternative means for intervening and engaging the world differently (Fenwick & Edwards, 2010). This process engages not only the project as unfolding event(s), but the trajectory of the research(er)-becoming alongside sociomaterialist thinking.

As I noted in the introduction chapter, I find this study sits somewhere among these spectra. Upon reading these chapters as a whole, I was somewhat disappointed to see that it seemed to still be human-focused. The human is perhaps less centered than in sociocultural analyses, but still the predominant lens through which the unfolding work is understood. Human cognition has ended up primus inter pares ("first among equals") in this writing, rather than one actor among the masses – or even purposefully relegated to make the liveliness of other matter more prominent. While I use both Barad and Deleuze in my framing, it could (generously) be considered more Baradian than Deleuzian. The more granular metaphysics of my current thinking does not separate matter and discourse, echoing the characteristics of Baradian agential realism rather than the Deleuzian philosophy of immanence (see Hein, 2016). Or, more plainly, I see both discourse and material phenomena intra-acting and being mutually implicated, rather than being a positive difference; these phenomena have units – a "metaphysics of things" (Barad, 2007, p. 33) – without a clear connection to Deleuze's formless, virtual plane (Hein, 2016). Similarly, my treatment of the assemblage, particularly the expressive dimensions, is likely subject to the same critiques (and many more besides) that are leveled at DeLanda and Bennett (Buchanan, 2021). I can certainly repeat in the abstract that assemblages are dynamic arrangements, more than their individual parts, and that the materials in an assemblage are always being transformed and produced, but whether these ideas are evident in the mappings I presented here is debatable. These limitations, however, are also affects of my choice to work with and between the dissonances in conducting and reporting a sociomaterial inquiry. As I mention in the introduction, this note is not intended to apologize for the work I have done, but to recognize the connections

and thinking that (did not) emerge(d) in this dissertation. I hope that this discussion acknowledges the multiple perspectives in the sociomaterial field, and to cautiously position my study among those theories.

Stepping Between

This work was intended to produce a stepping-between. Recognizing that much of my audience, whether academic or professional, is rooted in sociocultural perspectives, I sought to make the disruptive thinking more manageable and attractive to these readers. Perhaps I could start other curious researchers and practitioners on some of these lines of flight, or plant a seed for wondering what else might become with alternative theories…

There is much I have yet to deeply (re)consider in this area, that I found too difficult to work through without more structured support. While never alone in the process, as Deleuze and Guattari (1987) remind us, being self-directed in this learning seems humorously contrary to the sociomaterial focus on connectivity and collective potential. I did not always have a sociomaterial community to engage directly with my insatiable questions and confused ramblings, and my committee fielded many such inquiries as a result. I therefore discuss my understandings and engagements with these theories with great trepidation – which is far from the "expertise" I imagined I would generate in my doctoral studies. I thought that completing the PhD would mean I would be more confident in my knowledge as I approached submitting this dissertation. Shouldn't I be thinking less about the process of doing aspects of research, and more about the products? Is it acceptable to still be frequently looking back to prior literature to consider if I am using terms appropriately? Compounded by imposter syndrome, engaging sociomaterialism has made the journey more anxiety-ridden and this "end point" seem all the more questionable.

Thankfully, sociomaterialism offered more than just self-doubt – a way to trouble these thoughts and feelings. As Kraftl (2018) stated, "new materialist scholarship may, in combination

with other theoretical approaches, enable forms of critical engagement that may be (cautiously) affirmative." I explore one such encouraging instance below.

As I mentioned in the introduction chapter, while producing this work, there was a recurring pull towards making the analyses something that a teacher might care to read. I wanted teachers to see themselves in the writing, in a way that facilitates colliding their own experience with the data, analysis, and text. Even among the least esoteric and academic sociomaterial writing I encountered, I found suggestions that teachers casually pick up these articles as a way to reconsider their practice rather naive. I found it difficult to see how a teacher without a background in philosophy, some level of graduate studies, and/or who had not already been introduced to that topic would have any reason to persist through the strange mannerisms of sociomaterial writing. While I worried about the supposed trade-off between philosophical rigour and practicality of the articles, I continued to look for ways to create less intense on-ramps to engaging sociomaterial thinking in Articles 2 and 3. Of course, this choice had ramifications as part of this dissertation, as readers considered the disconnects and incoherence between my theoretical framework and the writing in these articles. Much like Article 1 could be considered a 'failure' of methodology, Article 2 could be a 'failure' of theoretical rigour. The verbiage, flow, and focus of a sociomaterial article was cut off by concerns for what the participants (and imagined other educators) and reviewers emphasized in order to help them engage and produce with the scenes. Yet, similar to the losses described in article 1, the productive forces continued in a new form. I offer them within the bounds of what unfolded in this process, yet there are still openings to (re)connect this thinking with sociomaterial concepts. As Deleuze and Guattari (1987) note, "if it is true that it is of the essence of the map or rhizome to have multiple entryways, then it is plausible that one could even enter them through tracings or the root-tree, assuming the necessary precautions are taken" (p. 14). I continue these openings below.

Over the course of the year, I had tried to slide some of the principles of sociomaterialism into casual discussion with the participants: thinking about systems and complexity, about relationality, or non-human participation in classroom practices. These produced some brief exchanges, polite enough, though the teachers did not quite share my interest in the topics. Philosophy, worldviews, and theoretical reframings were not as alluring subjects as lesson plans and pedagogical strategies. Despite this, inspired by Rice (2021), some of the interview questions drew on this vocabulary. For instance, in each interview, I asked what technology does or produces in the classroom, rather than how the teacher uses technology. By the final interview, the question had become notoriously difficult to answer, as the following excerpt from Vicky's third interview highlights:

> *Cam: And let's finish up with everyone's favourite repeating question, what does teaching with technology produce in FSL?*
>
> *Vicky: … I hate this question. I don't know why it's so hard to answer! What does teaching with technology produce? Well, I think I've always said the same thing […]*

Indeed, the teachers did stay consistent in their answers to the question, despite the initial hesitation before responding each time. As I mention in Article 3, the participants echoed that technology produces engagement (buy in, motivation, interest, etc.), 21st century skills, entertainment, accessibility supports or modifications, resource variety, organization, authentic learning, streamlined administrative processes, and so on. These are commonly cited benefits to technology in (language) education (Chang & Hung, 2019), and perhaps discourse they have heard in professional learning. However, thinking back on this process, I wonder if the decontextualized interview question might have limited the way the teachers were able to trouble "small" moments in their practice, rather than attempting to answer the question with "high level" outcomes. I wonder what asking this question at the end of an observation day, or more casually during a recess, might have produced differently. I wonder how I might have leaned into those moments of hesitation to produce new thoughts rather than letting them "answer" the question.

A query I hope to pursue in a future article, or follow up study, is how my participants respond to the articles and vignettes I co-created. Before my REB certificate expired, I sent my entire second article to Vicky and Aaron as the draft approached submission status. This choice was, again, not intended as a form of member checking, but to see what it did for them and their thinking as focal participants.

The teachers seemed to respond positively to the article. For Aaron, the articles reflected current realities, and brought attention and critical questions to issues he had faced as an FSL teacher. It also prompted him to think back on what he had done (e.g., "it is very accurate, and I thought how ridiculous I have had to be"), as well as what else might be possible (e.g., "it baffles me that I didn't think of some of those ideas"). Vicky was more reserved in her personal reactions, but wondered about navigating her relationships with her colleagues (e.g., "I might think more about this") and her pedagogy (e.g., "that art unit sounds really cool!"). Both teachers were also interested in more traditional conclusions or takeaway messages: "I would be curious to know if there are any clear policies in regard to sharing the classroom with the teacher," "I feel like stats are lacking, which would be interesting to see," and "I wonder if you could do a vignette that I could take to my next staff meeting!"

The article discussion also helped me reconnect with these teachers, where I could ask about what had changed or what new developments there were in the current school year. For Aaron, we discussed professional learning, and the fact that after repeated requests the FSL teachers in his school were given the full day to collaborate on their long-range plans, rather than taking part in a math PD workshop like in previous years. Vicky was excited to share the changes she made to her program based on an action-oriented pedagogy workshop that she completed over the summer. Both teachers talked about things that were still at play for them – e.g., questions they had, lessons they tried out, unit ideas they were considering – which arose during our shared time together. If I were to continue working with these teachers, I wonder what else I

would notice about the ways our collisions continue to shape our practices (as their practice similarly shaped my supply teaching!).

Contributions and Other Openings

The multiple intersections of this work provide spaces for (other) explorations of FSL teachers' professional practice with technology. I highlight these potential contributions as an expected part of the dissertation conclusion, but also to provide possible openings and future food for thought. Rather than statements of what was, I see them at ongoing elements at play that can be picked up without closing these lines.

Plugging in sociomaterial approaches with AR, PLCs, FSL, and technology-integrated practice prompted openings to think differently about these concepts, and to explore what and how they produce. This experimentation offers its own 'and-and' multiplicity – it is simultaneously a collision of scholarly fields, a weaving of theoretical orientations, an entanglement of professional learning, a question for technology practice, and a foray into the Canadian elementary FSL classroom. I take space to formally explore some of those ideas here.

Primarily, I want these concepts, vignettes, and wonderings to expand our current thinking, to incite further experimentation, and to make a positive difference in the lives of FSL teachers. I am more hesitant than Masny (2014) or Vasilopoulos (2021) to distance my subjectivities in what these articles (were intended to) produce – although I agree the "'I' fails to encompass the contradictions, differences, irrationalities, and incoherencies maintained and enacted by the self" (Martin, 2018, p. 10). I endeavoured to position these data in ways which might stimulate affective flows with the reader, but I can only use my experiences with FSL, educational research, fellow teachers, and so on to craft these scenes which provide possible (along with the unexpected and unknowable to me) openings for new thought. Ultimately, this work might only be "for me," and especially while it remains a draft in my personal files, I cannot know what it will become.

In addition to the wonderings I have scattered throughout this chapter, I briefly suggest a few possible future topics that might diffract out from this dissertation. First, while not successfully realized in this study, the research suggests that a PLC of practicing Core French teachers is worth exploring in greater detail (Kristmanson et al., 2011; Le Bouthillier & Kristmanson, 2023). This collaboration could employ a sociomaterial framing to do things differently. For instance, teachers could rhizomatically map their spaces and practices as a sense-making activity. Unpacking the invisible, the unanticipated of their becoming may help them understand their professional lives and practices and allow them to shift their conceptions of the place of FSL in schools. Such framing might open purposeful discussions of hybridity, uncertainty, marginalization, relational agency, and other concepts relevant to (re)framing their work beyond humanist, neoliberal orientations. Mentorship, collegiality, resourcing, and – most of all – action are essential components to any intervention in FSL (Arnott et al., 2023). For example, Core French teacher beliefs, and more specifically (in)consistency with regards to their technology practices, has recently been identified as a potential site of inquiry (Viswanathan, 2019). Beyond questionnaire and interview designs, considering how these beliefs are embodied and materially enacted can bring further insight into these teachers' identities and understandings of self in action (de Freitas & Curinga, 2015).

Digital technologies provided numerous openings for Core French teachers and students in this study, supporting collaboration, engagement, enjoyment, and facilitating pedagogical activity that would not be possible without it (Chang & Hung, 2019). Students in the Scratch activity found new opportunities to demonstrate their French knowledge, going beyond the expectations of the task, which differed from their attitudes in other class work. If projects like this, or Dagenais et al.'s (2017) Scribjab, can produce these affects more consistently in classrooms, we may begin to change the discourses surrounding the status of the subject. Of course, I also highlight glitches, structural barriers, off-task behaviours, and other frustrations that

emerged with different technologies. Again, “the use of technology should not be seen as a panacea, or a goal in and of itself, but rather as one means to support specific learning goals” (Chun et al., 2016, p. 77). We cannot engage technology as though it is separate from the systems which operate simultaneously in and beyond the material devices (Rice, 2021). Teachers must navigate them within the actual unfoldings in classrooms, and decades of hoping that a mix-and-stir addition of devices will solve the challenges in Core French has not shown results. No technology will produce administrative support, improve parental attitudes, or give teachers their own classroom. Yet, as their students enjoy learning French, the way teachers feel about their capacity and worth in schools may be bolstered. This confidence and competence may spark new possibilities in the Core French classroom as teachers co-construct their professional becoming (Le Bouthillier & Kristmanson, 2023).

Methodologically, working in uncertainty implicates how action research can be realized in the L2/FSL classroom, providing both theoretical and practical considerations into how this methodological approach can be taken up in those unique spaces (Burns, 2009; Pellerin, 2014). As previously discussed, L2 classrooms differ from English-dominant spaces, and different streams of FSL present distinct challenges and opportunities – each of which nuance considerations for AR. Fundamental to this shift is a move away from positioning professional learning and the success of classroom practice as an individual responsibility (Mulcahy, 2012, 2014). The porosity of classroom boundaries, the influence of diverse material actors in the network, and the (un)anticipated flows in assemblages when entities collide – however it is framed, these articles highlight what else becomes visible when we think in and beyond the classroom walls, and how actions and actors spill over and persist in-between what is traditionally considered professional practice. As Dania (2024) suggests, “affect-based interactions of co-constitution are needed for change to take place within a complex system” (p. 5).

To take up Bangou and Vasilopoulos' (2018) question of what might teacher education become, these concepts and forces may suggest ways for us as stakeholders to continue building a collective understanding and responsibility for FSL which begins before a new wave of teachers enter schools (Arnott et al., 2023). Helping future and current FSL teachers navigate the myriad, changeable conditions of their workplace seems to be an ongoing need (e.g., Masson, Battistuzzi, et al., 2021). We must work between blind optimism (i.e., pretending that the status of Core French is fine) and crushing negativity (i.e., overwhelming teachers with the many possible challenges they may face in their practice). Building their capacity to work amongst instability, variable conditions, and potentially marginalizing experiences seems relevant and practical (e.g., Bangou & Vasilopoulos, 2023; Viswanathan, 2019), but so too are the ways in which they can advocate for themselves, establish a network of support, and intentionally shift discourses in schools. These are conversations that can be started in teacher education, and carried forward with stakeholders throughout the school system (Arnott et al., 2023).

A renewal in FSL teacher education predicates the mobilization of actors, materials, and forces in K-12 schools, faculties of education, and ministries of education. Understanding the unique context of FSL – its materiality – through sociomaterialism is one way of engaging, experimenting, and intervening differently in the "avalanche" (Arnott et al., 2023). And after 30 or more years of enduring concerns with Core French (e.g., Masson, Knouzi, et al., 2021), we have ample reason to wonder: what (else) might become in Core French?

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Appendix A

Certificate of Ethics Approval

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

CERTIFICAT D'APPROBATION ÉTHIQUE | CERTIFICATE OF ETHICS APPROVAL

Numéro du dossier / Ethics File Number	S-05-22-7838
Titre du projet / Project Title	Using Professional Learning Communities to support technology-enhanced pedagogy among French as a Second Language teachers
Type de projet / Project Type	Thèse de doctorat / Doctoral thesis
Statut du projet / Project Status	Approuvé / Approved
Date d'approbation (jj/mm/aaaa) / Approval Date (dd/mm/yyyy)	25/05/2022
Date d'expiration (jj/mm/aaaa) / Expiry Date (dd/mm/yyyy)	24/05/2023

Équipe de recherche / Research Team

Chercheur / Researcher	Affiliation	Role
Cam SMITH	Faculté d'éducation / Faculty of Education	Chercheur Principal / Principal Investigator
Stephanie ARNOTT	Faculté d'éducation / Faculty of Education	Superviseur / Supervisor

Conditions spéciales ou commentaires / Special conditions or comments

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Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

Le Comité d'éthique de la recherche (CÉR) de l'Université d'Ottawa, opérant conformément à l'*Énoncé de politique des Trois conseils* (2014) et toutes autres lois et tous règlements applicables, a examiné et approuvé la demande d'éthique du projet de recherche ci-nommé.

L'approbation est valide pour la durée indiquée plus haut et est sujette aux conditions énumérées dans la section intitulée "Conditions Spéciales ou Commentaires". Le formulaire « Renouvellement ou Fermeture de Projet » doit être complété quatre semaines avant la date d'échéance indiquée ci-haut afin de demander un renouvellement de cette approbation éthique ou afin de fermer le dossier.

Toutes modifications apportées au projet doivent être approuvées par le CÉR avant leur mise en place, sauf si le participant doit être retiré en raison d'un danger immédiat ou s'il s'agit d'un changement ayant trait à des éléments administratifs ou logistiques du projet. Les chercheurs doivent aviser le CÉR dans les plus brefs délais de tout changement pouvant augmenter le niveau de risque aux participants ou pouvant affecter considérablement le déroulement du projet, rapporter tout évènement imprévu ou indésirable et soumettre toute nouvelle information pouvant nuire à la conduite du projet ou à la sécurité des participants.

The University of Ottawa Research Ethics Board, which operates in accordance with the *Tri-Council Policy Statement* (2014) and other applicable laws and regulations, has examined and approved the ethics application for the above-named research project.

Ethics approval is valid for the period indicated above and is subject to the conditions listed in the section entitled "Special Conditions or Comments". The "Renewal/Project Closure" form must be completedfour weeks before the above-referenced expiry date to request a renewal of this ethics approval or closure of the file.

Any changes made to the project must be approved by the REB before being implemented, except when necessary to remove participants from immediate endangerment or when the modification(s) only pertain to administrative or logistical components of the project. Investigators must also promptly alert the REB of any changes that increase the risk to participant(s), any changes that considerably affect the conduct of the project, all unanticipated and harmful events that occur, and new information that may negatively affect the conduct of the project or the safety of the participant(s).

Riana MARCOTTE
Responsable d'éthique en recherche / Protocol Officer
Pour/For **Barbara GRAVES** Président(e) du/ Chair of the **Comité d'éthique de la recherche en sciences sociales et humanités / Social Sciences and Humanities Research Ethics Board**

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Appendix B

Research Protocols

Interview Protocols

Interview 1

Tell me about yourself and your teaching practice.
What would you say to someone who wants to know what it's like to be an FSL teacher?
How do you engage technology in your FSL teaching?
What does teaching with technology produce for you? What makes technology use meaningful in your classroom?
What professional learning with technology have you already experienced?
What interested you about this research study? What are your expectations?

Reflections on the Fall term (Interview 2)

How is the year going so far?
Tell me about your how inquiry question in unfolding.
What have you noticed:

- About your approach to technology?
- About your students' learning?
- About sharing your experience with colleagues?
- About teaching FSL?
- About technology in FSL?

What does technology do in your lessons?
Who or what has contributed to those experiences?
What are you still wondering about? What new wonderings do you have?

Reflections on the Lesson(s) (Interview 2)

How did you feel the lesson went? What worked well? What would you change?
What is your data telling you about your teaching? Your students? Technology? Other elements?
What are the implications of those findings?
What kinds of improvisation or unexpected action occurred while you were teaching this lesson?
What about for the students? How did that go?
What might be some additional ways to look at this lesson? What data does not fit your understanding?

Final Interview

What has your participation in this research project produced for you?
How did your inquiry unfold? What resonated with you?
What moments stand out for you when you think back over the course of the year?
How do you think your teaching has changed? How have your students responded?
What are you thinking about now / next in your practice?

Observation Protocol

Based on the lesson plan, how is technology woven throughout the teaching and learning activity/ies?

What is the technology doing in the lesson?

- Supporting the objectives of the lesson?
- Facilitating/extending thinking or problem-solving?
- Interrupting, distracting?
- Other?

What technical problems occurred (if any)? How were technical issues addressed?
What are the teachers doing with technology? How are students engaged with technology and other actors?

In what ways did the technology impact…

- Student collaboration?
- Risk-taking in French?
- Language production and use?
- Other?

Observation Reflections (adapted from Adams & Thompson, 2016)

- *Narrate the day!*
- Describe how the technology appeared in the professional practice. What happened?
- Look closely at the materialities implicated in the activities. What micro-practices are visible?
- Who/what is acting as the body-technology-world interaction unfolds? What are they doing? Are some actors more or less powerful than others? Who/what is excluded?
- How have particular networks come to be configured this way? How have these people, objects, ideas, discourses, and events gathered? What is related to what and how? What sort of work does this network do or try to do?
- What are the initial conditions for this CALL activity? What aspects of change in the activity showed sensitivity to or depended on these conditions?
- What change occurred during the CALL activity? What were the processes and outcomes of the corresponding self-organization of the network and of its interaction with the environment?
- What was the technology intended to do? What did the technology disrupt? What did that produce? What anomalies, incongruences, and inconsistencies are being played out? Are there any unintended or surprising consequences?
- How have particular entanglements come to be and how do they maintain their connections? What work is happening as actors join up, stay linked, and/or break apart? What kinds of (re)orderings can be discerned?
- What unintended realities come into being as everyday practices unfold? What can be discerned about the gaps between practices and the realities they enact?

Researcher Reflection Prompts

- What data events and happenings demanded attention? What was my response at the time? How do I feel about it now?
- How did the lesson go? What worked? What was unexpected? What are the implications of that? What now?
- What seems to be emerging?
- How are individual actors implicated in those feelings/wonderings?
- Thinking about [name], what stands out about their practice?

Appendix C
A Partial Sociomaterial Glossary

Over the course of my PhD studies, I have been (quite irregularly) compiling a glossary of different theoretical, conceptual, methodological, onto-epistemological, etc. terms for my own reference. I found it helpful for (re)connecting with diverse sources and perspectives – allowing me to zigzag between new and old readings without interrupting my work – and checking whether I was using terms appropriately. Given that the flow and style of the thesis by articles does not allow for extensive clarification of all terms, I have included this tidier version of that glossary to be read alongside the document as needed.

This list is not intended to neatly define and capture meaning, particularly in the case of Deleuzoguattarian concepts, nor is it exhaustive; many of these concepts have varied (and sometimes conflicting) histories and uses by different authors and traditions. Many of these terms also rely on other conceptual elements to be understood to their full extent, making these references rather cyclical. I therefore knowingly present incomplete and (over) simplified entries. The citations selected below are not always primary sources or 'big name' authors, though many indeed are, but those who we felt provided approachable discussions. I cautiously offer up our understandings of sociomaterialist ideas to provide some context for the article. I encourage interested readers to explore much more fulsome sociomaterial dictionaries (Parr, 2010), almanacs (Skinner, n.d.), glossaries (Braidotti & Hlavajova, 2018), etc.

A shorter version of this glossary has been included in a journal article that is currently under review.

Actor-Network

An actor-network is a collection or web of entities, materials, etc. brought together through a series of transformations that perform various functions or produce something in their context (Fenwick & Edwards, 2010). Latour's (1996) definition emphasized the dissolution of micro-macro distinctions, the centrality of connections, and the liveliness of the network in order to differentiate it from technical or bureaucratic diagrams. Particularly in post-2000s ANT studies,

the actor-network "can be envisioned as ephemeral and rhizomatic in nature" (Fenwick & Edwards, 2010, p. 16).

For example, the movement of trains in a subway or an electrical circuit is not an actor-network, given the lack of transformations. However, these bodies may be implicated in actor-networks related to public transportation or technological innovation. Actor-networks can still be found in established and steady conditions, yet the presence of complex associations and transformations through those connections is fundamental (Fenwick & Edwards, 2010).

Affect

Unlike lay understandings of the term, which might refer to emotional response or a unidirectional exertion of influence, in sociomaterial writing affect is an emergent capacity (Massumi, 2015). Affect positions how an entity is able to move and intra-act in relation to others; as Ash (2015) notes, "affects travel across and through material environments. In doing so, affects are translated as they meet and are transformed by the material thresholds of objects" (p. 16).

Put simply, affect is the changing potential of something to transform (i.e., affect) and be transformed (i.e., be affected) in contact with other bodies. What an affect does is not pre-established. Thus, in contrast with traditional definitions of agency, affect positions not just what a thing can do, but what it can undergo, emphasizing production in the moment rather than an enduring trait (N. J. Fox & Alldred, 2015).

Assemblage

A Deleuzian concept, called *agencement* in French, the assemblage is a temporary, non-hierarchical, heterogeneous, dynamic grouping of elements (Gurney & Demuro, 2022). The assemblage centers relations, with the implication that they could have become otherwise.
The assemblage differs from a quilt, which is a patchwork of discrete elements that form a whole, assemblages are understood through the coming together of its human and non-human components for a period of time that creates new functions through the transformations of its constitutive components (Gurney & Demuro, 2022; Strom & Martin, 2022). An assemblage is always more than the sum of its moving parts (Deleuze & Guattari, 1987).

An assemblage is not just the material bodies or entities (i.e., the machinic), but also the acts, transformations, and expressions which give it certain qualities (i.e., the enunciation; Deleuze & Guattari, 1987). In addition, another axis of qualities (i.e., the intensive) implicates the forces of de/re/territorialization which characterize those movements.

Though they share many similarities (e.g., Adams & Thompson, 2016), assemblages differ from actor-networks in their metaphysical positioning. The network is usually taken to be both real and actual, while the assemblage is virtual with actual affects; the network 'exists' and lingers in the material world in a way that the assemblage cannot. For more on that, I refer readers to sources like Latour (1996) and Buchanan (2017).

Becoming

In Deleuze and Guattari's writing, becoming takes on the meaning of constant, untimely, and unpredictable acts of transformation. Unlike 'being,' which is traditionally used to indicate a stable and enduring state, "to become is never to imitate, not to 'do like', nor to conform to a model . . . There is no terminus from which you set out, none which you arrive at or which you ought to arrive at" (Deleuze & Parnet, 1987, p. 20). Things are never in stasis, but rather in an ongoing unfolding without end; things are always in-between, becoming what they are not (Waterhouse, 2012). Becoming highlights the process of coming-into-being, rather than the 'state' of being (Vasilopoulos, 2021).

In research, becoming disrupts the possibility of transcendent and reproducible methods or practices as becoming is always singularized (Deleuze, 1997). If what things become is unknown, we cannot take predictability and stabilization as a start or end of research processes (Jackson & Mazzei, 2012). I continue this thinking in Article 2.

Cartesianism

Cartesianism, named for René Descartes, is associated with dualisms or binaries that separate two concepts (Jaarsma & Berkhout, 2022). Well-known (and fundamentally rejected in new materialism) dualisms include (a) the split between mind and body, and (b) the separation of person and the 'external' world. By integrating rather than separating these elements, the centrality of materials and embodied knowing requires correcting these supposed binaries, "embracing a view of bodies as porous and permeable" (Dernikos et al., 2020, p. 4).

Diffraction / Diffractive Methodology

Frequently used in feminist new materialisms, diffraction means "to break apart in different directions" (Barad, 2014, p. 168). is used in contrast with reflection to focus on differences, how differences are created, and the effects of those differences as they are continuously (re)made (Boylan, 2021). Diffractions demand iteratively reconfiguring what has been, rather than mirroring it, as entanglements in a changing world.

A diffractive approach to research engages how method might become different as it is employed, rather than attempting to repeat acts with the goal of sameness. A diffractive review of texts recognizes the role played by human and non-human elements in knowledge production and continually interrogates how the ways in which we research affects the knowledge we produce (Sauzet, 2021). The focus is on reading the texts through each other, rather than against each other, and in light of personal experience and other data in order to creatively develop new insights (Murris & Bozalek, 2019).

(Post) Humanism

In contrast with humanism, which emphasizes the agency of human beings over all other matter (anthropocentrism), posthuman philosophies reject the centrality of the human knowing subject and provide a new ethical imperative for engaging with non-human entities (Taylor, 2016). These approaches center a relational subjectivity, a view of things becoming and emerging in assemblages that are co-constitutive rather than composed of fully autonomous beings, that include "both human and non-human agency, knowledge systems, and material conditions, that change over time" (Rosiek & Pratt, 2024, p. 199).

Intra-Action

Originating in the work of Karen Barad (2007), intra-action is used in place of the more common "interaction" in order to reflect the entanglement of bodies and agency in sociomaterialist thinking.

The prefix inter- presupposes the existence of individual entities, and acts occurring "between" separable beings, rather than emerging as a result of those confluences (Barad, 2007). Underpinning the term is the understanding that all bodies are defined by their relations, rather than being considered discrete or autonomous, challenging the taken-for-granted perceptions of what 'bounds' a body (Adams & Thompson, 2016).

For example, a teacher's positionality would be formed among the many elements that circulate in their professional context: discursive and material forces and bodies intra-act recursively to jointly produce what this teacher can do, a plurality which emerges among elements traditionally situated either "in" or "beyond" the teacher's body, agency, etc. (Strom & Martin, 2022).

Lines - Molar line

Deleuze and Guattari speak of the molar line as a force of control, order, rigidity, and segmentation. For them, a molar line is a "rigid line of segmentarity; in no sense is it dead, for it occupies and pervades our life, and always seems to prevail in the end" (Deleuze & Guattari, 1987, p. 195). A molar line is defined by binary classifications - either-or thinking - patterns and territories which are categorized and coded without regard for their nuance and difference. A molar line enforces norms and pulls disruptions back into existing governable regimens. Yet, this line also organizes, classifies, and provides consistency; it is not just associated with repression and constriction. Indeed, it provides 'common ground' in language, social life, and systems. It is also an orientation from which to experiment, as the machinic repetition of the molar breeds the desire to escape and surpass the status quo (Williams, 2003). A molar line might include the standardized conventions governing the composition of scientific articles published in peer-reviewed journals.

Lines - Molecular line

The molecular line comprises segments "which are like quanta of deterritorialization" that produce cracks within the molar line (Deleuze & Guattari, 1987, p. 196). The suppleness of this line expands the molar beyond the binary, seeking and-and-and connections, without attaining the frenetic intensity of a line of flight. It therefore simultaneously seems "to resist the cut line while still fearing it will sink into the rupture" (de Miranda, 2013, p. 116). This 'doubling' of perspectives posits what a body *can do* beyond what it *is* (Deleuze & Guattari, 1987), which is important for the ways in which we can engage this concept. Again, like the other lines, a molecular line may ultimately reinforce or be co-opted by the molar forces at play with/in an assemblage. Molecular lines could be cracks in the armor of scientific writing. They could be spots where a paper does not follow the standard rules for research articles.

Lines - Lines of flight

As ruptures that defy and cut through molar segmentarities, lines of flight are vectors of escape. The line of flight "no longer tolerates segments; rather, it is like an exploding of the two

segmentary series. She has broken through the wall, she has gotten out of the black holes. She has attained a kind of absolute deterritorialization" (Deleuze & Guattari, 1987, p. 197). This line is a "radical movement of becoming, unsaddled by the imperatives of assimilation or imitation" (Windsor, 2015, p. 164). However, lines of flight do not necessarily result in cataclysmic change; their energies may be insufficient to break free of the molar, becoming a mere blip in time. Nor is the turmoil and upheaval associated with them always a force of 'good' - in intention (action) or in consequence (reaction). For example, a line of flight might involve articles that diverge significantly from traditional peer-reviewed conventions while maintaining their scientific orientation.

New / Sociomaterialism

As I describe in the introduction, these terms refer to growing and diverse set of theoretical perspectives that extend through and beyond education and applied linguistics. I cautiously position sociomaterialism as my umbrella term, though I could easily have used ' new materialism' or another term entirely. I list a number of possibly related traditions in the dissertation, while recognizing that the list is non-exhaustive and that scholars within these domains may use different terms to define themselves. Scholars may also consciously (not) use variations on materialism to define their work, which makes the boundaries of the term difficult to define. As one example of criteria that might 'define' sociomaterialism, I refer to the three points developed by Develennes and Dillet (2018): 1) there is an emphasis on the novelty of the theory; 2) explicit or implicit ontological claims are made about the nature of matter and its impact on our lives; and 3) methodical implications of considering matter in academic practices are examined.

Non-Representational (or More-Than-Representational) Theory

This theory similarly emerged from the post-structuralist movement, notably in human geography, which rejects a "social science obsessed with control, prediction, and the will to explain and understand everything" (Vannini, 2015, p. 4). In particular, non-representational theory contributes an alternative perspective based on the concept that events, knowings, etc. are continuously reconstructed within new engagements rather than transmitting (or representing) a pre-existing, fixed reality. Instead of focusing on what things mean or signify, non-representational theory centers the pre-cognitive and pre-personal responses to encounters with the world that exceed our attempts to contain them in (re)presentations (N. Williams, 2020).

Onto-Epistemology

As the combination of ontology and epistemology might suggest, onto-epistemology is often used by socio materialist writers to reinforce that knowing and being cannot be separated and thus neither can our theories of those domains (Barad, 2007). Sometimes separately expressed as ethico-onto-epistem-ology, the term also implicates the ethics associated with these acts, given that practices always include or exclude different matterings (Geerts, 2016).

(Co-)Production

Reflecting other sociomaterialist neologisms like intra-action, authors may employ the term co-production in order to continue to trouble the metaphysics of individualism (Barad, 2007). Rather than seeing objects emerge through processes that are separate from the entanglements which produced them, the use of co-production emphasizes the material-discursive condition and multitude of entities that form any 'singular' body.

Rhizome

Inspired by the botanical term for a horizontal plant segment from which other shoots sprout, the rhizome is a fundamental concept in Deleuzoguattarian thinking. The rhizome continuously grows in all directions, fostering new connections (Waterhouse, 2012). The rhizome is unpredictable; it does not follow a pre-determined logic or plan. A rhizome is characterized by seven traits: connectivity, heterogeneity, multiplicity, signifying, rupture, mapping, and decalcomania (Deleuze & Guattari, 1987).

In contrast with arboretic (tree-like) thinking, the rhizome eschews linear cause-and-effect rationality, dualities, and the visible tracing of reality (Kane, 2015). Instead, the rhizome demands mappings that "highlight potential difference, the present, creatively looking to new possibilities" (Vasilopoulos, 2021, p. 63).

Thinking with Theory

Originating in the work of Jackson and Mazzei, thinking with theory is a methodological approach that "eschews a use of concepts for what they mean and instead puts to use concepts to show how they work, what they do, what they allow, and what they unsettle" (2017, p. 732). In short, the purpose of thinking with theory is to spur new lines of thought from within a research project, to break open and trouble accepted, standardized processes around the treatment of data

and analysis. Rather than closing down thought, the intent is to keep thinking "on the move," positioning thinking as always becoming (Jackson & Mazzei, 2017, p. 719).

Translation

An ANT-ish term, translation refers to the affects of bodies intra-acting, and therefore transforming, as they enter into relation in the material world (Adams & Thompson, 2016). As these connections are established, the actors begin to distribute functions within the actor-network. Of course, translation can be resisted or rejected, it may take time or be instantaneous, be weak or totalising, etc. – what emerges is not predetermined (Fenwick & Edwards, 2010). Translation allows ANT researchers to follow processes and trace what is happening and has happened to bring about an actor-network; "in education, translation provides a new language and a richly materialized conception to intervene more precisely, more honestly, within the messiness and multiplicity that make up those processes that we refer to as learning and teaching" (Fenwick & Edwards, 2010, p. 12).

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