

Social Roles in an Experiential Activity in an Undergraduate
Neuroscience Course: A Case Study with Emergency
Remote Teaching Considerations

by

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Abstract

Undergraduate neuroscience students must learn how to effectively produce discipline-specific genres. Evidence suggests research experience may help students learn to write for discipline-specific purposes; yet a need exists for more widely available methods of research experience than lab experiments. As an investigation into a more available method, this thesis presents a case study of an experiential activity used in a neuroscience writing course at one medium-sized, Canadian university. Using rhetorical genre theory, this study investigated if and how this experiential activity, which took place outside of the lab, helped students discursively construct the social role of researcher and learn how to write for disciplinary purposes. An inductive, thematic analysis of in-class observations, interviews, and open-ended questionnaire responses suggests that the research experience provided by this activity may help neuroscience students bridge the roles of student and professional researcher to effectively write for their discipline, in both physical and virtual environments.

Keywords: science writing instruction, rhetorical genre theory, social roles, experiential learning activity, discursive constructions

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Chapter 1: Introduction

Teaching effective written science communication at the undergraduate level is becoming increasingly important within the scientific community (Yu & Northcut, 2018). The ability to effectively communicate scientific ideas through discipline-specific writing tasks is an important skill for future scientists (Petersen, 2020; Yu & Northcut, 2018). Students' abilities to write competently within their discipline can play a part in determining whether they can continue their scientific education (Appleby & Appleby, 2006; Yu & Northcut, 2018). It may also affect their professional success within academia (Petersen et al., 2020), and outside of academia (Yu & Northcut, 2018). Increasingly, science instructors are recognizing that it is essential for their students to learn discipline-specific writing as part of their undergraduate science education (Clabough & Clabough, 2016; Grzyb et al., 2018; Petersen et al., 2020), and students are often expected to become proficient in discipline-specific writing during their undergraduate studies (e.g., Dansereau et al., 2020).

Despite this recognition and expectation, undergraduate science students may still be provided with only limited writing instruction (Coil et al., 2010; Grzyb et al., 2018; Petersen et al., 2020). Instruction may also be ineffective, as research on the writing produced by undergraduate science students who had received varying forms of writing instruction found that their discipline-specific writing was still subpar even toward the end of their undergraduate degrees (e.g., Jerde & Taper, 2004; Weaver et al., 2014). This lack of implementation or effectiveness of writing instruction interventions in the sciences may be explained partly through barriers identified in the literature. These

barriers include student resistance to writing instruction (Carlson, 2007; Deiner et al., 2012; Petersen et al., 2020); instructors' unwillingness or inability to provide writing instruction (Coil et al., 2010; Holstein et al., 2015; Moon et al., 2018); and limited institutional resources (Köver et al., 2014; Jones et al., 2011).

Often, the typical forms of writing that students are taught in secondary school – such as book reports and five-paragraph persuasive essays – may not prepare students in the sciences for the writing tasks of their post-secondary scientific disciplines (Carlson, 2007). As a result, these students may struggle in adjusting to writing in the new university setting in which they find themselves. Science students tend to begin their undergraduate studies with a negative view of writing, often not understanding its value in scientific disciplines (Petersen et al., 2020). For instance, “it is not unusual to hear undergraduates declare that they have entered science . . . to avoid writing” (Ross et al., 2011, p. 15), which may make them less receptive to writing instruction, if and when it is offered. Additionally, science instructors may be unable or unwilling to take the time away from teaching scientific content to focus on writing instruction (Coil et al., 2010; Moon et al., 2018). Instructors may also be limited in implementing certain science writing instruction interventions because of institutional challenges, concerns, such as class or university size (Köver et al., 2014), and economic considerations (Jones et al., 2011).

Research experience has been shown as an effective way to promote scientific thinking and student engagement in undergraduate science courses (Seymour et al., 2004). Within the literature on science writing instruction, research experience often

takes the form of a laboratory experiment in various scientific disciplines (e.g., Clabough & Clabough, 2016; Colabroy, 2011; Dansereau et al., 2020; Grzyb et al., 2018; Jones et al., 2011), which are then paired with writing instruction interventions that attempt to translate scientific thinking into improved scientific writing. However, while laboratory experiments are often effective as research experience (Seymour et al., 2004), a need has been suggested for more widely available forms of research experience that do not require laboratories (Köver et al., 2014), and more available methods of science writing instruction in general that are less time-consuming (Moon et al., 2018) and more cost-effective (Jones et al., 2011).

To further explore mechanisms outside of the formal lab that can be used to help students learn how to write for their disciplines, I conducted a case study of an experiential activity in an undergraduate neuroscience writing course that consists of a short-term, non-laboratory research experience. Experiential activities are classroom exercises that allow students to “process real-life scenarios, experiment with new behaviors, and receive feedback in a safe environment” (Lewis & Williams, 1995, p. 9). These types of exercises include simulations, role-plays, and case studies, among other activities (Lewis & Williams, 1995), and have a theoretical basis in experiential learning theories (e.g., Fowler, 2008; Jackson & MacIsaac, 1995; Kolb, 1984; Moon, 2004). Theories of experiential learning are founded in the pedagogical approach of learning by doing (Lewis & Williams, 1995), and I use basic tenets of these theories to contextualize the experiential activity and conduct this investigation.

In addition to drawing on experiential learning theories, I also employed Rhetorical Genre Theory (RGT), a sociocultural theory of genre advanced by Miller (1984), to investigate this activity. In RGT, written texts are considered the products of genres (Freedman, 1999). Genres can be viewed as regularized social actions that respond to exigences – that is, socially recognizable needs – within typified rhetorical situations, or communally defined contexts (Miller, 1984). Genres also create “social roles [which are] performed by writers and readers” (Pare & Smart, 1994, p. 122). Recognizing the social roles that exist within a written genre and how and when to perform them is an important part of what it means to know a genre (Devitt, 2004). These “regulated roles . . . of the texts’ writers” (Paré, 2014, p. A-84) are of central focus in this investigation.

I conduct this investigation by analyzing students’ discursive constructions. Within this thesis, discursive construction refers to the expression of experience and perception using language. Language is the filter through which we interact with the world. Within my research, I am unable to study my participants’ internal perceptions, as these are beyond my reach; all I have access to is the language they use to articulate their perceptions, which is what gives their experience meaning in the context of this investigation. To conduct this study, then, I analyze my participants’ discursive constructions, or how they use language to construct their experience of the activity.

The main purpose of this research study was to discover and examine how neuroscience students discursively constructed the social roles they performed throughout the completion of the experiential activity and resulting written assignment

designed to help them learn how to write for the neuroscience discipline. Through this examination, my objective, described by Mills and Birks (2014) as a “tangible subset of stated research questions” that “includes reference to specific object or phenomenon” (p. 11), was to determine (1) if and how the in-class experiential activity in any way allows the students to discursively construct their role as that of the researcher; and (2) whether and how the students find the roles they adopt beneficial to writing the accompanying paper within the neuroscience discipline.

Overview of Chapters

This thesis is divided into seven chapters. In the first chapter, I have provided an introduction to the study’s research problematic and the research objectives. In Chapter 2, I discuss the theoretical framework used to conduct this investigation: RGT (Miller, 1984) and theories of experiential learning (e.g., Dewey, 1897/2012), with consideration of various experiential learning concepts in pedagogical settings. Additionally, the second chapter provides a synthesis of the epistemological perspectives behind RGT and experiential learning theories to illustrate how I have fused them to conduct this case study analysis. In Chapter 3, I offer a brief history of post-secondary writing instruction in North America and a review of the literature on writing instruction in undergraduate science courses, touching briefly on current best practices and focusing on the use of experiential learning to help students learn how to write in various scientific disciplines. I situate my case study within this research and also discuss the topical issue of instruction during emergency remote teaching (ERT) in consideration of the effects of COVID-19 safety protocols.

In Chapter 4, I outline my research methodology, describing the methodological perspectives behind this study and providing a brief overview of a previous iteration of the study to offer necessary background information for some of the data. I then briefly discuss the process of ethics approval. Following this, I provide a description of the science writing course and the experiential activity under investigation. I then describe the research methods, including a description of this study's participants and recruitment, as well as methods of data collection and analysis. In the following chapter, Chapter 5, I describe my data and analysis. I lay out the phases of Braun and Clarke's (2006) Thematic Analysis (TA) and describe my procession through the phases of TA that resulted in my themes. I provide a thematic map as well as a description of each theme I have identified, with examples of raw excerpts from my data to provide justification for the themes from each method of qualitative data collection.

In Chapter 6, I answer my research questions, relating the themes I have identified in my data back to my research questions and considering the themes through the lenses of RGT and theories of experiential learning. Next, I discuss how my themes and the theory relate to the course professor's responses gleaned from her interview.

In the final chapter, I conclude my thesis by providing a brief recap of the data collection, results, and discussion. In the following section, I discuss the implications of this investigation for teaching and learning. I then highlight the limitations of this study and provide recommendations for further research into these topics that are suggested

by my analysis, including further research into this case specifically as well as research on the use of experiential learning in writing and genre instruction.

Chapter 2: Theoretical Framework

In this chapter, I outline the theoretical context driving this study. The goal of this study, as stated in my research questions, was to discover and interpret if and how undergraduate neuroscience students discursively constructed their experience of an experiential activity they performed in an undergraduate neuroscience writing course. The goal of the activity, and indeed the goal of the course, is to help undergraduate neuroscience students learn how to write for their discipline of study by introducing them to specific genres in their discipline, specifically the genre of the neuroscience journal/experimental article. In accordance with these goals, the theoretical framework of this study consists of Rhetorical Genre Theory (RGT; Miller, 1984), which is a theory of genre, and theories of experiential learning (e.g., Dewey, 1897/2012), which are the theoretical perspectives behind the concept of learning by doing.

In the first section of this chapter, I introduce and discuss RGT and its relation to this case study. In addition, I provide an explanation of undergraduate writing instruction from the RGT perspective. Following that, I offer an overview of theories of experiential learning, in which I describe key concepts of experiential learning that are used in this study's framework. In the final section, I outline how these theories coexist epistemologically in my theoretical framework and in the context of this study, explaining how the in-class activity under investigation can be viewed through this framework.

Rhetorical Genre Theory

RGT, also referred to as North American Genre Theory, is a sociocultural theory of rhetorical genre that highlights the social and rhetorical aspects of the writing experience. Miller, in her 1984 seminal work *Genre as Social Action*, which solidified the theoretical basis of RGT, defined genres as “typified rhetorical actions based in recurrent [social] situations” (p. 159). These actions are “motivated by shared recognitions of shared exigences” (Miller et al., 2018) that provide “reproducible speaker [or writer] and addressee [or reader] roles” (Miller 1994, p. 60). The neuroscience journal article, which is the topic of the in-class activity at the centre of this case study, is a well-established genre, meaning it is a rhetorical action that is performed through generic roles in response to a recognizable exigence within a rhetorical situation. The purpose of this section is twofold: first, to introduce RGT through a discussion of the key concepts referenced here – rhetoric, rhetorical situation, and exigence, followed by genre and generic roles – that relate to this study; second, to provide a brief description of the literature on genre learning in classroom settings, focusing on the RGT perspective and outlining the issues RGT scholars have raised surrounding the transferability of genre knowledge from classrooms to professional settings.

Basic Tenets of RGT: Rhetoric, Rhetorical Situation, Exigence

Burke defined rhetoric as the use of language as symbolic action (1951, as cited in Bawarshi & Reiff, 2010); rhetoric “allows human beings to function within and construct social reality—to use language symbolically to establish identification and

induce cooperation” (Bawarshi & Reiff, 2010, p. 61). This idea that the use of rhetoric is a social action is a foundational element of RGT, providing the perspective that the “significance [of discourse] should be judged on the basis of what it does” (Artemeva, 2008, p. 14) – what it achieves as an action. Rhetorical actions are these discursive, symbolic uses of language (Burke, 1951, as cited in Bawarshi & Reiff, 2010) that are performed in rhetorical situations to achieve specific social goals, or exigences (Miller, 1984).

A rhetorical situation, as described by Bitzer (1968), is “a natural context of persons, events, objects, relations, and an exigence which strongly invites utterance” (p. 5). It is a convergence of contextual circumstances that prompts the use of rhetoric and that, according to Bitzer, may “mature [and] decay or mature and persist” (p. 12). In describing the situations that persist, Bitzer states that, “[f]rom day to day, year to year, comparable situations occur, prompting comparable responses; hence rhetorical forms are born and a special vocabulary, grammar, and style are established” (p. 13). Campbell and Jamieson (1978), in differentiating between their conceptualization of rhetorical action and Bitzer’s definition of rhetorical situation, wondered if situations can actually recur, or if they are by nature “idiosyncratic and hence do not and cannot produce recurring forms” (p. 11). In other words, given that all situations must have material elements that make them in some ways unique – time, individual participants, relationships between participants, political atmosphere, to name a few – can any situation truly be the recurrence of another?

Following Campbell and Jamieson's (1978) perspective, Miller (1984) also questioned and rejected the materialistic aspects of Bitzer's definition of rhetorical situation. Expanding Bitzer's conceptualization of recurrent situations, she concluded that typified, recognizable rhetorical situations by nature recur, because to be recognized as a typified situation requires recurrence; and second, that "[w]hat recurs cannot be a material configuration of objects, events, and people, nor can it be a subjective configuration, a 'perception,' for these, too, are unique from moment to moment, person to person" (p. 156). The recurrent element of a rhetorical situation cannot be these material elements that, as Campbell and Jamieson (1978) suggested, make each situation in some way idiosyncratic, nor is it an internal, individual perception of the situation. Instead, Miller argues, "[w]hat recurs is . . . our construal of a type" (Miller, 1984, p. 157). Situation types, or typifications, are "socially-defined and shared recognitions of similarities" (Bawarshi & Reiff, 2010, p. 62), or "routinized, socially-available categorizations of strategies and forms for recognizing and acting within familiar situations" (p. 67). Rhetorical situations, then, that have recurred enough to be recognizable by their participants, are typified social constructs. Phrased differently, they are peoples' recognition of situational similarities based on socially and culturally shared situation types among participants, who constitute their discourse community – that is, a socio-rhetorical community that shares common goals and language (Swales, 1990).

Within a recognizable, typified situation, one must also determine exigence, defined here as the conceptualization of social motive in a rhetorical situation (Miller,

1984). Bitzer (1968), as part of his description of rhetorical situation, defined exigence as “an imperfection marked by urgency” (p. 6) that is only rhetorical in nature if it is “capable of positive modification . . . [that] requires discourse or can be assisted by discourse” (p. 7). From this perspective, a rhetorical exigence is a problem that *can* be solved with discursive action if participants become aware of it, but which exists as the external focus of a rhetorical situation regardless of human awareness of its existence.

Like Bitzer’s conceptualization of rhetorical situation, Miller (1984) concluded that this definition is also too materialistic for a rhetorical understanding of exigence, as it attempts to separate a problem from the social understanding of that problem. Like the rhetorical situation, an exigence only exists insofar as it is socially constructed; it is “a mutual construing of . . . an objectified social need” (Miller, 1984, p. 156), and this mutual construal is the result of typification through recurrence. People become aware of the social needs, or exigences, of a particular situation based on their recognition of its similarities to other types of situational social needs. Miller (1984) thus proposed a refined understanding of exigence as “a set of particular social patterns and expectations that provides a socially objectified motive for addressing danger, ignorance, [or] separateness” (p. 158).

The socially constructed situation type that may be recognized as a rhetorical situation for the journal article genre may include, for example, *reporting collected experimental results*, or as Bazerman (1988/2000) has described it, “present[ing] empirical experience” (p. 7). Bazerman (1988/2000), in his analysis of the historical and rhetorical construction of the experimental scientific article genre, described an

“emergent rhetorical situation” (p.326) for the experimental article: “[when] large issues coalesce into a specific question, large research goals take shape in a specific project, a local environment of immediately relevant claims and counterclaims emerges from the literature . . .” (p. 326). According to Bazerman (1988/2000), this arising rhetorical situation “may seem to call for an immediate written response, it may call for further experiments to address unresolved questions and criticisms . . . or it may call for fundamental investigations out of which whole new kinds of statements will grow” (p. 326). The *call* that Bazerman refers to here is the exigence of the rhetorical situation. It is a call to rhetorical action. This rhetorical action can be interpreted, as defined above and discussed in the next section, as the genre.

Genre as Action and Generic Social Roles

Historically, traditional literary genre scholars focused much of their understanding of genres on text-type, viewing genres as “characterized by regularities in textual, that is, thematic, stylistic, and compositional, features” (Artemeva, 2008, p. 13). Drawing on the works of Burke (1965; 1969, as cited in Miller, 1984), Bitzer (1968) and Campbell and Jamieson (1978), among others, Miller (1984) expanded on the then contemporary sociological identification of genre when she reconceptualized genres as “typified rhetorical actions based in recurrent situations” (p. 159), and with this seminal redefinition established the field of RGT. In addition, Bakhtin’s (1979/1986) earlier work contributed to RGT with his theory of speech genres, or the genres of language, also emphasizing the social nature of genre. He argued that addressivity is a necessary feature of genre, as all genres have their “own typical conception of the addressee” (p.

79). All genres, he posited, require (at least) a speaker – in the case of written genres, a writer – and an addressee (i.e., reader), highlighting genres as social phenomena. He also separated speech genres into two types, “primary” genres – that is, genres with “an immediate relation to actual reality and to the real utterances of others” (p. 62) and “secondary” genres – that is, “complex” genres that are “primarily written” and made up of primary genres (p. 62). Written genres such as scientific journal articles are seen as secondary genres, which “codify activity in situations occurring over time and in distant locales” (Berkenkotter & Huckin, 1995, p. 7-8).

Written genres, as secondary genres, function as “forms of organized cultural communication” (Berkenkotter & Huckin, 1995, p. 10) that serve to “facilitate the multiple social interactions that are instrumental in the production of [disciplinary] knowledge” (p. 1). Rather than viewing written genres solely as text-types, RGT scholars consider the textual features of written genres – elements including but not limited to the language, composition, and grammar of a text such as a journal article – to be products of the rhetorical social actions that people undertake in response to recurrent rhetorical situations (Freedman, 1999). A written text is constructed as one’s response to a situation – the result of one performing a social action while enacting the appropriate generic social role(s).

Genres are the rhetorical actions that are performed in response to particular rhetorical situations, and like rhetorical situations and exigences that repeatedly recur, genres can also be typified. The relationship between the typification of genre and the typification of the rhetorical situation and exigence is reciprocal: “Genres participate in

the construction of the situations to which they respond” (Bawarshi & Reiff, 2010, p. 69). This reciprocal typification that can occur between rhetorical situations, exigences, and a genre stem from one’s “recognition of a situation . . . calling for a certain response [which] is based on our having defined it as a situation that calls for a certain response” (p. 70). Once one defines a situation, they are limited in the ways they might react in that situation; as suggested by Bitzer (1968), there is a certain “power of situation to constrain a fitting response” (p. 11). In other words, people are limited in their choice of genres by their definition of a situation and their recognition of its exigence.

If one identifies a particular rhetorical situation as *reporting collected experimental results*, this definition they have given the situation constrains their available rhetorical actions. In other words, it would not make rhetorical sense to respond to this situation with, for example, a résumé. In asserting the definition of *reporting collected experimental results* and acknowledging appropriate generic responses, such as the journal article, the situation is recurring, solidifying the typification of the situation and of the appropriate social actions within the situation. In this way, genres contribute to their own typification. As Bawarshi (2000) puts it: “genre does not simply *regulate* a pre-existing social activity; instead, it *constitutes* the activity by making it possible by way of its ideological and rhetorical conventions” (p. 340). While one’s recognition of the rhetorical situation as *reporting collected experimental results* constrains the available generic responses, at the same time the genre of the journal article makes possible the activity of reporting collected experimental results.

Situating genres in the realm of social action necessarily ties them to the realities of an ever-changing social world; as societies form, change, grow, dissolve, and so on, so too do the socially recognized aspects of rhetorical situation, the mutually construed exigence, and the typified rhetorical genre. To account for this social growth – or as Miller (1984) puts it, a genre’s ability to “change, evolve, and decay” (p. 163) – Catherine Schryer (1993) offers a consideration of genres as “stabilized-for-now or stabilized-enough sites of social and ideological action” (p. 208). This idea that genres are stable entities, but not permanently so, allows us to consider genres as “simultaneously diachronic and synchronic structure[s]” (p. 208). Through this perspective, genres can be analyzed and described in relation to their current contexts (synchrony) as well as considered and studied in how they have changed over time, through different contexts with different participants (diachrony).

As an example of the synchrony and diachrony of genres, people can understand and recognize the current, stabilized-for-now typified genre of the neuroscience research article and which typified situations and exigences prompt that response. This understanding is necessary to be able to understand and use genres, as well as investigate the evolution of the research article genre over time, as done by Bazerman (1988/2000). Genres are stabilized-for-now sites of action that “shape their operators” (p. 208) but, in particular cases, are also malleable enough to be shaped by members of the community of users and change, in particularly instances, over time. In other words, just as genres are constituted through the people who use them, they also constitute the identities of the people performing the genre roles and are constituted in turn by

the people fulfilling those roles. For instance, the identity of a researcher who uses the journal article genre to report her collected experimental results is constituted through completing the action of writing the journal article to report her collected experimental results. This point is well illustrated by Bawarshi (2000), who explains that “genres shape our social realities,” yet, at the same time, our actions also “give shape to them [the genres]” (p. 353).

The identities that are constituted by genres, or the social roles enacted by the people participating in a genre, help explain how genres shape the participants in a rhetorical understanding of genre. As Devitt (2004) has explained, “[p]art of what all readers and writers recognize when they recognize genres are the roles they are to play, [and] the roles being played by other people” (p. 12). The social roles of a genre performance are, in their most basic form, speaker (writer) and addressee (reader), as in Bakhtin’s discussions of speech genres (see Bakhtin, 1979/1986). Within identified rhetorical situations, these roles often have more specific labels.

Sometimes the social roles of a genre are professional relations. For example, Bawarshi (2000) refers to doctor and patient roles when discussing the genre of the Patient Medical History Form, and Bazerman (1988/2000) describes the “emerging role of scientist” (p. 319) within scientific genres. Sometimes roles refer to social relationships, which was exemplified when Devitt (2004) described how she may “enter the role of friend” when reading a letter from a friend. Roles may also be based on the actions being taken. For example, Bazerman (2002) says that people “become taxpayers” when “filling out [their] income tax forms” (p. 14), and that people take on

“the role of consumers of political opinion” when reading “the partisan retelling of the news . . . [by political] parties” (p. 31). All these descriptions constitute social roles within genres because they are identities people assume as they participate in particular social actions.

According to Paré and Smart (1995), “generic characteristics of role and relationship determine what can and cannot be done and said by particular individuals, as well as when, how, where and to whom” (p. 125). Phrased differently, within a rhetorical situation, social roles – and the participants’ relations to the different available roles and the people enacting them – help orient and constrain the possible generic responses. People necessarily adopt social roles in every genre within which they participate; to perform a rhetorical action is to adopt at least one social role, because “we all function . . . within genre-constituted realities within which we assume genre-constituted identities” (Bawarshi, 2000, p. 354). Part of the implicit knowledge a person uses when enacting a genre is the knowledge of the roles being constituted by the genre (Devitt, 2004).

As genres can be interpreted by users as social actions, their users, by nature, can assume at least two social roles (i.e., the speaker and addressee, per Bakhtin, 1979/1986).¹ It is common, however, for participants to perform multiple roles in the same setting (Paré & Smart, 1995). For example, Beaufort (2007) discusses a research participant “‘trying on’ his social roles as [both] engineer and writer” (p. 131) during his

¹ Both roles may be enacted by the same person, such as with a diary entry, but they are still being enacted.

production of an organizational memo. In classroom settings, while the typical participant role filled by the professor may be that of teacher, they may also fulfil other roles alongside this primary one, such as the role of evaluator while marking work or assessing engagement, or the role of lecturer while presenting the lesson. Similarly, students in the classroom may also fulfill more roles other than their primary role of learner in the classroom, such as when they read journal articles and adopt the additional role of (paraphrasing Bazerman, 2002, p. 31) consumers of scientific research.

In the experiential activity in this case study, the students are provided the opportunity – and encouraged – to adopt specific social roles in addition to their typical role as learner, which include the roles of research participant and scientist/researcher when participating in the constructed rhetorical situation of the activity and the role of researcher/writer when enacting the genre of the journal article assignment to report the results of the experiment. The adoption of these roles is meant to help the students begin to experience the genre of the journal article in the discipline of neuroscience from the researcher/writer role (rather than solely a learner/consumer role) by providing them the opportunity to perform the actions of a researcher/writer (e.g., posing and testing their own research question).

In the previous section, I have described the theoretical understanding of genre through the lens of RGT. As explained, typified rhetorical situations produce recurring exigences which elicit the enactment of social responses, or genres (e.g., Bazerman, 1988/2000; Miller, 1984). When people enact genres in response to exigences, they necessarily perform social roles through their enactment (e.g., Bawarshi, 2000; Devitt,

2004). As Beaufort (2007) explains, “the social roles of writers” are influenced by and help realize the discourse community’s “values and goals” (p. 113). Having discussed the nature of genre and identified the purpose of the in-class activity as attempting to provide opportunities for students to adopt the researcher role within the enactment of the journal article genre, in the following section I provide an overview of the application of rhetorical genre theory in real-world contexts. Specifically, I discuss various perspectives of rhetorical genre theorists on genre instruction and learning in classroom settings, as well as what it means to know a genre, focusing on the areas that are most relevant to this report of the case study.

Genre and RGT in the Classroom

Genres in the RGT tradition, as defined above, are typified rhetorical actions taken in typified rhetorical situations in response to typified exigences (e.g., Miller, 1984). The conceptualization of genre as a social action that is necessarily tied to situation and purpose raises questions for RGT scholars about genre instruction in classroom settings. As Freedman (1993) explains, genres are not learned so much as acquired, and acquisition of the genre – the knowledge of how, when, and what roles to take to perform the social action – occurs tacitly through performance of the genre within the context of the rhetorical situation and the catalytic exigence.

Explicit genre instruction, as described by Freedman (1993), typically focuses on the textual and linguistic features of the written by-product of the rhetorical action, and may include “explication of the social, cultural, and (or) political features of the context that elicits the textual regularities” (p. 224). Because genres, from the RGT perspective,

are so inextricably tied to the social contexts in which they are constructed – and that they construct in turn (Bawarshi, 2000) – Freedman (1993) asserts that genres cannot be taught in full outside of their contexts of use. Drawing heavily on the theories of linguist Stephen Krashen (1984; 1991, as cited in Freedman, 1993), Freedman (1993) argued that, from the RGT perspective, explicit genre instruction is not possible in most contexts.

The argument was that the textual and rhetorical features of a non-classroom genre decontextualized – or recontextualized, to the context of a classroom or a specific class – cannot provide proper genre acquisition, as these “decontextualized formal rules learned in advance will provide no guidance” (Freedman & Medway, 1994, p. 11) to students when encountering an authentic rhetorical situation and exigence to which they must respond. The language rules of genres are “too complex and too numerous to be explicitly taught” (Freedman, 1993, p. 232), as much of one’s knowledge of acquired genres and the rules they follow to perform them is tacit or subconscious. As Artemeva and Fox (2010) have shown, explicit knowledge about the conventions of written genres does not necessarily equate to the ability to enact those genres, as tacit genre knowledge is necessary.

This necessary tacit genre knowledge includes recognition of the specific contextual circumstances that make up the rhetorical situation and exigence such as time, audience, purpose, and social roles, as well as overarching knowledge of “the pervasive values, priorities, and expectations” (Freedman & Medway, 1994, p. 11) within the discipline. It also includes what Giltrow and Valiquette (1994) call

“knowledge-of-the-world” (p. 49) shared by the members of a discipline, or what is known and not known, or accepted and not accepted as fact between the members of a discipline. Successful genre performance in discipline-specific contexts requires this tacit knowledge of the inner workings of the discipline, and most members of the discipline who have mastered these genres cannot accurately articulate this knowledge, let alone explicate it to students (Freedman, 1993).

Other RGT scholars suggest there may be some merit in the explicit instruction of generic features. Coe (1994), for example, proposed that explicit instruction of the rhetorical features of a genre may “help some students . . . who presently fail” (Coe, 1994, p. 159) at acquiring genres, and may help proficient students acquire genres faster, with the ultimate goal being to “lead students to understand formal structures generically in relation to rhetorical contexts” (p. 165). In a similar vein more recently, Banting (2014) also discusses the possibilities of explicit instruction in the rhetorical features of genre from the perspective of English Lit, suggesting it could lead to “fewer essays that desperately flail” and a “richer shared vocabulary” (p. 7) between students and teachers. Devitt (2004) advocates for explicit teaching of genre awareness as writing instruction, or teaching “conscious knowledge of genre” (Tardy et al., 2020, p. 290).

Freedman herself (1993) suggests, based on Ellis’ (1990, as cited in Freedman, 1993) theories related to second-language acquisition, that explicit instruction in generic features may in some cases be not only possible, but beneficial. That is, in very specific circumstances, with students at appropriate levels of understanding, it may be possible for knowledgeable instructors to teach some features of genre explicitly in such a way

that allows for or enhances students' genre acquisition (Freedman, 1993). Freedman (1993) asserted, however, that this possibility requires that students be "involved in authentic tasks and authentic contexts" (p. 244) while the instruction takes place. What this implies for classroom genre instruction is that explicit teaching may, rarely and specifically, be useful in teaching academic genres related to the specific classroom in which it is employed, as these specific academic genres are the authentic genres of that classroom setting.

While students may be able to acquire academic genres in the classroom due to context-specific disciplinary exigences, the question of how to help students acquire – or learn to write – professional discipline-specific genres still remains, including in the sciences (e.g., Keys, 1999; Petersen et al., 2020). This restriction on the possible efficacy of explicit teaching has different implications for the teaching of non-academic or workplace genres in classroom settings, however RGT scholars are quite clear about the importance of context for genre acquisition, and that "genres for use in one context . . . can[not] be straightforwardly taught in a different context" (Freedman & Medway, 1994, p. 11). In other words, genres for use by professional scientific researchers in professional contexts – for example the journal/research article at the centre of the in-class activity in this case study – cannot be effectively taught *explicitly* in classroom contexts, as such genres must be acquired through their authentic use. Freedman and Medway (1994) state that "school writing . . . [is] *school* writing, a solution to a quite different set of exigences" (p. 13-14, emphasis in original) than professional or

workplace writing. As Devitt (2015) explains, genre theorists have not yet discovered a way around the “weakness of having to teach genres in isolation” (para. 7).

To sum, within the theoretical frame of RGT, genres cannot reliably be taught in the traditional, explicit sense, as they are not learned in the traditional sense (Devitt, 2015; Freedman, 1993). Genres are acquired through authentic participation in the authentic contexts in which they are used. In other words, they are acquired through the user experiencing their use in context. It is by authentically experiencing the context of a genre that a person begins to acquire the tacit knowledge necessary to accurately perform the genre. This brings me to the second half of my theoretical framework, theories of experiential learning, which are centred on the idea of transforming authentic experience into knowledge.

Theories of Experiential Learning

Alongside RGT, my theoretical framework for this study was also informed by theories of experiential learning. The term experiential learning is an “umbrella term” that “refers to a spectrum of meanings” (Fowler, 2008, p. 428) across various disciplines (see Moon, 2004; Stein, 2004). The breadth of this spectrum is understandable, as “all learning is, in fact, learning from experience” (Moon, 2004, p. 104). Additionally, the label of experiential learning has been applied to many different types of learning activities. As Illeris (2007) observes:

In primary and secondary school, experiential learning can refer to excursions [and] projects . . . In adult education the concept is usually related to the recognition and application of students’ prior informal learning. And in relation

to workplace learning it is very much about learning by doing instead of learning by courses and studies. (p. 84)

Conversely, accepted conceptualizations of experiential learning also go by many different terms. These terms include but are not limited to experiential learning (e.g., Fowler, 2007; Kolb, 1984/2014), active learning (e.g., Chickering & Gamson, 1987), authentic learning (e.g., Knobloch, 2003), transformational learning (e.g., Mezirow, 1991), and practice-based learning (e.g., Fenwick, 2004), among others. What most varying perspectives on experiential learning have in common, however, is the understanding that “a uniquely valuable source for learning . . . lies in the experience of everyday life and the conceptualization and reflection on it” (Stein, 2004, p. 20).

For the purposes of this case study, I use the term “theories of experiential learning” to draw on some of the fundamental conceptualizations of the nature and construction of knowledge and the processes of learning that inform different views of experiential learning. Specifically, I focus on the foundations of experiential learning as a pedagogical concept that sits at the “intersection between situation, educator, and subject whose position is designated *learner*” (Fenwick, 2000, p. 245). I specify my focus here because, while all learning occurs through experience in the philosophical sense, this conceptualization is unhelpful in a practical discussion; for the concept of experiential learning to have meaning in the pedagogical context it must refer to specific types of learning that differ from learning that is conceived as *not* experiential (Illeris, 2007). For my theoretical framework, I use the pedagogical view of intentional

experiential learning that regards it as a functional theoretical concept which is operationalized and applied in real-world contexts.

The foundational ideas of pedagogical theories of experiential learning include: the concept of dual knowledge (e.g., James, 1890); the importance of experience and reflection on experience to knowledge construction (e.g., Dewey, 1938); the importance of current knowledge in the processing of new experiences into knowledge (e.g., Piaget 1947/2001); the ideas of scaffolding (e.g., Wood et al., 1976) and the zone of proximal development (ZPD; e.g., Vygotsky, 1978); and the use of authentic learning experiences (e.g., Jackson & Maclsaac, 1994). In the following section, I provide an overview of these foundational concepts of experiential learning theories and describe how I conceptualize these ideas within the context of the experiential activity under investigation. I also relate these concepts directly with pedagogical application to highlight the implications in classroom settings.

Foundations of Experiential Learning

James (1890) pioneered the philosophies of radical empiricism and dual knowledge theory, two concepts that are important to modern conceptualizations of experiential learning. Radical empiricism was the philosophy through which James “integrated both sensation and thought in experience” (Kolb, 2014, p. 24). Empiricism is the epistemological philosophy that posits that all knowledge is based in either sensory experience or a priori logical truths (see Audi, 2010). James took this view further with radical empiricism, a perspective through which all knowledge is viewed as “grounded in experience” and none as being “genuinely a priori” (Audi, 2010, p. 117). James instead

developed the notion of pure experience, or “present-oriented experiencing free from conceptual interpretation” (Kolb, 2014, p. 24), which is then acted upon.

This concept of pure experience was further elucidated through James’ dual knowledge theory, in which he posits that there are two fundamental types of knowledge: “knowledge of acquaintance” and “knowledge-about” (James, 1890). Knowledge-of-acquaintance is pure experience – peoples’ awareness of the things they experience, and their feelings and sensations based on their initial experiences of these things. Knowledge-about is the knowledge people have when their experiences are acted upon with their thoughts, or their conceptions about their experiences and the things they contain (see Kolb, 2014, pp. 69-71); in other words, knowledge-about is “the product of [the process of] reflection” (Stein, 2004, p. 21).

The importance of reflection in knowledge construction is a key concept in pedagogical theories of experiential learning. Reflection, as it is understood from the perspective of experiential learning, is “a form of mental processing – like a form of thinking” (Moon, 2004, p. 82) that “involves a conscious or stated purpose . . .” (p. 83). The power of reflection was highlighted by John Dewey, “the most influential educationalist in the twentieth century” (Stein, 2004, p. 21) and a seminal figure in the application of learning through experience in pedagogical settings (see Dewey 1897/2012; 1910/2003). Dewey (1910/2003) described reflection as “not simply a sequence of ideas, but a *consequence*—a consecutive ordering in such a way that each determines the next as its proper outcome” (p. 183). Reflective thought was synonymous with a logical chain of thought for Dewey. The process of reflection, said

Dewey (1910/2003), was akin to examining every inch of a stone; it is “turning a topic over in various aspects and in various lights so that nothing significant about it shall be overlooked” (p. 224). Taken together, these definitions of reflection in the pedagogical understanding indicate a process whereby a thought is intensely retroactively analyzed for a particular (pedagogical) purpose.

Thought, as knowledge, has a unique meaning in theories of experiential learning. As mentioned, James (1890) posited the existence of two types of knowledge: knowledge-of-acquaintance and knowledge-about. Dewey (1910/2003) advanced James’ idea of dual knowledge, refining *knowledge of acquaintance* and *knowledge-about* to the more functional domains of *apprehension*, or “direct understanding,” and *comprehension*, or “indirect, mediated understanding” (p. 274), respectively. Dewey made the connection from James’ philosophical theories of knowledge to the concept of intentional experiential learning with the ideas of *active doing* and *receptive undergoing*, which are the two reciprocal facets of experience. While experiencing, a person does something (acts) and then undergoes the consequences (feels with the senses) – then does something in response and undergoes new consequences (Wong, 2007). This process, or experience, “becomes educative as we grasp the relationship between doing and undergoing” (Wong, 2007, p. 203) – which is grasped through reflection. Therefore education, according to Dewey, is at once a process and a goal which must be understood as the “continuing reconstruction of experience” (Dewey, 1897/2012, p. 79).

Reflection, as described above, is how a student reconstructs their experience; to clarify the above definition, it is a process whereby *an experience* (or apprehension) is intensely retroactively analyzed for a particular (pedagogical) purpose (typically comprehension). This reflection often occurs through the medium of writing in educational contexts (Moon, 2004); however, it can take other forms as well. For example, within the in-class activity in this case study, students were provided with the opportunity to experience visual iconic memory (VIM) trials, and then the class dialogically reflected on these simulations before repeating the trial and moving onto the next one, on which they again briefly reflected. Additionally, students were prompted to personally reflect on their experience of these trials and the phenomenon of VIM with the specific goal of creating a research question that could be tested in the same manner. According to the theoretical conceptions of experiential learning, this reflection has the potential to help students “generate apparently new and meaningful ideas . . . that are not immediately related to specific existing knowledge though . . . are based on what [they] 'know'” (Moon, 2004, p. 85).

The notion that these ideas are new yet related to what one knows echoes the constructivist developmental theories of Jean Piaget (1947/2001), which are another foundational concept in most pedagogical theories of experiential learning. While Piaget’s theories focused on childhood development, aspects of them have also been applied to theories of experiential learning (e.g., Kolb, 1988/2014). Piaget describes child development in stages from less to more complex thought processes, “driven by the dialectic tension between previous information acquired through the process of

assimilation and the accommodation of existing cognitive structures to new information” (p. 26). According to Kolb, this “describes how intelligence is shaped by experience . . . [and] arises as a product of the interaction between the person and his or her environment” (p. 12).

Ultimately, “humans must [individually] construct their own knowledge” (Ültanır, 2012, p. 202). Learning, according to Ackerman’s (2001) summarization of Piaget’s work, is “indirect . . . [an] interpret[ation of] what [students] hear in light of their own knowledge and experience. They transform the input” (p. 3). The pedagogical implication of Piaget’s theory, as described by Kolb (2014), is that “learning is best facilitated by a process that draws out the students’ beliefs and ideas about a topic so that they can be examined, tested, and integrated with new, more refined ideas” (p. 26). In other words, including reflections on current knowledge in the processing of new experiences into knowledge aids learning. This construction of new knowledge through consideration of previous knowledge is often actualized through scaffolding in theories of experiential learning.

The concept of scaffolding, originally developed by Wood et al. (1976), also plays an important role in pedagogical theories of experiential learning. Scaffolding in education refers to the “temporary assistance that teachers provide for their students to assist them to complete a task or develop new understandings, so that they will later be able to complete similar tasks alone” (Hammond & Gibbons, 2005, p. 9). Through scaffolded instruction, activities are broken down into progressively harder tasks. Students are provided support to complete the tasks that they are unfamiliar with, and

this support buttresses their ability to complete these tasks within their capabilities. As they successfully complete these tasks with support, the amount of support gradually lessens as students become familiar with and capable of completing the tasks themselves (Hannah & Gibbons, 2005). Nordlof (2014) provides the example of teaching a child to ride a bike. First their parents provide them with training wheels; then, when they are accustomed to peddling, the training wheels come off and their parent holds the back of the seat as they ride. Finally, when the child is accustomed to balancing, their parent lets go, and the child rides on their own, having been scaffolded through the process of learning how to ride a bike.

Scaffolding (Wood et al., 1976). can be viewed of as the concrete enactment of Vygotsky's (1978) earlier zone of proximal development (ZPD). The ZPD is, formally, "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). Put another way, the ZPD is the difference between the levels of development defined by what a learner can do on their own, and what they can do with the help of a teacher or tutor.

Vygotsky (1978) emphasized the importance of the relationship between learner and teacher in navigating the ZPD. In this model, knowledge construction is "a developmental process in which concepts are internalized through social interaction" (Nordlof, 2014, p. 56) between the learner and their teacher, tutor, or peer. Importantly, each learner has their own ZPD, meaning the level at which they need to

be met with support is unique to each student in a classroom. The ZPD “suggests the upper and lower limits . . . within which new learning will occur” (Hannah & Gibbons, 2005, p. 13); if a task is too easy, students do not need to challenge their current understanding and knowledge is not constructed, but if a task is too hard, they will become frustrated from lack of understanding. It is the relationship between student and teacher that allows the teacher to understand how to sequence and scaffold tasks, so the task remains within the student’s ZPD, and learning is achieved.

Another component of some theoretical conceptions of experiential learning that I use in my study’s framework is the idea of authenticity. This concept is sometimes referred to in theories of learning through doing as an authentic learning experience (Jackson & MacIsaac, 1994). Authentic learning experiences are “the necessary basis for meaningful skill acquisition and human development” (p. 22). Within theories of experiential learning, a learning experience is authentic when “features of the instructional context . . . match or approximate relevant performance contexts” (p. 22). While classroom learning is authentic to the classroom context, in the realm of experiential learning, the concept of authenticity refers to how well something within the classroom imitates or approximates a target experience, typically an experience from a context other than the classroom. In other words, authentic learning experiences provide the learner with exposure to a form of the real-world contexts in which the subject matter applies (Jackson & MacIsaac, 1994). For example, the real-world context in which the journal article genre is enacted follows the experimental process and may

include asking research questions, constructing an experiment, testing subjects, and collecting results.

Additionally, when learning experiences are authentic according to the definition employed by experiential learning theories, they “engage students’ lived experience, and students can find meaningful connections with their current views, understandings and experiences and ‘newer’ views, understandings and experiences” (Stein et al., 2004, p. 240). This definition echoes Piaget’s (1947/2001) ideas about the nature of knowledge construction discussed above, that “instructional activities must reflect awareness of how previously learned information influences new learning and how learners direct and control this process” (Jackson & Maclsaac, 1994, p. 23). Acknowledging students’ current level of understanding is an important aspect of theories of experiential learning.

Within the sphere of experiential learning, authentic learning experiences can take place in the classroom, bridging the gap between the university context and the authentic context outside the university. Students can “process real-life scenarios, experiment with new behaviors, and receive feedback in a safe environment” (Lewis & Williams, 1994, p. 9) through authentic learning experiences in classroom settings. This requires that the learning experience be authentic to the student’s lived experiences as well as to the “culturally-bound, pre-set meaning structures” (Stein et al. 2004, p. 241) of the real-world context being taught. This view interprets students attempting to learn about these non-academic, professional contexts as active members of the various cultures through which the contexts exist. Learning experiences can be authentic within

the classroom, therefore, by including “cultural significance . . . [which grants] authenticity on a community of practice . . . level” (p. 241). The level of cultural significance as well as the students’ perceptions of the meaningfulness of the experience determine whether the classroom experience is authentic enough for learning to occur.

These concepts of dual knowledge (James, 1890), reflection (Dewey, 1910/2003), internal, individual knowledge reconstruction (Piaget, 1947/2001), scaffolding (Wood et al., 1976), ZPD (Vygotsky, 1978), and authentic learning experiences (Jackson & Maclsaac, 1994) together constitute much of the foundation of current perspectives on experiential learning. To contextualize these concepts within the pedagogical experiential learning framework, I can synthesize them thusly: experience is reconstructed into knowledge when students are provided with authentic learning experiences that fall within their ZPD. Also, within the ZPD is the students’ current knowledge and beliefs, which are accounted for and scaffolded through social interactions with a more knowledgeable teacher. These experiences are then reflected upon to achieve comprehension through making meaningful connections with their prior understanding, completing the process of learning through experience.

Having explained these theoretical underpinnings, discussed how they work in pedagogical settings, and having provided an overview of rhetorical genre and its academic applications in the previous section, in the following section I justify and explain the synthesis of these two perspectives which constitute the theoretical framework for my study.

Synthesizing RGT and Experiential Learning

To conduct this case study, I considered the case – the in-class activity – and crafted my research questions from a synthesized framework of the two theoretical perspectives discussed above: a rhetorical theory of genre, RGT, and the theoretical underpinnings of experiential learning. Constructing a synthesized conceptual lens by fusing key concepts from these two theoretical perspectives through which I could view and investigate the in-class activity first required an examination of the theories' different conceptualizations of knowledge and knowledge construction. The two theoretical perspectives of RGT and theories of experiential learning emerge from two fundamentally different, but not necessarily opposing, epistemologies. As I will describe in this section, particular components of each of these theoretical perspectives have enabled me to construct a framework to understand important aspects of this case study.

Theories of experiential learning, based in the foundations discussed above, are largely founded in the social constructivist view of reality (see Fenwick, 2000; Moon, 2004). RGT, alternatively, can be located in a constructionist epistemology (see Freedman & Medway, 1995; Talja et al., 2005; Walker, 1998). Versions of these epistemologies differ slightly between disciplines (see Freedman & Medway, 1995); however, the underlying assumptions discussed here are consistent. Social constructivism is the epistemological perspective that each individual's reality is constructed through social interaction. From a pedagogical perspective, social constructivism posits that "humans gain their knowledge and skills from an interaction

between their experiences (mostly social, i.e., generated in contacts and collaboration with other people) and their ideas” (Tarnopolsky, 2013, p. 13). In other words, it is through our social experiences that one constructs and reconstructs their understanding of the world. Constructionism – also known as social constructionism² – is the epistemological perspective that “advocates the social construction of knowledge” (Walker, 1998, p. 28), and, pedagogically, emphasizes “the collaborative processes in learning” (p. 128). From the constructionist viewpoint, reality is a communal construct, which is achieved through shared language (Talja et al., 2005).

Both social constructivist and constructionist epistemological perspectives share the assumption that reality, and knowledge about reality, are constructed (Talja et al., 2005). They also agree that the process of construction is “an essentially linguistic one” in which “language . . . is a tool to make sense of reality in a social context” (Vall Castelló, 2016, p. 130). The perspectives differ in where they situate the main site of learning, however. From the social constructivist perspective, “learners [are] independent constructors of their own knowledge” (Fenwick, 2000, p. 248). While social experiences are essential to the construction of knowledge from a constructivist point of view, it is the individuals themselves who use those experiences to construct meaning. Intrapersonally, “the mind constructs reality in its relationship to the world” (Talja et al., 2005, p. 81). It is through language that people can interact socially and build mental constructs, but the actual construction is internal, in the social constructivist view.

² While constructionism and social constructionism are used interchangeably, constructivism and social constructivism are not (see Talja, 2005). Consequently, I refer to these concepts as constructionism and social constructivism, respectively.

The idea of mental constructs – “mental models or knowledge structures” (Talja et al., 2005, p. 89) – is a result of the dichotomous “distinction between mind and language” (p. 89) inherent in social constructivism. Within constructionist epistemology, this distinction does not exist, as reality only exists interpersonally, through language. Communally, “we produce and organize social reality . . . by using language” (p. 89). Language constitutes reality in the constructionist perspective, and the site of learning is therefore situated in the use of language “between people and through relationships” (Vall Castelló, 2016, p. 130).

Clearly, there are fundamental differences between the epistemological perspectives of constructionism and social constructivism – and as a result between the theoretical perspectives of RGT and experiential learning, respectively. These differences do not mean that these two theories cannot work in tandem, however. These differing epistemological perspectives have been bridged before in different disciplines; in the realm of psychology research and practice, social constructivism and constructionism have been successfully integrated into a framework with a dual individual and social focus (Vall Castelló, 2016). This approach “broaden[s] your worldview as . . . a researcher . . . [as] both views give important information about the same phenomena” (p.137). Within the field of information science, these perspectives “complement each other . . . [by] address[ing] and solv[ing] different types of research questions” (Talja et al., 2005, p. 92). These examples show it is possible to use these differing epistemologies together for the benefit of the research.

While the epistemological lenses of RGT and theories of experiential learning do not overlap into one cohesive telescopic lens with which to view this case study, they do work together to create a binocular lens, so to speak, which still provides a comprehensive picture of the case and questions in this investigation. Using these theories to construct my framework allowed me to investigate from complementary angles in this case study.

I selected RGT for the framework of this investigation because this theory allows me to contextualize the goals of the in-class activity by providing a conceptualization of genre – what it means to know how to use a genre and what it means to perform a role within a genre. RGT also provides a lens through which to interpret the students' discursive constructions of their social roles and identities while participating in this activity. I drew on theories of experiential learning for this study because they allow me to conceptualize the in-class activity as a constructed experience, and also provide a backdrop to contextualize the students' discursive constructions of that experience within a learning environment. Additionally, theories of experiential learning provide an alternate angle with which to interpret students' discursive constructions within the activity concerning what and how learning occurred. By bringing together theories of RGT and experiential learning perspectives, I can explore if and how students' discursively constructed experiences within the experiential in-class activity may relate to learning to perform the role of the writer in the journal article genre.

Explanations of the theories constituting my theoretical framework provide contextualization of my research questions and help situate them within the theoretical

fields of RGT and experiential learning. Having explained and justified my theoretical framework, in the following chapter, I review the literature at the intersection of RGT, experiential learning, and undergraduate science writing instruction, and situate this case study within that literature.

Chapter 3: Literature Review

In this chapter, I provide a review of relevant literature and situate my study. First, I briefly outline the history of undergraduate writing instruction in Canada and the United States. I then focus specifically on undergraduate writing instruction in the scientific disciplines, where I provide an overview of the current situation on science writing instruction, including best practices. Following this, I review the literature on science writing instruction with an experiential component, which is followed by a review of the literature on science writing instruction from the RGT perspective, ending with a consideration of the dearth of literature on science writing instruction from an RGT perspective with an experiential component. Here, I situate my study. In the final section, I briefly review the available literature on emergency remote learning to situate this study within the context of COVID-19.

A Brief History of Post-Secondary Writing Pedagogy in the United States and Canada

Academic writing instruction takes its roots from the studies of rhetoric in the early days of the academe (Berlin, 1987). Through the late 19th century, instruction in rhetoric, or how to use either oral or written language to achieve a particular social purpose, was an important cornerstone in academic curricula across the western world, when schools were institutions primarily for the elite (Halloran, 1990). This idea of academic writing instruction was largely consistent in the western world until the mid-19th century, when differences began appearing in the American approach. In the United States, a shift began to take place at the university level around the turn of the 20th century, spurred by the rise of the middle class and larger and more varied

enrollment (Halloran, 1990). American universities moved their focus from the study of rhetoric to composition, which emphasized writing's "practicality, utility, and grammatical correctness" (Brooks, 2002, p. 675). As a result, freshman composition courses became mainstays at most American universities by the mid-1900s.

Canadian post-secondary institutions did not embrace composition courses in the same way, instead maintaining the study of literary criticism in traditional English classes as the closest thing to freshman writing instruction; however, the omnipresence of the rhetoric of American composition helped shape Canadian writing instruction by providing an "anti-model... to be avoided at all costs" (Kearns and Turner, 2008, p. 2). It was believed by prominent Canadian scholars of the time that writing instruction did not fit the purview of post-secondary education and should only be the concern of secondary schools (Brooks 2002; Kearns & Turner, 2008). The first-year English courses on literature and composition that were offered by many Canadian institutions, and mandatory for some programs, did not provide much in the way of interdisciplinary or professional writing instruction, and instead focused on the literary criticism essay (Smith, 2006).

In the 1960s and 1970s, a change in the demographic make-up of American post-secondary institutions occurred again as a concerted political effort was made in the United States to grant educational opportunities to non-white and/or low-income students who might not have otherwise had access to post-secondary education (Lamos, 2009). This demographic shift in the United States higher education context prompted American educators in the mid-1970s to declare a 'literacy crisis' in American

universities. This crisis was not actually a crisis at all; according to Russell (2002), any evidence of mass illiteracy was the result of raised literacy expectations in response to the demographic shift that was occurring, as well as “the old assumption that writing was a single skill, independent of specific contexts” (p. 240).

Nevertheless, this perceived crisis resulted in a perceived need for “greater access [and] greater equity” (p. 271) within American universities. Around this time, American “teachers began to perceive their students as writers (rather than people with grammatical problems in need of fixing)” (Brooks, 2002, p. 681). As a result, composition was becoming a legitimate, professional field of research and teaching in the United States (Brooks, 2002), and writing-across-the-curriculum (WAC) perspectives were being adopted alongside first-year-composition courses to improve access to writing instruction (Russell, 2002). WAC is a pedagogy in which the process of writing discipline-specific content is perceived as a method of learning that content, and this writing-to-learn perspective became an important part of the post-secondary writing instruction landscape in the United States through the 1970s and 80s (Ochsner & Fowler, 2004).

In contrast to the American model, the Canadian academic landscape continued to reject the concept of university composition and writing courses, and “rhetorical education and writing instruction did not significantly develop” (Brooks, 2002, p. 284) in Canada through the 1980s. There were some Canadian scholars who were attempting to shift the national perspective to a focus on rhetoric and the socio-rhetorical aspects of language – “the nineties were filled with Canadian research on WAC” (Clary-Lemon, 2009, p. 103; also see Smith, 2006). The predominant perspective in Canadian academia,

however, remained that “writing mattered ... but it was a skill to be demonstrated rather than learned” (Kearns & Turner, 2008, p. 1). English departments continued to view writing as the purview of literature courses despite the research being done by Canadian scholars on the “social construction of writing” (Clary-Lemon, 2009, p. 98) beginning in the late 1980s.

Resulting from this continued rejection from English departments and the emergence of new genre studies and technical communication research, Canadian instructors and researchers in writing and rhetoric began to establish WAC or writing-in-the-disciplines (WID) courses within other departments, such as engineering and computer science (Smith, 2006). The WID perspective on writing instruction advocates for writing to take place within the context of the discipline; WID courses were established within different faculties that focused on teaching students “their disciplinary community's respected discourse: its preferred genres, vocabulary, types of arguments, types and uses of evidence, and other rhetorical concepts” (Ochsner & Fowler, 2004, p. 118-119). The establishment of WAC/WID programs were largely born out of research in new genre theory in Canada and internationally that began an “emerging unity of British, American, Australian, and Canadian scholars” (Clary-Lemon, 2009, p. 104) on the perspective of written text as a product of social action. Out of this scholarship came the field known as North American genre studies – RGT, as discussed in detail in the previous chapter – and much of contemporary Canadian writing theory (see Smith, 2006).

An important aspect of this history of writing instruction – that was partly spearheaded by Canadian writing and genre scholars adopting the WID perspective before WID formally existed (see Smith, 2006) – is the idea that writing is not one singular skill. Writing is contextual, and importantly, discipline specific; the written genres that are produced in engineering contexts are not the same as those produced in the discipline of biology, and focused writing and genre instruction within each discipline is necessary. Much of the current writing instruction in Canadian universities comes in the form of undergraduate discipline based WID courses, where the goal is to provide students with exposure to the specific methods of thinking and expressing thoughts within that discipline (Smith, 2006). These courses now exist in many different disciplines, including the sciences, in an effort to help undergraduate science students acquire the ways of knowing and saying within their discipline.

Undergraduate Writing in the Scientific Disciplines

Since it first came to be understood that writing is discipline specific, research on writing for specific scientific disciplines has evolved. Writing has long been recognized as an integral part of the scientific process and the construction and distribution of scientific knowledge (Keys, 1999; Moon et al., 2018; Reynolds & Thompson, 2011), and helping undergraduate neuroscience students learn to write for their discipline is a topic that has been gaining traction in the twenty-first century; however, the research is still limited (Holstein et al., 2015). Many instructors and researchers in the sciences acknowledge both the importance of helping undergraduate science students learn to write in their disciplines and that writing instruction and support within the scientific

disciplines has, historically, been inadequate or nonexistent (Brownell, et al., 2013b; Cyr, 2017; Jerde & Taper, 2004; Moon et al., 2018; Petersen et al., 2020).

Researchers and instructors have attempted to address this problem of inadequate undergraduate writing instruction in the sciences in multiple ways. Some researchers and instructors have created writing guides that systematize the scientific genres to aid science students in their writing (e.g., Goldbort, 2006; Matthews, 2014; Peat, 2002; Reynolds et al., 2009). Additionally, undergraduate courses have been constructed to focus on highlighting the fundamentals of scientific writing in a particular science discipline, much like the course that contains the topic of this case study (e.g., Adams, 2011; Brownell et al., 2013a; Colabroy, 2011; Holstein et al., 2015; Kiefer and Leff, 2008). Focus has also been given to tools and methods that may be implemented in science classrooms to encourage engagement with the performance of scientific genres, not unlike the topic of the current study, the in-class experiential activity (e.g., Cyr, 2017; Jones et al., 2011; Prichard, 2005; Reynolds & Thompson, 2011; Wiertelak & Dunbar, 2012).

The following sections review existing research on undergraduate writing instruction in scientific disciplines from the perspective of experiential learning, followed by RGT. First, I focus on research that has been conducted using experiential methods, after which I review RGT literature on undergraduate writing and the use of experiential methods. While the focus of this case study and this review is neuroscience writing instruction, the interdisciplinarity of neuroscience allows researchers and instructors to “build broadly on studies and practices in ... related courses in biology,

chemistry . . . and other fields to develop a roadmap for effective science writing training for neuroscience students” (Petersen et al., 2020, p. 1). As such, this review will also include relevant research from adjacent scientific fields, such as biology.

Overview of Literature on Experiential Writing Instruction in the Scientific Disciplines

The literature on teaching undergraduate science has found evidence for differing benefits of multiple methods of writing instruction (see Petersen et al., 2020, for a review of best practices). For example, research has been conducted on the use of detailed rubrics (e.g., Clabough & Clabough, 2016), the creation of writing-intensive courses (e.g., Brownell et al., 2013a; Grzyb et al., 2018), and the use of peer review (e.g., Cyr, 2017; Holstein et al., 2015; Prichard, 2005; Reynolds & Thompson, 2011), among others. Incidentally, some of the most promising evidence has been found using one or more concepts related to theories of experiential learning discussed in Chapter 2, such as scaffolding (e.g., Cyr, 2017; Deiner et al., 2012; Holstein et al., 2015; Köver et al., 2014); reflection (e.g., Köver et al., 2014; Reynolds & Thompson, 2011); and authentic learning experiences (e.g., Cyr, 2017; Deiner et al., 2012; Jones et al., 2011; Holstein et al., 2015; Prichard, 2005; Reynolds & Thompson, 2011). While the literature frequently uses these concepts, however, the studies themselves do not explicitly or intentionally follow experiential learning principles. Nonetheless, reviewing this literature provides insight into the methods through which experiential concepts are implemented, as well as the ways in which they affect undergraduate students’ writing in the scientific genres.

Extensive research on scaffolding has provided ample evidence for its pedagogical benefits in many areas (see Yelland & Masters, 2007), and this finding is

also relevant for science writing instruction (e.g., Cyr, 2017; Deiner et al., 2012; Holstein et al., 2015; Köver et al., 2014). For example, Köver et al. (2014) used a scaffolded grant proposal assignment, which included an element of reflection in an introductory neuroscience course, to help students improve their scientific thinking in the absence of a lab. In this study, 109 students in an introductory neuroscience course were scaffolded through three grant proposals, with the amount of scaffolding reduced for each proposal. Prior to each proposal, students were guided through structured learning activities (Köver et al., 2014).

After attending a neuroscience lecture, students participated in a brainstorming activity, in which they were given the opportunity to brainstorm experiments related to the lecture material. Following this, students were presented with a case-study regarding the lecture material in sections, allowing them to discuss between sections what they would do next. Next, students were presented a prompt for a grant proposal with a “constrained experimental environment” (p. A31), or explicit boundaries for the case within which to draft a proposal related to the lecture material. Finally, after they began writing, students employed reflection by participating in “pitch meetings” (p. A32), which were tutorials with fewer students in which they discussed their drafts and received feedback from the instructor and their peers. This process was repeated three times, with successively less scaffolded instructor involvement during each phase.

To investigate the effects of their grant proposal scaffold, Köver et al. (2014) employed surveys that contained multiple choice and free-response questions, which were completed by 93 students (of 109 enrolled). They also collected self-reflection

comments throughout the course. An absolute majority of students indicated in the multiple-choice section of the survey that the scaffold in the course “increased specific scientific competencies” (p. A32). These competencies included comprehending difficult concepts within the field of neuroscience, understanding how to construct good experimental research questions and designs, and “communicating scientific ideas in writing” (p. A32). These results were supported by their self-reflection comments and free-response answers on the survey. Köver and colleagues (2014) posited that the students were motivated and engaged with the course material because they could see their own progress in these scientific competencies throughout the course.

The study by Köver et al. (2014) provides evidence for the benefits of scaffolding that includes reflection on students’ perception of their scientific comprehension and communication skills in undergraduate science writing instruction. Researchers have also investigated scaffolding combined with other experiential methods, such as authentic learning experiences (Cyr, 2017; Deiner et al., 2012; Holstein et al., 2015). Both Deiner and colleagues (2012) and Holstein and colleagues (2015) investigated the effects of scaffolded writing assignments in addition to authentic learning experiences in the form of laboratory experiments.

Deiner et al. (2012) conducted research on the effectiveness of a laboratory report scaffold in a General Chemistry course that included laboratory components. The research took place over three sections of the course completed by 12, 17, and 19 students. Deiner et al. (2012) separated the main sections of a laboratory report and presented them to students after they completed a different laboratory experiment

every week, progressing through the sections of the report over the course of the semester. The researchers presented the sections of the report through a “directed self-inquiry scaffold” (p. 1512), which asked students to answer three progressively more detailed questions about the experimental process. The students were then prompted to write the section using their answers in formal scientific style. The researchers assigned specific questions for each section to explicitly teach students to “associate key questions ... with the communicative goals of the laboratory report sections” (p. 1511-1512) and elicit appropriate responses. Sections were graded and one-on-one feedback for each section was provided.

Efficacy of the scaffold created by Deiner and colleagues (2012) was measured through grade comparisons between course sections before and after the scaffold was implemented. Results showed a statistically significant improvement in student grades as measured in laboratory report abstracts after implementation compared to the semester before implementation, as well as fewer overall errors in structure and length. Additionally, observations indicated a “decrease in student frustration” (p. 1513) while writing the sections of the report. The authors speculated that scaffolding the report sections after the laboratory experiments helped the students understand the purpose of the sections of the report, which reduced confusion in how to meet requirements for the assignment. Deiner et al.’s (2012) study provides support for the efficacy of combining scaffolding with authentic learning experiences in a similar manner to experiential learning to improve undergraduate writing in the sciences.

Similarly, Holstein and colleagues (2015) modified an introductory psychology lab course to fit a scaffolded design which also included authentic learning experiences in the form of laboratory experiments, in this case adding explicitly guided peer review. With a focus on “teaching writing as a content (genre)” (p. A103), Holstein et al. (2015) developed a course that was scaffolded to “more gradually and explicitly teach the discipline-specific conventions” (p. A102) of different forms of writing within the scientific discipline, aiming to improve students’ genre knowledge for each form. This study took place over two semesters, with two sections of the course under investigation per semester. In the first semester, 40 students each conducted three laboratory experiments and wrote three full laboratory reports without the scaffold, participating in peer review for each report based on a rubric provided by the instructor. In the second semester, 47 students experienced the same course elements while being scaffolded through the process and taught more explicitly about the conventions of scientific genres. This was achieved by focusing on the “structure and purpose” (p. A103) of each section of a lab report, allowed for by the scaffolded approach which highlighted different sections for each laboratory experiment, building up to a full report in the third assignment.

To analyze the effects of the scaffold, Holstein et al. (2015) compared report assessments and collected student evaluations of the course. For the assessments, the authors had three reviewers each independently assess four random reports per semester using a rubric that included items about both genre and writing conventions. Additionally, the reviewers collaboratively assessed four random reports from each

semester for the purposes of standardizing the assessment, resulting in a total of 32 assessed laboratory reports. Holstein and colleagues (2015) discovered through these assessments that there was no improvement in writing conventions, such as flow and transitions, between the two semesters. Conversely, genre knowledge, or knowledge of genre conventions, such as the purpose of each section of the laboratory report, was significantly improved by the explicit teaching between the two semesters. In evaluations of the course, students indicated that the scaffolded approach was helpful, indicating support for both strategies of writing instruction.

Along with finding the scaffold created by Holstein et al. (2015) beneficial, students also indicated in their course evaluations that they found the explicitly guided peer review particularly helpful. There is some supporting evidence regarding peer review as a method of undergraduate science writing instruction (see Petersen et al., 2020). Relevant to the perspective of experiential learning theories, there is evidence within this literature on science writing instruction that peer review is implemented as a type of authentic learning experience. Reynolds and Thompson (2011) refer specifically to peer review as an “authentic learning experience” that provides practice in “the same process of self-regulation and evaluation used by professional scientists to improve quality and uphold standards” (p. 210).

In addition to the explicit labeling used by Reynolds and Thompson (2011), less explicit references are made to “approximat[ing] relevant performance contexts” (Jackson & MacIsaac, 1994, p. 22) of the professional peer review process in most of the research that incorporates peer review. While Holstein et al. (2015) do not reference

the professional contexts of peer review, Cyr (2017) suggests that the use of peer review and revision replicates “how professional projects evolve” (p. A48), and Prichard (2005) explains that she employs peer review because it is “virtually the only way higher level [professional] science information is critiqued and validated” (p. A34). It can be argued that peer review is being implemented in this research in attempts to provide students with authentic learning experiences, as conceptualized within theories of experiential learning. While “[c]ontrolled studies assessing peer review as a teaching instrument are relatively rare” (Peterson et al., 2020, p. 4), it is often used in research on science writing instruction combined with other experiential methods.

Consequently, this research has found evidence of the benefits of the authentic learning experience of peer review for undergraduate science writing instruction when combined with other experiential components. For example, Cyr (2017) investigated the effects of a scaffold that included an authentic peer review experience. Cyr (2017) implemented the scaffold and formal peer review in a stepwise writing project for an upper-level endocrinology course over two semesters that included 15 and 22 students. The focus of the course was helping students learn to produce “concise scientific writing” (p. A46). Groups of two to three students chose a topic which they would work with and write about throughout the entire course. Assignments in the course consisted of two miniature literature reviews on their topic, followed by a poster presentation. After each assignment was graded, students exchanged their work with the peers in their groups for review, following explicit instruction on effective peer review that mirrored professional peer review (Cyr, 2017). Word limits were reduced from 500

words in the first review to 250 words in the second review, to encourage more succinct and synthesized writing.

To determine the effects of the stepwise project and the peer review, Cyr (2017) conducted an anonymous survey of the students that included both Likert-style and qualitative free-response questions. The Likert-style portion of the survey was answered by 31 students across both semesters, and 28 responded to the free-response reflection questions. In response to the quantitative questions, 94% of students who responded either agreed or strongly agreed that participating in the stepwise scaffold “improved their ability to write succinctly” (p. A49). Analysis of the students’ free-response answers indicated that peer and instructor feedback and collaboration was beneficial to in-depth learning of their topic and learning to write concisely about scientific topics.

Additionally, students indicated that Cyr’s (2017) scaffolded stepwise project was enjoyable and more helpful in learning scientific material and writing than writing assignments in other courses. Cyr’s (2017) own interpretation of her students’ writing indicated that “their skills choosing, analyzing and synthesizing studies improve[d] dramatically” (p. A50) as a result of this course. Cyr (2017) attributed these results to the “time, choice and flexibility” afforded by the project, which she posited motivated them and allowed them to engage more deeply with literature and the writing and editing process. Overall, Cyr’s (2017) stepwise project provides evidence for the benefits of the experiential concepts of scaffolding and the authentic experience of peer review as beneficial to students’ opinions of science writing instruction.

In addition to scaffolding, research has also found evidence to support the combination of the authentic learning experience of peer review with reflection, another experiential method, in undergraduate science writing instruction (e.g., Prichard, 2005; Reynolds & Thompson, 2011). Reynolds and Thompson (2011) created a teaching tool called the Biology Thesis Assessment Protocol (BioTAP) and conducted research on its efficacy in helping improving biology students' thesis writing. The BioTAP assessment tool consists of a rubric that presents the standard thesis requirements of the department and "a guide to the drafting–feedback–revision process that is modeled after professional scientific peer review" (p. 211), which includes an explicit reflection component.

To test the efficacy of BioTAP, Reynolds and Thompson (2011) created a course for undergraduate students in biology who were completing a thesis or a major research paper so they could administer the BioTAP teaching and assessment tool. The 47 students who enrolled in the course were taught to "engage in scientific peer review" (p. 211); using the detailed rubric that is part of BioTAP, students were shown how to appropriately review practice science paper excerpts according to the rubric criteria, which were then discussed in class to calibrate their reviews with the course instructor's reviews. They then progressed through writing their own drafts. Once they had written drafts to be reviewed, students were then "required to reflect on the strengths and weaknesses" of their work and "ask readers direct, focused questions that [addressed] the struggles they identif[ied]" (p. 211); this step incorporated the important experiential element of reflection in this authentic learning experience. Using the

BioTAP model, students reviewed each other's work, encouraged by the guidelines to ask questions and make comments in their reviews, rather than simply edit. Their drafts were also reviewed by their assigned thesis supervisor. When students received their feedback, they created tables to highlight the changes that were made in their writing in response to the feedback they received, to give them explicit "practice making writing choices" (p. 211).

The researcher's assessed the effectiveness of the BioTAP teaching tool over three years by comparing the final honors theses of the 47 students who took the elective course with those of students who did not take the course ($n=143$). Using the rubric included in the BioTAP tool, Reynolds and Thompson (2011) had graduate and post-doctoral fellows rate the theses anonymously. Two raters rated each thesis and then discussed their ratings to achieve a consensus score agreed upon by both raters. In addition, the researchers tracked the official grades the theses received after submission and collected course evaluations. Results indicated that students who took the course were significantly more likely to achieve the highest honours designation on their thesis and scored significantly higher on the rated BioTAP assessments. Reynolds and Thompson (2011) posit that the reasons for these benefits were "a combination of effects" (p. 214). One possible reason was class discussion elicited by the BioTAP guidelines about reader expectations and scientific writing conventions, which students cited as a primary benefit of the course on the course evaluations; a second was the use of the BioTAP chart for effective peer review when interacting with supervisors. While Reynolds and Thompson (2011) acknowledge questions about the efficacy of BioTAP

outside of the specially constructed course designed to help students use BioTAP, these data suggest engaging in peer review as an authentic learning experience combined with an explicit reflection task may provide benefits to biology students writing their theses.

Earlier research on another type of peer review instrument included a less explicit reflection component (e.g., Prichard, 2005). Prichard (2005) conducted a study investigating the use of the online Calibrated Peer Review™ (CPR) program in two courses, an introductory neuroscience course and an upper-level specialized neuroscience course, which consisted of 50 and 40 students, respectively. As Prichard (2005) explains, CPR is “a free, web-based writing and peer review program” (p. A34) that allows students to anonymously review their peer’s work. The program provides specific instructions on how to conduct peer review, as well as clear criteria for the content of the review, and it “analyzes and assesses student input” (p. A34), providing a grade for the reviewer and a report for the instructor.

The students in the introductory and upper-level neuroscience courses were assigned two and three writing assignments, respectively, for which they were required to use CPR (Prichard, 2005). For each assignment, each student wrote an essay and uploaded it to the platform. Next, they were required to review three teacher-provided essays by rating and answering pre-set questions about their style and content to calibrate their peer review style for that assignment to the teacher’s expectations. Finally, they double-anonymously reviewed three essays written by their classmates, based on the criteria they learned in the calibration stage. The final stage was to review

their own essay according to these criteria; these self reviews, which are a graded for accuracy as part of the assignment, act as a deep reflection of their own work after reviewing their peers' work to gain new perspectives.

Prichard (2005) collected data through student self-reports and instructor observation. Students' reports about CPR were mixed, with many citing the unfairness of what they perceived to be subjective grading by peers as a drawback of the program, and others citing the real-world application of the authentic learning experience of peer review as a positive. However, over the semester, Prichard's (2005) observations indicated that "students' purpose for writing shifted from writing for the professor, to writing a clear argument for a general audience" (p. A39). She attributes this shift in purpose to the "engagement and autonomy in the writing and review process" (p. A39) required by the program that allowed students to retain focus on their own intentions in their writing. Like Reynolds and Thompson (2011), Prichard's (2005) research on CPR also provides evidence for the positive effects of combining the authentic experience of peer review with the experiential element of reflection.

Evidence also suggests that there are benefits to pairing authentic learning experiences with other authentic learning experiences in undergraduate science writing instruction (e.g., Jones et al., 2011). Jones and colleagues (2011) investigated the effects of a publication incentive in an undergraduate neurobiology course that also included laboratory experiments and peer review. The researchers created a course in which students performed "authentic, primary research" (p. A85) to collect data and write a manuscript to submit to the journal *IMPULSE*, a neuroscience journal created and run by

undergraduate students that peer-reviews and publishes research conducted by neuroscience undergraduates. In Jones et al.'s (2011) study, 20 students participated in the course conducting research on the effects of stimulants or depressants on the heart rate of a crustacean. The course consisted of a laboratory and a lecture section. In groups of four, the students chose which chemicals to test in the laboratory section, designed experiments, conducted the experiments and collected data, and wrote manuscripts.

Throughout the initial writing process, the lecture section of the class discussed the format of different sections of *IMPLUSE* journal articles such as the materials, the abstract, and the results (Jones et al., 2011). Once the students had completed manuscripts, they participated in a peer review workshop with students in other groups amid ongoing data collection. Each group revised their manuscripts based on their peers' reviews, which were submitted to the instructor for feedback. After further revisions, students submitted their manuscripts to the journal *IMPULSE*. Coursework continued while the manuscripts underwent peer-review by *IMPULSE* reviewers, and then the students received comments from reviewers. Students responded to reviewers' comments and revised their work before resubmitting to the journal (Jones et al., 2011). All five of the revised journal articles were accepted and published by *IMPULSE*, meaning all 20 students enrolled in the course became published researchers.

According to Jones and colleagues (2011), this course provided the students with a "full-scale model of the research experience, from experimental design and planning, through manuscript preparation and publishing" (p. A90). Jones et al. (2011) measured

students' interpretation of the effects of the course through post-course questionnaires that included quantitative Likert-style questions and qualitative written response questions, which were completed by 15 of the original 20 students. Results of the Likert-style questions indicated that "students spent significantly more time on writing" (p. A87) the drafts of the manuscript that were submitted to the journal than the instructor, taking more care and consideration with the writing process. Additionally, most students indicated in their written responses that participating in the publication process for IMPULSE improved their experience of the laboratory experiment. Also in their responses, many students indicated that they were more thoughtful with the entire experimental and writing process because they knew they were submitting the manuscript for possible publication. Jones et al. (2011) suggest that this finding stems from the potential for publication, which caused students to invest more in the outcome of the assignment than typical assignments. This research provides evidence for the enhanced benefit of combining authentic learning experiences in the form of laboratory experiments with authentic learning experiences in the form of submission to a peer-reviewed journal to strengthen undergraduate neuroscience students' writing.

This literature on undergraduate science writing instruction uses many elements of experiential learning and has found evidence for benefits from scaffolding (e.g., Cyr, 2017; Deiner et al., 2012; Holstein et al., 2015; Köver et al., 2014); authentic learning experiences (e.g., Cyr, 2017; Deiner et al., 2012; Jones et al., 2011; Prichard, 2005; Reynolds & Thompson, 2011); as well as reflection (e.g., Köver et al., 2014; Reynolds & Thompson, 2011). Some of these studies investigated the effects of these methods on

writing production by comparing grades (Deiner et al., 2012; Reynolds & Thompson, 2011), or scores on specifically crafted assessments (Holstein et al., 2015; Reynolds & Thompson, 2011). Others investigated the effects on students' writing process and ability through teacher observations (Cyr, 2017; Deiner et al., 2012; Prichard, 2005). Additionally, the effects of these methods on students' opinions of their writing ability were the main focus of or also measured in many of these studies through questionnaires (Cyr, 2017; Jones et al., 2011; Köver et al., 2014), course evaluations (Holstein et al., 2015; Reynolds & Thompson, 2011), and student self-reports (Prichard, 2005). Through these methods of data collection and analysis, evidence for the benefits of these experiential methods was found in this literature.

Many of these studies combined more than one experiential method, and more than one method of data collection; however, while some acknowledged an experiential perspective (e.g., Deiner et al., 2012; Jones et al., 2011; Köver et al., 2014), none overtly intended an experiential learning theory connection, based on their lack of mention within the studies. There is little if any literature on the explicit use of theories of experiential learning in undergraduate science writing instruction. Additionally, there is very little literature on the application of principles of rhetorical genre theory on science writing instruction, or genre acquisition.

Experiential Science Writing Instruction and RGT. In consideration of the other half of my theoretical framework, RGT, only one of the studies I have reviewed here applies a genre theory perspective to undergraduate science writing instruction (see Holstein et al. 2015). Research into undergraduate science writing instruction following

the theoretical principles of RGT – including authentic participation for the purposes of context-dependent genre acquisition (e.g., Jones et al., 2011) – is limited. Even more limited is the available research on this topic that uses RGT principles in combination with experiential learning principles.

The research I have reviewed here unanimously employs explicit instruction of compositional and/or rhetorical conventions in their investigations into writing instruction methods; while some studies used authentic learning experiences (e.g., Cyr, 2017; Deiner et al., 2012; Jones et al., 2011; Holstein et al., 2015; Prichard, 2005; Reynolds & Thompson, 2011), which could equate to implicit instruction, students were also provided with explicit breakdowns of the conventions of the writing assignments within this research. As discussed in the previous chapter, the efficacy and necessity of explicit instruction in genre acquisition is questionable (see Freedman, 1993). Evidence of improved knowledge of writing and rhetorical conventions was found in this literature using explicit methods of instruction, but this does not necessarily correlate to the acquisition of the genre (see Artemeva & Fox, 2010).

The results reported from many of the studies reviewed here echo rhetorical genre considerations, however. Across these studies on neuroscience undergraduate writing instruction there was evidence from both students' and teachers' perceptions and writing assessments of improved knowledge of the communicative purposes of each section of the scientific report (e.g., Deiner et al., 2012; Holstein et al., 2015), as well as newfound considerations for audience (Prichard, 2005; Reynolds & Thompson, 2011), and improved understanding of complex, discipline-specific concepts and how

they are communicated within the field (Köver et al., 2014). It could be argued that these areas of improvement in undergraduate science writing correspond to facets of implicit genre knowledge discussed in the previous chapter (see Freedman & Medway, 1994; Freedman & Medway, 1995). However, as these competencies were for the most part not measured or analyzed with a rhetorical genre perspective, this remains speculative rather than conclusive/definite.

Clearly, there is a dearth of existing literature on the combination of experiential learning methods and the rhetorical genre perspective within science writing instruction.³ There is some research on genre acquisition from the RGT perspective that employs concepts important to theories of experiential learning, such as authentic learning experiences (Blakelslee, 2001; Campbell, 2017; Dias et al., 1995; Freedman et al., 1994), in addition to scaffolding (Dias et al., 1995), and reflection (Campbell, 2017); however, these studies do not focus on undergraduate science writing instruction. Additionally, like the literature reviewed above concerning experiential concepts in undergraduate science writing instruction, these studies are not explicitly based in an experiential perspective. Regardless, there is benefit in reviewing literature that ties RGT with experiential concepts in general. Consequently, in the following section, I pivot to provide examples of how experiential learning elements have been conceptualized within the RGT literature.

³ RGT is most often combined with the closely related Situated Learning theory (Lave & Wenger, 1991). There are many similarities between situated learning and experiential learning, but the main difference is that, as discussed in the previous chapter, experiential learning comes from a social constructivist epistemology, while theories of situated learning are constructionist (see Fenwick, 2000).

RGT and Experiential Learning Concepts

Research has been conducted on facilitating genre acquisition from the RGT perspective that employs experiential methods. In Chapter 2, I discussed arguments for the ineffectiveness of explicit writing and rhetorical instruction, as well as the importance of context for genre acquisition (see Freedman, 1993). In the previous section, I described the evolution of discipline-specific writing instruction and outlined the need to teach neuroscience students to write the professional genres of their discipline (e.g., Moon et al., 2018; Peterson et al., 2020). The question becomes how to promote discipline-specific genre acquisition non-explicitly. To address this problem, researchers and writing instructors from different disciplines have attempted to find ways to implicitly aid their students' genre acquisition, such as by using experiential methods to bridge classroom and workplace contexts to facilitate professional genre acquisition. Some research has been conducted that indirectly uses foundational concepts of experiential learning (e.g., Blakeslee, 2001; Campbell, 2017; Dias et al., 1999; Freedman et al., 1994), although this research is hard to find. These challenges may stem from the recognition within RGT that rhetorical situations and exigences in classroom settings are fundamentally different to those in a professional workplace (see Freedman & Medway, 1994). These differences make the prospect of helping students acquire professional genres in classroom settings challenging, from an RGT perspective.

This challenge was clearly illustrated in a study by Freedman et al. (1994) in which they examined the effect of a case-study simulation in a third-year financial analysis course on students' learning role and genre. In this course, 25 students were

presented with real-world financial case studies stripped of context and analysis, and through class discourse with the professor and the readings were expected to “determine for themselves the relevant principles to apply” (p. 199). Students created formal written analyses of these case studies in which they were expected to apply the principles and in groups of three they presented a written case analysis to the class while “roleplay[ing] actual players within the case, making recommendations to the relevant board of directors” (p. 199). Students were asked to assume the social role of professional executives by dressing in formal, professional clothing and “hand[ing] out executive summaries of their reports” (p. 203) to the audience, thus simulating the roles of the rhetorical situation of the genre in the workplace context.

Freedman et al. (1994) analyzed 43 of the students’ written case studies and observed their oral presentations and found that, despite the role-play, students’ perceptions of the roles they were playing and the rhetorical situation they were writing within was “shaped by the university context” (p. 203), which ultimately shaped the genres they produced. In other words, students were unable to fully inhabit the social role they were attempting to role-play to begin to acquire the professional genre they needed to use. This challenge arose because they were still students within the academic institutional context, rather than professionals acting in the workplace context, and this was evident in their writing (Freedman et al., 1994).

Role-play, simulations, and case studies of this type are common forms of classroom-based experiential learning techniques in experiential learning pedagogy (Lewis & Williams, 1995). The goal of experiential assignments is to provide *authentic*

learning experiences, which “approximate relevant performance contexts” (Jackson & MacIsaac, 1994, p. 22) and promote “active participation in ... the learning process” (p. 22). The meaning of authenticity in experiential learning pedagogy differs from that of rhetorical genre perspectives, however. In RGT, authentic contexts – in which authentic writing takes place – are the contexts in which genres are actually used. Freedman (1993) describes the importance of “authentic ... writing tasks involving the targeted genre” (p. 244) in classroom settings, referring to the genres of the classroom in which the writing tasks take place. To be authentic, in this view, is to be real by necessity, unlike the authentic learning experiences of experiential learning.

Another perspective of authenticity, however, suggests that authenticity may be viewed as a scale measurement, with texts being varying degrees of authentic (Purcell-Gates et al., 2002; 2007). While I do not apply any specific measurement scale in this study, I apply this principle of authenticity as malleable and measurable rather than an all-or-nothing condition. With this consideration of authenticity and authentic learning experiences, it is worth returning to a review of Freedman et al.’s (1994) study on the financial analysis course. Even though students were unable to acquire professional genres or adopt professional roles in the course, Freedman et al. (1994) did report benefits to the students from the authentic learning experience. The structure of the course allowed the students to “participate in the type of thinking encouraged by the rhetorical practices of their discipline” as they were “inducted into the ways of knowing... construing and interpreting phenomena, valued in that discipline” (Dias et al., 1999, p. 205). This participation, Freedman and Medway (1994) have argued, is “one of

the most important purposes of school writing” (p. 14). Students in the course acquired and performed new academic genres specific to their discipline through participation within the “rich discursive context” the instructor created through modeling the “lexicon Modalities . . . syntactic relations [and] lines of reasoning” (Freedman & Adam, p. 407) appropriate to the discipline. Consequently, the students were able to begin to think like members of that discipline. Throughout the course, “ways of knowing became ways of saying” (Dias et al., 1999), and the students were able to produce the new academic genres that allowed them to “enact the ways of thinking and the ways of identifying, delimiting, construing and approaching phenomena characteristic of [the] discipline” (Freedman & Medway, 1995, p. 169). Freedman et al. (1994) suggested that performance of these types of genres could help students acquire the “intellectual stance . . . ideology, and . . . values necessary” (Freedman et al., 1994, p. 221) in the professional context.

There are other examples of research from the RGT perspective that investigate more authentic learning experiences for professional writing instruction in academic contexts. Some of this research has found benefits for students that may aid in or ease their acquisition of professional genres (e.g., Blakeslee, 2001; Campbell, 2017; Dias et al., 1999). Dias et al. (1999) and Blakelsee (2001) reported research on collaborations between the classroom and the workplace in attempts to provide more authentic – or closer to real-world – authentic learning experiences. Dias et al. (1999) observed an upper-year systems analysis course in which the professor used the “dual exploitation of both academic and workplace settings” (p. 207) by collaborating with real-world client-

organizations that required systems analyses. The students in the class were assigned to workplaces in groups, and the groups were required to visit the workplace, interview with the staff, and solve their unique systems analysis problems. They produced three written documents concerning these problems that received intense feedback from the instructor and were eventually “presented to the client, sometimes accompanied by an oral presentation, if the client so desire[d]” (p. 207). The students also presented rough drafts of their documents orally to the class.

In addition to an authentic learning experience, this experience was “highly scaffolded” (Dias et al., 1999, p. 206), applying two principles integral to experiential learning. Through analysis of the students’ composing sessions and document drafts, Dias et al. (1999) observed that this authentic learning experience of the professional writing context, while still ultimately based in the university and tied to grades and epistemological knowledge construction, provided students with a secondary exigence in the workplace. Additionally, it allowed students to experience of the social roles of workplace writers performing genres for workplace readers, though they were unable to fully inhabit those roles. This type of course may prepare students for the tough transition from the classroom to the workplace, as it provides “a kind of bridge across the gap between school and work” (p. 209).

In similar research on workplace-classroom collaborations, Blakeslee (2001) conducted teacher research in an introductory technical communication course and an upper-level computer documentation course. In the introductory course, 15 students were assigned a task by three technical writer clients from an electronics company, who

asked the students for “five deliverables” (p. 174) – genres of writing concerning the task – over the semester. Students were working in groups on the same task, and groups were competing against each other to be selected by the client. In the upper-year course, 18 students were separated into groups and assigned different parts of an instruction manual requested by clients at a web-based listserv (Blakeslee, 2001). The students met with the clients in class as well as outside of class for “research, testing, and reviewing” (p. 175).

Blakeslee (2001) conducted interviews with the students and the clients, and collected student questionnaires, the students’ drafts and documents, and the clients’ documents to “shed light on what students may [have] learn[ed]” (p. 175) from this type of project. Additionally, Blakeslee (2001) investigated her students’ perceptions of the authenticity of the project. She determined that, while the “classroom-workplace collaboration [did] not fully replicate workplace contexts” (p. 179), the course “expose[d] students, at least to some extent, to the activities that are carried out and/or considered important in the workplace” (p. 176). She also found that students viewed the projects overall as inauthentic to the workplace but as more than simply school assignments, with some authentic elements; for example, they found their audience to be more concrete. Blakeslee (2001) concluded that these types of simulations may “gradually introduce[e students] to the genres that both arise from and support [the] cultures and activities [of the workplace]” (p. 189).

More recently, Campbell (2017) studied the efficacy of an authentic learning experience that involved explicit reflection. The experience was a robotic nursing

simulation, designed to aid nursing students' acquisition of the patient health record genre. Over the course of a year, Campbell (2017) observed "approximately 80 third-year nursing students" (p. 261) completing simulation narratives with a sick robotic patient – controlled by a coordinator in a separate room – in a simulated hospital suite; they were required to care for the patient and chart patient care through a patient health record. In groups, students constructed the simulated patient health record on one or two large whiteboards within the suite in real time as they cared for the robotic patient, while their classmates watched from outside. After the simulation ended for one group of students, "the coordinator facilitated a debrief conversation" (p. 261) with the full class, "encouraging critical reflection" (p. 262) on their peers' performance. According to Campbell (2017), "this space for critical reflection distinguishes simulations from real-world genre experiences and is perhaps their greatest affordance" (p. 276).

Campbell (2017) collected and analysed observational field notes and videos, interviews with the students, and images of the whiteboards containing the patient health records. Through analysis she determined that students were "flexibly and responsively repurposing hospital genres both to support their care within the simulation and to further influence their understanding of the professional genre's role" (p. 275). The nursing students drew on their previous experience with hospital record systems during clinical placements, and their group discussions of the appropriate use of these clinical genres in the rhetorical situation of the simulation affected their rhetorical construction of the patient health record. In addition, these discussions improved their understanding of the purpose of the clinical genres they had previously encountered. In

choosing how to apply their previous knowledge within the simulation, the students “experienced firsthand how those formal choices coordinated social action” (p. 275) and felt the social and rhetorical constraints inherent in the professional genres.

Additionally, Campbell (2017) concluded that students were also able to experience the socially mediating role of the patient health record through the simulation, or how it “support[ed] interactions with patients, other nurses, and the doctor” (p. 276).

Ultimately, Campbell (2017) determined that simulation genres could be a way to help “scaffold [students’] critical engagement with professional genres” (p. 261) by providing these authentic learning experiences.

This brief review of RGT-based research on genre instruction that applies experiential learning elements provides examples of how these elements have been conceptualized from an RGT perspective. Similar to the undergraduate science writing instruction research above, these studies also provide evidence that students do derive some benefits from participating in these authentic learning experiences. Whether these benefits ultimately lead to writing improvements is unclear, and whether and how they relate to professional genre acquisition is speculative, but the authors of these studies suggest that the use of these types of learning experiences are beneficial to students attempting to learn to communicate within a discipline (e.g., Dias et al., 1999; Freedman et al., 1994).

In this chapter’s first section, I reviewed literature that used experiential learning elements in undergraduate science writing instruction (e.g., Deiner et al., 2012), while in the more recent one, I considered literature on the facilitation of genre acquisition from

an explicitly RGT perspective. Both sets of research provided evidence of experiential learning elements resulting in improvements in audience awareness (e.g., Blakeslee, 2001; Jones et al., 2011; Prichard, 2005; Reynolds and Thompson, 2011), knowledge of discipline-specific thought and discourse (e.g., Cyr, 2017; Freedman et al., 1994; Köver et al., 2014), and understanding of rhetorical purpose (Campbell, 2017; Deiner et al., 2012; Holstein et al., 2015). In the next section, I situate my study within this literature.

Situating the Study within the Gaps

To situate this case study, I have identified gaps within the literature reviewed in this chapter based on theoretical perspective, methodology, and analysis, as well as the case itself. There are some important differences between the two groups of literature reviewed here that are relevant to this case study, and I explicate those differences here. In the first subsection, I consider differences between the experiential learning activity in this study and the literature, and situate the study within the identified gaps. Following this, I outline differences between the theoretical perspectives in the literature and my theoretical approach and methodology that result in further gaps in which I situate my study. Finally, I situate the study within the context of COVID-19.

Uniqueness of The Case

The case study presented in this thesis is an investigation into the effects of an experiential activity on genre acquisition in an undergraduate neuroscience writing course. The case itself – the activity, or the authentic learning experience – was unique within this literature in numerous ways. First, the research reviewed here involved tools implemented in entire semester-long courses (Cyr, 2017; Prichard, 2005) or in courses

designed specifically to implement that technique (e.g., Blakeslee, 2001; Campbell et al., 2017; Deiner et al., 2012; Dias et al., 2015; Freedman et al., 1994; Holstein et al., 2015; Jones et al., 2011; Köver et al., 2014; Reynolds & Thompson, 2011). Conversely, the activity investigated for this study and the coursework surrounding it took place over approximately four weeks.

Additionally, the pseudo-experiment within the activity is different. While many of the cases described in this chapter involved authentic learning experiences in the form of experiments (e.g., Deiner et al., 2012; Holstein et al., 2015; Jones et al., 2011), these are all laboratory experiments. Conversely, the neuroscience experiment that constitutes the authentic learning experience in my study took place in the classroom, with the class as the subjects. As a result, this case may be one of the first within the literature to use human subjects instead of a controlled laboratory experiment in an authentic learning experience. Due to the nature of testing on classmates as human subjects within the classroom, the activity in this case is also unique in that it required that students participate as research subjects within the experiment as well as those posing questions for the experiment. Finally, unlike in the laboratory experiments, students were provided with the option of posing a research question, as opposed to the requirement that they do so.

There is a gap in the literature investigating authentic learning experiences that involve experiments with short-term implementation, which this case in my study fits into. It also fits in the gap consisting of the lack of human subjects in authentic learning activity experiments, as well as the gap in the literature on students participating as

research subjects in the research they will be writing about in an authentic learning experience.

Gaps in Theoretical Approach and Methodology

In my review of the literature, I have found research into the effects of undergraduate science writing instruction that use elements of experiential learning (e.g., Cyr, 2017; Deiner et al., 2012; Holstein et al., 2015; Jones et al., 2011; Köver et al., 2014; Prichard, 2005; Reynolds & Thompson, 2011). I have also found research into the effects of elements of experiential learning concepts on facilitating rhetorical genre acquisition in pedagogical settings (e.g., Blakeslee, 2001; Campbell, 2017; Dias et al., 2019; Freedman et al., 1994). One important issue here is that writing instruction and genre instruction are not the same thing (see Holstein et al., 2015). What is being investigated in the undergraduate science writing research – writing instruction – is not what is being analyzed in the RGT research. While both approaches are concerned with students' production of generic texts within their discipline, they have different focuses that lead to differences in methodology, data collection, and analysis within research.

When studies investigate the effects of writing instruction without a rhetorical genre perspective, they do not consider elements of genre such as generic social roles, nor do they intentionally measure and analyze discursive constructions (see e.g., Cyr, 2017; Deiner et al., 2012; Holstein et al., 2015; Jones et al., 2011; Köver et al., 2014; Prichard, 2005; Reynolds & Thompson, 2011). Within this literature on science writing instruction, there is a gap in investigations of generic social roles. My study attends to this gap because I consider the effects of the implementation of the activity on generic

social roles, akin to Blakeslee et al. (2001), Freedman et al. (1994), and Pare and Smart (1994). I have done this work in this case study by choosing to investigate the effects of the experiential activity on students' perceptions of the social roles they performed while participating in the experiential activity through the medium of their discursive constructions, filling the gap in measurement focus.

In addition to the gap in measurement focus, there is a large gap in the existing literature that excludes the intersection of the intentional use of experiential learning concepts, an explicit rhetorical genre perspective, and methods of improving undergraduate neuroscience students' production of discipline-specific texts. The case study which is the focus of this thesis seeks to fill this gap. The investigation of experiential learning methods, the focus on undergraduate science writing instruction and genre acquisition, the consideration of genre roles, as well as the measurement of discursive constructions together are factors that fit this case into obvious gaps within the literature.

The final gaps occupied by the case study I report in this thesis are gaps in research highlighted by the COVID-19 pandemic and emergency remote teaching (ERT; Hodges et al., 2020). In the next section, I briefly review the literature on ERT and the impacts of COVID-19 on post-secondary education so I may situate this study within this literature.

COVID-19 and ERT

In March 2020, the COVID-19 pandemic forced post-secondary institutions across Canada and worldwide to implement safety protocols that fundamentally

changed the educational experience (Houlden & Veletsianos, 2022). To help prevent the spread of COVID-19, institutions cancelled in-person classes and abruptly transitioned to online instruction (Hodges et al., 2020). This online instruction has been dubbed emergency remote teaching (ERT; e.g., Hodges et al., 2020; Houlden & Veletsianos, 2022), along with its counterpart perspective, emergency remote learning (ERL; e.g., Gonzalez-Ramirez et al., 2020; Schultz & Demers, 2020). These types of instruction differ from what is known as online learning, or intentional, evidence-based online education supported by decades of literature and theory, that is planned and refined over months or years of research (Hodges et al., 2020). On the contrary, the impromptu switch to ELT, especially as it was implemented at the beginning of the pandemic, was rushed and makeshift, shaped by the emergency context (Hodges et al., 2020).

Since the beginning of the pandemic, much research into the effects of ELT on post-secondary students has been fast-tracked (e.g., Houlden & Veletsianos, 2022). Researchers have investigated the consequences of ERT on students' mental health (e.g., Lischer et al., 2021; Shin & Hickey, 2021; Unger & Meiran, 2020), as well as its academic impact (e.g., Bawa, 2020; Iglesias-Pradas et al., 2021; McWatt, 2021; Supriya et al., 2021; Wilhelm et al., 2022; Yakar, 2021). In addition, researchers have investigated students' perceptions about their educational experience during ERT (e.g., Buttler et al., 2022; Jeffery & Bauer, 2020; Lee et al., 2021; Mican et al., 2021; Saxena et al., 2020; Selco & Habbak, 2021; Wester et al., 2021).

This research has yielded interesting results on the effects of ERT throughout the COVID-19 pandemic. Researchers found that the move to ERT may have affected

undergraduate students' mental health significantly, with some reporting that students experienced increased levels of anxious symptoms related to ERT (Unger & Merian, 2020), especially for those who had previously experienced anxiety (El-Sakran et al., 2022). Some of these mental health effects may be attributed to the pandemic itself; however, researchers have also found that increased anxiety and depressive symptoms can also be related to COVID-19 lockdowns (Cao et al., 2020) and COVID-19 news coverage (Huckins et al., 2020) among undergraduates. Alternatively, other research has found that students coped well with lockdowns overall (Lischer et al., 2021) and were satisfied with ERT (Shim & Lee, 2020). Researchers have suggested that the discrepancies in these findings may be a result of differences in "access to technology and infrastructure, as well as broader financial obligations and opportunities determined by national context (e.g., tuition costs and funding), and the degree to which the pandemic has impacted social and economic norms" (Houlden & Veletsianos, 2022, p. 4).

Evidence on the effects of ERT on students' academic experience has also been somewhat contradictory. Many studies have found that students achieved higher grades after the pivot to ELT (e.g., Bawa, 2020; Iglesias-Pradas et al., 2021; McWatt, 2021; Supriya et al., 2021; Wilhelm et al., 2022; Yakar, 2021). However, some of the same studies and others have also reported students' impressions of learning loss (e.g., Supriya et al., 2021; Wilhelm et al., 2022; Yakar, 2021). These discrepancies are speculated within the literature to be the result of various factors other than improved learning that may have contributed to improvements in grades, including increased

flexibility of coursework when courses were moved online (Supriya et al., 2021), and lack of exam anxiety (Yakar, 2021). Additionally, cheating during online exams was suggested as a concerning possibility by researchers and students (Iglesias-Pradas et al., 2021; Wilhelm et al., 2022). Other negative perceptions reported by students included lack of peer interaction (Jeffery & Bauer, 2020; Lee et al., 2021; McWatt, 2021; Supriya et al., 2021; Wester et al., 2021), and loss of motivation (Jeffery & Bauer, 2020; Shin & Hickey, 2021).

Conversely, some studies have reported that students saw benefits with ERT (e.g., Iglesias-Pradas et al., 2021; Lee et al., 2021; Mican et al., 2021; Selco & Habbak, 2021). These benefits included the flexibility of self-paced learning (Buttler et al., 2021; Iglesias-Pradas et al., 2021; Selco & Habbak, 2021), increased access to course content posted online (Selco & Habbak, 2021), and efficiency of work using online platforms (Mican et al., 2021). Additionally, researchers observed an increased willingness to initiate communication with instructors through digital channels than through formal emails and in-person office hours (Lee et al., 2021; Wester et al., 2021). Research has also found students' perception of the health and safety benefits of closing schools had an ameliorating effect on their experience of ERT (Saxena et al., 2021; see also, Lee et al., 2021).

Clearly, there have been positives and negatives to the implementation of ERT for undergraduate students in general during COVID-19. Research has shown, however, that within undergraduate science courses, there may be further drawbacks on students' learning through ERT (e.g., Jeffery & Bauer, 2020; McWatt, 2021; Selco &

Habbak, 2021; Supriya et al., 2021; Wester et al., 2021; Wilhelm et al., 2022). For instance, students reported that there were significant differences in the laboratory classes that are usually incorporated in courses such as chemistry (Jeffery & Bauer, 2020), anatomy (McWatt, 2021; Wilhelm et al., 2022), and biology (Supriya et al., 2021). These laboratory classes, which typically provide students with hands-on, applicative experiences, were at best reduced to experiments performed alone with household items (Selco & Habbak, 2021), and at worst reduced to second-hand video observations (Jeffery & Bauer, 2020).

While science students also reported the negative effects discussed above, such as learning loss (e.g., Wilhelm et al., 2022) and loss of motivation (e.g., Jeffery & Bauer, 2020), they often reported loss of the authentic learning experiences of laboratory classes as one of the largest drawbacks of online learning and a cause of those negative effects (Jeffery & Bauer, 2020; McWatt, 2021; Wilhelm et al., 2022). In addition, research showed a lack of engagement and interest in science without the hands-on laboratories (Jeffery & Bauer, 2020; Wester et al., 2021). Students also expressed feelings of detachment from their disciplinary community within the university (Jeffery & Bauer, 2020; McWatt, 2021; Selco & Habbak, 2021; Supriya et al., 2021; Wester et al., 2021). Ultimately, students acknowledged the importance of the interactive element of laboratory classes (Jeffery & Bauer, 2020; McWatt, 2021; Wester et al., 2021; Wilhelm et al., 2022).

This literature on the effects of ERT on undergraduate students' experiences shows that moving online has been detrimental to many science students' educational

experience. Many science undergraduates' feel their education is diminished without interactive elements such as peer interaction and hands-on authentic learning experiences (Jeffery & Bauer, 2020; Wilhelm et al., 2022). There is a need for interactive elements in online science courses that can provide authentic learning experiences. In this current study, I investigate one such element for neuroscience students.

In the next section, I provide my research questions.

Research Questions

In previous chapter, I explicated the theoretical framework of this study. In this chapter, I provided a review of the available literature on experiential learning concepts in undergraduate science writing instruction and facilitated rhetorical genre acquisition, as well as a review of the COVID-19 ERT literature and situated my study within the pertinent gaps. Having provided this contextual background, I now present my research questions, which are as follows:

1. How do students who have taken SCWR 2000⁴ discursively construct their experiences within the experiential activity? How do they discursively construct the social roles they performed throughout the experience?
2. What, if anything, is the difference in students' discursive constructions of their roles within this activity before and after COVID-19 safety measures were enacted?

These questions reflect the focus of this study. My first question probes how students construct, through their use of language, the roles they perform during the experiential

⁴ This is a fictitious course code to protect the anonymity of the participants.

activity, and the second question takes the situational changes due to COVID-19 into consideration. My research objectives – the subset of research questions that reference tangible goals, as stated in the first chapter (see Mills & Birks, 2014) – were to determine (1) if the in-class experiential activity in any way allows the students to discursively construct their role as that of the researcher; and (2) whether the students find the roles they adopt beneficial to writing the accompanying paper within the neuroscience discipline.

Together, these research questions and objectives guided the construction and execution of this study, from methodology through analysis. In the next chapter, I provide an overview of the methodology structuring this research, as well as an explanation of the ethics applications, participants, research site, and methods of data collection and analysis that were used to conduct this case study investigation.

Chapter 4: Methodology and Research Methods

This chapter explains the methodology, design, ethics, and research and analytical methods used to complete this study. The first section outlines the study's methodological lens, accompanied by a description of the research design. In the second section, I describe the ethical procedures and considerations of this project involving human participants and monetary compensation. The third section presents a description of the undergraduate neuroscience course and the experiential activity under investigation. In section four, I outline this project's research methods, describing the research site, participants and recruitment procedures, the data collection procedures, and the instruments and their construction. The chapter concludes with a brief description of the analytical method of Thematic Analysis (TA) employed to analyze the quantitative data.

This project underwent necessary changes halfway through its completion due to COVID-19 health and safety protocols that were implemented during the first attempt at data collection. The qualitative data collected in the initial attempt at data collection are still applicable to this study, however. In the following sections, brief references to and explanations of the first iteration of the study are provided where necessary for proper contextualization.

Methodology

Smart (2008) distinguishes methodology from research methods by defining methodology as “method *plus* an underlying set of ideas about the nature of reality and knowledge” (p. 56). I employed a case study research method for this investigation,

specifically an intrinsic case study, as “the focus is on the case itself (e.g., evaluating a program . . .) because [it] presents an unusual or unique situation” (Creswell & Poth, 2017, p. 157). The second half of Smart’s (2008) definition of methodology are what Creswell and Poth (2017) refer to as “philosophical assumptions” (p. 47) When pursuing qualitative inquiry using methods, such as a case study, Creswell and Poth (2017) advise that one should explicitly state the philosophical assumptions and how they are applied to the research through an interpretive framework, or paradigm, within which the research is conducted.

As discussed in Chapter two, I apply two different epistemologies in the interpretive framework of this study: constructionism and social constructivism. Rhetorical Genre Theory (RGT), with its foundation in the social construction of meaning (see Miller, 1984), follows a constructionist epistemology. Braun and Clarke (2013) summarize constructionism as the perspective that “what we know of the world, and ourselves and other objects in the world is constructed (produced) through various discourses and systems of meaning we all reside within” (p. 30). Alternatively, social constructivism, the epistemology behind theories of experiential learning, is also concerned with socially, discursively constructed meaning, but “can be applied more individualistically and [is more] psychologically oriented than constructionism” (Braun & Clarke, 2013, p. 329).

By combining these views in my interpretive framework within this case study methodology, I have been able to consider both the participants’ socially constructed and internally constructed knowledge of the activity. The analytical foci of this study are

students' discursive constructions, which are reflections of their individually constructed knowledge related to the experiential activity; however, in collectively analyzing their discursive constructions along with my observations of their social interaction during the activity to generate codes and themes (as will be described in the next chapter), I was able to investigate the shared social knowledge that was constructed within the experiential activity. I structured this case study from design to analysis using this interpretive framework.

Design

To gather qualitative data for this study, I employed a case study design. According to Yin (2018), a case study is an appropriate method of inquiry when the situation meets three criteria: if the researcher is (1) asking a how or why question (2) about a current phenomenon (3) that cannot be controlled or manipulated by the researcher. My research questions fit these criteria: my research questions and objectives are *how* questions; the case I am studying – the in-class experiential activity – is currently being run every semester; and it is out of my power to purposely alter the conditions of this activity. For these reasons, I had appropriate rationale to conduct an exploratory case study.

To begin an exploratory case study, Yin (2018) says, questions and purpose must first be made clear to guide the investigation, and these are reflected in my research questions and the research objectives I outlined in the previous chapter. The next step, Yin (2018) advises, in case study research design is to define and, if necessary, *bound* the case. Bounding the case involves specifying the boundaries of the phenomenon one is

studying; as Creswell (2007) defines it, bounding means describing “how [the case] might be constrained in terms of time, events, and processes” (p. 76).

I identified the case that I am studying as the experiential activity under investigation, and I bounded this case in four respects. Identifying time boundaries, I chose to investigate the activity from its inception, by including in my investigation participants from every semester the experiential activity had been implemented, from the first semester it was introduced to the most recent semester at the time of data collection. Additionally, I bound the case by events, including both day one and day two of the activity in my investigation, as well as the accompanying written assignment students needed to complete; yet I left the assignments building up to the activity outside the boundaries of the case. Finally, I bound the case by its processes, including the research and experimental processes of the activity itself and the writing process for the paper in my consideration of this case. Following an emergent design, I was also required to define a contextual boundary that included a version of *in-class* that did not take place in a physical classroom, but rather a virtual classroom, in consideration of COVID-19 safety protocols.

Creswell (2007) defines a case study as an exploration of “a bounded system (a *case*) . . . over time, through detailed, in-depth data collection involving *multiple sources of information* (e.g., observations, interviews, audiovisual material, and documents and reports), [that] reports a *case description* and case-based themes” (p. 73). Having identified the boundaries of my case and intending to investigate the effects of the phenomenon at different points in time, I collected “multiple sources of

information” (p. 73), which consisted of open-ended questionnaires and observational notes, as well as a singular interview from the first data collection attempt. Yin (2018) identifies case description as one possible analytic strategy in case study research, which follows a descriptive framework; alternatively, in this case study I chose to employ an inductive framework, in which data is analyzed using a bottom-up analytic approach (Yin, 2018). In chapter five, I report case-based themes from my inductive analysis of the data. The methods of data collection are described below (also, see Appendices A & B).

Ethics

This research project included human participants and therefore required ethics clearance from the university’s ethics board. In accordance with the approved ethical procedure, ethical recruitment was adhered to, and informed consent was obtained from each participant prior to their participation in each method of data collection. Having consent forms for all types of data collection allowed the participants to consent to and participate in only the data collection methods with which they were comfortable. Electronic data was kept in an encrypted file and paper data was kept in a locked filing cabinet for protection. Data that contained identifying information was transcribed and anonymized within two weeks of data collection, and the original data with the identifying information was encrypted to protect the participants’ personal information.

This project received funding, which provided students with monetary compensation for their time. Funds were allotted to the project by the SCWR 2000 course professor through a research grant from the university. This financial support

allowed for the presentation of a \$15 Amazon electronic gift card to each participant. Ethical considerations as a result of this funding included ensuring anonymity of the participants from the course professor by disallowing any access to possibly identifiable primary data. Additionally, the units of compensation were purchased separately from the grant and subsequently reimbursed, which allowed any information that could identify the participants unknown to the course professor.

Intervention: The Experiential Activity

At a mid-sized Canadian university, a neuroscience professor was approached by the Department of Neuroscience to create a writing-focused course, SCWR 2000. The aim of this course is to help provide students with much-needed writing instruction in the sciences in preparation for writing their undergraduate theses. The single-semester course the professor has created focuses on different communicative tasks within neuroscience, such as literature reviews and journal articles. One particular activity that the professor developed for this writing course, the visual iconic memory (VIM) activity, adds a readily available experiential component to the course content. It is this experiential activity that is the focus of my research in this study.

The VIM activity under investigation in this study was aimed at providing students an opportunity to experience the research process prior to writing a journal article about that process. Students were given the tools and experience to think critically and scientifically about a topic – an important step in teaching science as “a way of thinking” rather than “a collection of facts” (Reynolds & Thompson, 2011, p. 209). The activity took place over two classes in this course. During the first session, the

professor introduced students to the concept of VIM, which was followed by the presentation of two practice arrays of letter grids with a 50ms exposure to exemplify VIM. After experiencing the practice VIM tests, the professor described the activity and accompanying writing assignment to the students: they would collect their own data as participants and tabulate it as a class. Acting as researchers, they had the opportunity to propose research questions involving different types of arrays to test on their classmates in the second activity class; the scores from the second class were tabulated, and together with the data from the first day constituted the data for the journal article writing assignment.

Then the first round of data collection began for the students; the professor presented three more arrays to the students with 50ms exposure and had them write down the letters that they remembered after each array. After completing the arrays, she presented an Excel file with the students' names entered into a chart. She called on the students individually to report their results and tabulated the number of correct responses each student was able to record for each array, which resulted in a chart of VIM test data.

Between the first and second day of the activity, students had the opportunity to pose research questions concerning VIM that, when feasible, were tested on the second day of the activity – for example, whether different coloured letters in the array improve VIM, or if the type or size of the font affects VIM. The professor worked with the students to create the arrays and on the second day of the activity, the arrays suggested by students were presented to the class. VIM scores were recorded and tabulated, and

the preliminary results were discussed by the class. Students had the option to choose data from any of the tested questions to write about in their journal article assignment based on this experiment.

With this activity, the professor of the course attempted to provide students with an engaging experience that would help them “buy-in” to the research and have a stake in the outcome of the research. Because the journal article assignment was based on a pseudo-experiment that the students experienced and even participated in, the professor hoped they would become invested in the writing they were producing in a way that would allow them to understand the purpose of reporting the research in the journal article genre, as the researcher and the writer.

Research Methods

Research Site

This research study was conducted at a mid-sized, Canadian university in a second-year undergraduate neuroscience writing classroom.

Participants

The research participants for this project were students who had taken SCWR 2000, an undergraduate neuroscience writing course offered at the university. The total population of these students during the first iteration of this study was approximately 80 (4 semesters x twenty students per semester). Originally, this population was broken down into two subpopulations: 1) students who took SCWR 2000 either in the fall of 2018, the winter of 2019, or the fall of 2019, which is approximately 60 students; and 2) students who were enrolled in the class during the time of data collection, which is

approximately 20 students. The reason for the division of the population was twofold: a difference in tested experience – for instance, application of knowledge beyond the course, which current students cannot attest to; and a difference in available measurements – students enrolled during data collection were able to be observed in their participation in the experiential activity, and previous students were not.

The participant groups were altered slightly as a result of changes due to COVID-19. The semester of data collection changed from Winter 2020 to Fall 2020. The students who were previously in the “current students” group became part of the “previous students” group, which grew by approximately twenty students to an approximate total population of 80, and students enrolled in SCWR 2000 in the fall 2020 semester became part of the study population as the “current students” group. This change brought the total population of students who have taken or were taking SCWR 2000 to approximately 100.

This study had a total of $n=27$ submissions of student participant data recorded across all measures of data collection; the exact number of participants is unknown due to the anonymous and elective nature of the measures across two attempts at data collection, as some participants may have participated in more than one measure at different times. These participants are all between the ages of 16 and 30, skew female, and belong to two departments within the university, Neuroscience ($n=25$) and Psychology ($n=2$). Most of the participants were second year students at the time they took SCWR 2000; however, some were third year and fourth year students as well. All participants were fluent in English.

This study also included as a participant the professor of the course, who created the activity under investigation. She was included to provide insight into the purpose behind the activity and its goals, as well as her perspective of the activity's effectiveness at achieving those goals.

Recruitment. Participants were originally recruited for this project in various ways. Winter 2020 SCWR 2000 students were recruited in-class for all measures: they were informed of the experiment and recruited to participate in the observation component of the study prior to the experiential activity. Previous students were originally recruited for interviews through forwarded emails. A recruitment email was forwarded, blind-carbon-copy, to all previous students of SCWR 2000 by the Neuroscience Department Chair. This email included a description of the project and my contact information to set up interviews and/or request a link for the online survey.

After COVID-19 safety protocols were implemented, the recruitment process was reworked to fit new methods of data collection. Students in the Winter 2020 semester and all previous semesters were contacted by email, which was sent to them by the Neuroscience Department Chair, with a link to a new, open-ended questionnaire (see Appendix A). To recruit students in the Fall 2020 semester, I posted a bulletin on the class website that explained the project and also contained a link to a slightly different version of the new, open-ended questionnaire (see Appendix A). This bulletin was automatically emailed to all students who were, at that time, currently enrolled in the class and remained on the website for further reference.

To obtain consent for observation in the Fall 2020 semester, I incorporated the online format in my recruitment method while still maintaining in-class recruitment. At the beginning of the class I was observing, the professor created a separate digital meeting, or breakout room, for myself and the students, so I could explain the project and request their consent to be observed without the professor's knowledge. Obtaining verbal consent from each participant would have taken too much class time, so I asked the students to share a thumbs-up emoji if they agreed to be observed. I took note of the screen names of the students who did not share the emoji and left any visual or auditory activity from their labeled windows out of my observations.

Methods of Data Collection

In the first iteration of the study, I was intending to conduct interviews with some previous SCWR 2000 and Winter 2020 SCWR 2000 students, as well as with the professor of the course. They were one-on-one, semi-structured, 60-minute interviews that were audio-recorded. Pre-written lists of open-ended questions were drafted for each set of participants (Appendix B) which left room for follow-up and clarification questions. I planned to conduct classroom observations of the Winter 2020 SCWR 2000 class on Day 1 and Day 2 of the activity, taking field notes of consenting students' participation of and engagement with the in-class Visual Iconic Memory (VIM) activity.

As a result of COVID-19 safety precautions, the university moved its classes online, after I had observed Day 1 of the activity, but before I was able to observe Day 2. In addition, in-person interviews were no longer permitted. I moved the interview venue to online platforms such as Skype and Zoom, and observation of the second day

of the in-class experiment was canceled, as I could not obtain ethics clearance for methods of obtaining consent in a virtual classroom in time.

Interview Protocols. The interview protocol consisted of 11 to 14 questions concerning the activity, the rubric, and the writing assignment, and was intended to capture participants' own discursive constructions of their experiences with each tool (see Appendix B). Questions I planned to ask were what and how questions, in an attempt to provide students with the greatest opportunity for description and elaboration. I did not have the opportunity to pilot the interview questions in an interview setting, but the questions were reviewed by myself, the course professor, and my supervisor. In addition, I created an interview protocol for my interview with the professor (see Appendix B).

Open-ended Questionnaires. The open-ended questionnaire created after the extension of the project was based on the cancelled interview protocol for students. Hosted on Qualtrics.com, this questionnaire consisted of five demographic questions and 13 open-ended questions (see Appendix A). Taking advantage of the display logic feature available on Qualtrics.com, I hid or revealed two questions based on the participants' answer to the question of which semester they took the course, and the rest of the questions were answered by all participants. I sought to understand students' experiences completing the activity, and their opinions about their experiences, in their own words. These questions provided the opportunity for students to discursively construct their own experiences and opinions about this activity that I

could no longer garner through interviews. This questionnaire was piloted with the course professor, who indicated it took approximately one hour to complete.

Observation. In addition to drawing on surveys and interviews (in the pre-COVID version of this study), I also used the method of non-participant observation to collect data for this study. I employed this method by observing the first day of the activity in two different semesters, in two different venues. In the Winter 2020 semester, I took observational notes on Day 1 of the activity in the classroom. In the Fall 2020 semester, I took observational notes on Day 1 of the activity in the students' Zoom class. I also created post-observation memos based on my impressions and observations for both days, within one day of each of my observations of the class. I used the same observational method for each observation, however the differences in medium drastically affected the available observable data between the winter and the fall semesters, as students in the winter semester were not required to keep their cameras on during the Zoom class. Thus, due to this change I was unable to observe students in the same way I did before. Additionally, for logistical reasons I was unable to observe Day 2 in either semester; however, I believe consideration of the observational data collected on Day 1 of the activity across two semesters is still relevant and sufficient for a pre- and post-COVID-19 comparison.

Methods of Analysis

Thematic Analysis (TA)

To conduct the qualitative analysis for this study, I applied Braun and Clarke's (2006; 2012; 2013) step-by-step guide to Thematic Analysis (TA). Braun and Clarke lay

out six steps for completing TA. The first step is for the researcher to familiarize themselves with their data, and the second step is to code the data. Step three involves investigating the generated codes for themes by separating them into preliminary categories, and step four is to check these preliminary themes against the raw data to ensure they accurately capture the data and generate a thematic map of the analysis. Step five in Braun and Clarke's method is the refining process, in which themes are clearly defined and refined and the map is adjusted accordingly to reveal "the overall story the analysis tells" (2006, p. 87). Step six is the additional level of analysis that takes place while writing the discussion of the themes and the way they relate back to the theory and research questions. The first five steps of TA are explicated in Chapter 5, and the sixth step is covered in Chapter 6.

Having elucidated my methodology and methods, as well as provided a description of the course and experiential activity that I investigated for this study, I now present my detailed analysis in Chapter 6.

Chapter 5: Analysis and Results

In this chapter, I outline the qualitative data I collected through both the initial and altered rounds of data collection and my analysis of this data. First, I describe my raw qualitative data, providing a context of gender, age, and academic major of the participants that were elicited from the open-ended questionnaires and the single interview I was able to conduct, as well as the semester in which they took the course. Next, I outline the process of my thematic analysis of this data. Following this discussion, I outline and explain the themes I have identified in section three and provide evidence consisting of codes and raw data extracts to support their identification from each data source. I conclude by explicating how the themes and subthemes are connected to each other based on my analysis.

Raw Qualitative Data

The open-ended questionnaire was live between October 24th, 2020, and January 1st, 2021. In that time, I had 17 respondents. Table 1 outlines the demographics of the participants who responded to the questionnaire, who are labeled R for 'respondent,' as well as the single interview participant, labelled P1. I have chosen to present the interview participant's data with the questionnaire respondent data as the open-ended questions that were asked were largely comparable between the two instruments. As illustrated in the table below, of the participants in this part of the study ($n=18$), 13 identified as women and five identified as men. Additionally, 10 were in the 16-20 age range, seven were in the 21-25 age range, and one was in the 26-30 age

range. All questionnaire respondents were neuroscience majors; this information was not gathered from the interview participant.

Regarding the semester in which the participants took the course, two of the respondents took the course in the Fall 2018 semester, two in the Fall 2019 semester, two in the Winter 2020 semester, and 12 in the Fall 2020 semester. Thus, 14 of the respondents (two from Winter 2020 and 12 from Fall 2020) took the course sometime during the COVID-19 pandemic-related restrictions and, as a result, experienced at least one day of the activity in an online format.

Table 1

Questionnaire Participant Demographics

Respondent	Age Group	Semester	Gender	Major
P1 (Interview)	21-25	Fall 2018	Man	-
R1	21-25	Fall 2018	Woman	Neuroscience and Mental Health
R2	16-20	Fall 2019	Woman	Neuroscience and Mental Health
R3	21-25	Fall 2019	Woman	Neuroscience and Mental Health
R4	16-20	Winter 2020	Woman	Neuroscience and Mental Health
R5	21-25	Winter 2020	Woman	Neuroscience
R6	16-20	Fall 2020	Woman	Neuroscience and Mental Health
R7	16-20	Fall 2020	Woman	Neuroscience and Mental Health
R8	21-25	Fall 2020	Man	Neuroscience and Mental Health
R9	16-20	Fall 2020	Man	Neuroscience and Mental Health
R10	16-20	Fall 2020	Woman	Neuroscience and Mental Health
R11	16-20	Fall 2020	Woman	Neuroscience and Mental Health
R12	21-25	Fall 2020	Man	Neuroscience and Mental Health
R13	16-20	Fall 2020	Man	Neuroscience and Mental Health
R14	16-20	Fall 2020	Woman	Neuroscience and Mental Health
R15	16-20	Fall 2020	Woman	Neuroscience and Mental Health
R16	21-25	Fall 2020	Woman	Neuroscience and Mental Health
R17	26-30	Fall 2020	Woman	Neuroscience and Mental Health

Unlike the interview and questionnaire data, I did not collect demographic information for the anonymous observation. The observational data I collected during the first attempt at data collection consisted of my real-time observational notations about what I observed on Day 1 of the activity (in class) in the Winter 2020 semester, as well as my post-observation memos about my observations and the experience. Additionally, in the second attempt at data collection, I collected real-time observational notations about what I observed on Day 1 of the activity (on Zoom) in the Fall 2020 semester, shortly following which I created post-observation memos.⁵ The majority of students agreed to be observed in both semesters – one student declined to be observed in the Winter 2020 semester, and two students declined in the Fall 2020 semester. Additionally, some students were absent. The end result was $n=19$ observed subjects on Day 1 of the activity in Winter 2020 (18 students and the professor) and $n=21$ observed subjects on Day 1 in Fall 2020 (20 students and the professor).

Thematic Analysis

Following Braun and Clarke (2006), I conducted a Thematic Analysis (TA) of the qualitative questionnaire data, observational data, and interview data as explained in Chapter 4. The first five phases of this six-phase process are described below.

Phase One

During the first phase of the TA process, I familiarized myself with the entire qualitative dataset by reading through all of the questionnaire responses, interview

⁵ I was unable to observe Day 2 in either semester for logistical reasons; however, I believe consideration of the observational data collected on Day 1 of the activity across two semesters is still relevant and sufficient for a pre- and post-COVID-19 comparison.

responses, and observational notes and memos three times, and taking notes. The purpose of this work was to “immerse [my]self in the data... [so I was] familiar with the depth and breadth of the content” (Braun & Clarke, 2006, p. 87) and could begin to “read the data *as data*” (Braun & Clarke, 2012, p. 60). As emphasized by Braun and Clarke (2006), I performed the immersion in an “*active way* – searching for meanings [and] patterns” (p. 87); I read the data “actively, analytically, and critically, and start[ed] to think about what the data mean[t]” (Braun & Clarke, 2012, p. 61). During the third read-through, I wrote descriptive notes and compiled memos of each questionnaire response, interview response, and observational memo, in which I identified interesting quotes and noted common and contrasting ideas and sentiments I noticed between the various sets of data. After my third read-through of the questionnaire, interview, and observational data, I wrote a final memo with my concluding thoughts about the data, in which I identified interesting recurring sentiments that might be themes and considered how the data related to my research questions (see Appendix C).

Phase Two

Following phase one, I moved on to phase two in which I coded the data in a process Braun and Clarke (2006) call “generating initial codes” (p. 88). There are two main types of codes in TA: those that provide a label at the semantic level of meaning and those that provide a label at the latent level of meaning. Codes at the semantic level are descriptive and “provide a pithy summary of a portion of data or describe the content of the data” (Braun & Clarke, 2012, p. 61); codes at the latent level provide “a conceptual interpretation to make sense of what [the respondent] is saying” (p. 61),

allowing interpretation through the framework of the research questions. According to Braun and Clarke (2006), novice coders usually use more descriptive codes than interpretative ones, although most code lists contain both. This situation held true for me as, while I did use some interpretative codes beyond the level of semantic meaning in order to “interpret their accounts through [my] framework” (p. 61; e.g., my code *implicit self-identification with researcher perspective*), I found myself coding mostly descriptively, using active phrases that “stay[ed] close to the content of the data” (p. 61), such as my codes *deepened students’ understanding* and *activity is interactive*, which both use recurring terms directly from the data.

I completed all of my coding using nVivo (released in March 2020), which is a Computer-Assisted Qualitative Data Analysis Software (CAQDAS) that allowed me to code textual data and collect and collate my codes digitally. Using this software, I created separate files for each survey respondent (and the interview participant), as well as for each day of observational memos, and coded the data by identifying and labeling what Braun and Clarke (2006) refer to as “data extract[s]... [which are] individual coded chunk[s] of data, which [have] been identified within” (p. 79) a dataset and set aside. I set these data extracts aside by creating a code list within nVivo as I “work[ed] systematically through the entire data set” (p. 89) that I continually coded to and altered.

Throughout phase two, I used what Braun and Clarke (2013) refer to as “complete coding” where the “aim [is] to identify *anything* and *everything* of interest or relevance to answering your research question” (p. 206). While it was necessary to be

slightly selective – for example when coding the interview response, I had to ignore the data concerning the rubric, as although it had initially been a focus of this study, it was no longer – I based my coding strategy on the idea of an exploratory analysis of discursive construction; I did not know if and how the students would discursively construct their experience of the activity, and the point of the coding process was to find out. Additionally, because the questionnaire questions were static rather than back-and-forth, interview-style questions, there was no potential for conversational tangents, meaning the data I received was already very focused towards my research questions based on the specificity of the questions I chose to include. As a result, during my coding, virtually all the data became data extracts which were assigned codes. I also took the additional step of categorizing the data during phase two. Saldaña (2013) describes the coding process as “a method that enables you to organize and group similarly coded data into categories or “families” because they share some characteristic” (p. 9); in other words, categorizing is a natural progression of the codifying process. I followed this codifying process by creating a hierarchical code list that included codes and categories, which I refer to as child codes and parent codes, respectively, per Saldaña’s (2013) description of subcoding. This code list was continuously altered and updated as I coded and recoded, and categorized and recategorized the data in a recursive process.

As an example of this codifying process, there were some data extracts concerning creativity that I initially coded as *liking being creative*. These data extracts discussed the opportunity to be creative within the activity as a positive aspect of the

activity. Eventually I came to Respondent 6 (R6) who mentioned creativity in a negative way within the context of a positive statement about the activity. More specifically, the respondent indicated that, while the creative aspects of the activity were a positive experience in general, they themselves were “not very creative” (Dec. 01, 2020), which was a negative. Originally, I coded this data extract with a new code, *creativity (negative)*; however, upon further reflection I decided this code did not accurately fit the sentiment in the extract. The respondent indicated that the opportunity to use creativity was still a positive aspect of the activity, even if they did not completely enjoy or make use of that aspect. I combined this code with the *liking being creative* code by focussing on the similarities in the sentiments, which related to the activity, and created the code *activity allows creativity*. This code was eventually categorized with the code *activity allows personalization* under the parent code *activity gives students control*.

After coding all of the data through this recursive coding and categorizing process, I settled on my final codebook (available in Appendix D). My codebook contains parent codes such as *activity gives students control* and *students identified as participants*, which includes child nodes with more detail regarding how the respondents expressed their feelings of control, and whether students implicitly or explicitly identified as research participants (respectively). I had 15 final parent codes when I finally moved onto phase three.

Phase Three

The third phase, creating “candidate themes” from the codes, was an extrapolative process. As Braun and Clarke (2013) state, “codes combine to form

themes” (p. 224). A theme has a “central organizing concept, which . . . tells us something meaningful in relation to our research question” (p. 224). In my first attempt at theming the data, I looked for underlying ideas that connected the parent codes I had created. This activity was similar to the categorizing process I engaged in during phase two, however the goal was different. As Rossman and Rallis (2003) describe it, a category is “a word or phrase describing some segment of your data that is explicit, whereas a theme is a phrase or sentence describing more subtle and tacit processes” (p. 282, as cited in Saldaña, 2013, p. 14). While creating my parent codes, or categories, I was looking for what explicitly connected the codes I applied to the data – I “clustered [them] together according to similarity and regularity” (Saldaña, 2013, p. 8). This process of codifying the concrete patterns in the data provided a basis for analyzing the deeper meaning; as Saldana (2013) explains, “when the major categories are compared with each other and consolidated in various ways, you begin to transcend the “reality” of your data and progress toward the thematic [and] conceptual” (p. 12).

Phase Four

I then took these prospective themes into phase four, in which I compared them to the data extracts in the codes I had collated to ensure they accurately expressed ideas from the data. Something that made this part of the process difficult as a novice analyst was attempting to remember that, as I am “reporting patterned meaning, some less patterned or irrelevant codes will be excluded” (Braun & Clarke, 2013, p. 230). Finding the balance between which codes fit the candidate themes and which could be discarded if they did not fit was a difficult process. I proceeded by determining which

codes revealed information related to my research questions, and which did not. When a code was irrelevant to the candidate themes and confused them rather than offering support, I discarded them according to one of two criteria: if I could not conceive of a theme that made them relevant to my questions, and/or if they were sparsely used and did not cover much of the dataset. For example, initially I had the parent code *nerves* which contained three child codes from two respondents that represented students discussing their nerves at different points of the activity. This code did not fit any of my candidate themes and there were only three references in the entire dataset that fit under this parent code (each coded to its own child code, with one reference per code), so I discarded this code in phase four.

Phase Five

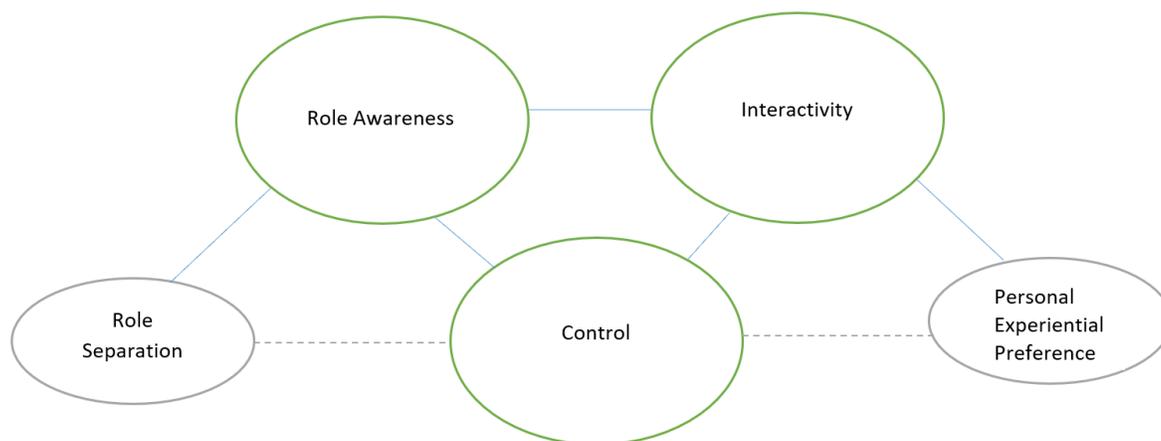
After completing this process with all of my generated codes, I moved on to phase five, which involved refining and clearly defining the themes I identified. I defined the themes in a way that related them back to the data and to my research questions to ensure that they accurately describe and explained this connection. These definitions and descriptions are provided in the next section. Also in the following section is a thematic map of my themes and subthemes that shows how they connect and “tell the story” (Braun & Clarke, 2013, p. 248) of the data. Phase six of the process of TA is the discussion of how the themes relate to my research questions with regards to my theoretical framework, which I provide in Chapter 5.

Qualitative Themes

Figure 1 shows the thematic map I have generated of the themes I identified in my analysis of the codes, per steps three through five of Braun and Clarke's method (2006; 2012).

Figure 1

Thematic Map



As can be seen in the thematic map, I have identified three main themes in the qualitative data through my analysis of the participants' discursive constructions: *Role Awareness*, *Interactivity*, and *Control*. These three themes are interconnected within the data, as represented in the map. In addition, *Role Awareness* contains the sub-theme *Role Separation*, and *Interactivity* contains the sub-theme *Personal Experiential Preference*. These subthemes also relate less directly to the *Control* theme, as indicated by the dotted lines. In the following sections, I explain these themes and their connections, providing evidence of the codes and data extracts that informed their identification. This section will illustrate how these themes represent the data.

Role Awareness

Throughout their responses, the way the student participants discursively constructed the activity indicated a general conscious knowledge of the existence of the different possible constructed social roles in the activity, which ultimately lead me to label the theme Role Awareness. There were 164 coded data extracts that fit within this theme in which respondents continually identified the different roles they performed and/or were expected to perform within the course of the activity. As I had expected, respondents labeled the roles they performed through the activity in direct response to Q15 of the questionnaire, which explicitly asked the respondents for their feelings about their roles at different points in the activity. To provide examples, in response to Q15, Respondent 14 (R14) wrote, “During day 1 I felt like a participant as I was somewhat blind to the objective. However, in day 2 I felt like more of a researcher as I had the opportunity to analyze the data collected in day 1” (Dec. 04, 2020), and R13 wrote, “Participant during day one, researcher during day two” (Dec. 02, 2020).

The respondents’ awareness of their roles was clear in their answers to Q15; however, these discursive constructions of their experience of the activity were in response to my wording of Q15, in which I specifically labeled the roles (student, participant, and researcher) for the respondents. They were using my constructions from the question to answer the question, which could have caused an ex post facto awareness of the roles in the activity. There was evidence that this awareness was not solely prompted by the questions, however, which allowed me to confidently label this theme Role Awareness. In addition to acknowledging their roles in the answers for Q15,

the participants also discursively constructed an awareness of these roles within the activity when answering other questions much earlier in the questionnaire, before any of my questions even mentioned these roles; for example R6 wrote, “[W]e, the students, were both the participants as well as the experimenters” (Dec. 02, 2020), in response to Q6, the first open-ended question in the questionnaire which asked about general likes and dislikes. In response to Q7, which asked the respondent’s opinion about posing research questions, R9 wrote, “Being able to pose my own question was great, as the assignment could be much more aligned with my own interests as [a] researcher” (Dec. 02, 2020). This early labeling of their roles in their answers implies an awareness of the different expected roles in the activity that my questions did not prompt them to retroactively construct.

An earlier contributor to the role awareness that the students discursively constructed in their responses may have been the professor’s introduction to the activity, as evidenced by data extracts from my observational notes. In my notes taken on Day 1 of the activity in Fall 2020, which took place online, I recorded extracts of the professor’s lecture to the students, including statements that the students would “...experience the same experiences as a researcher” and “be participants in the experiment” (Nov. 16, 2020). Another of my observational notes from Fall 2020 reads as follows:

–1:43 - Prof. shares PowerPoint screen

- “you = researcher; goal = test your VIM research questions”
- “roleplay”

- “you are the author and you are the researcher” (Nov. 16, 2020)

On Day 1 of the activity in Winter 2020, which took place in the physical classroom, some extracts from my notes include: “She talked to the students like they were prospective researchers,” and, “She encouraged that they see their classmates as potential research participants for their own questions” (March 11, 2020). From these notes, it is clear that the students were made aware of the expected roles in the activity while being introduced to the subject matter and participating in Day 1. The students’ discursively constructed awareness of their roles was, at least in part, discursively constructed by the professor.

While the professor’s labeling of the roles of the activity may have influenced the students’ discursive constructions, the theme of Role Awareness was also supported by deeper, thematic meaning, as I arrived at this theme with more than the respondents’ (and professor’s) explicit labels of the roles in the activity exhibited in most of the previous data extract examples. The respondents’ discursive constructions of their roles within the activity also included implicit descriptions of the tasks and perspectives of those roles; codes that fit under the Role Awareness theme included the code *implicit self-identification with researcher perspective* that was used to label 29 extracts from 14 different respondents. For instance, R1 described her experience of Day 2 of the activity: “For the first trial I had participants [perform a task] prior to the stimuli and in the second trial I had participants [perform a task]” (Oct. 24th. 2020; altered to preserve anonymity). Through the construction of this sentence, R1 implicitly positioned herself outside of the participant role and into the researcher role, by referring to her

classmates as a separate group of participants in the third person and placing herself in the active role of the researcher. Similarly, R17 positioned the class as her participants and herself as a removed experimenter twice when she wrote, “I liked the ability to submit our own experimental hypothesis and test the class,” and, “I also enjoyed the feeling of having my class participate in a question I designed” (Dec. 21, 2020), in response to two different questions. As another example, R3 positioned herself as an active researcher when she wrote, “this was my first experience with running an experiment and then having to write an actual research paper” (Dec. 01, 2020). Based on these and other extracts, I concluded that many respondents appeared to discursively construct their perspective as the role of researcher.

I also included in this code the many instances when respondents discussed a part of the activity from the scientific perspective, in which their discursive constructions suggested they were thinking about the activity and the experiment from the researcher’s point of view without specifically labeling themselves or their roles. For example, in response to Q6, a question about general feelings about the activity, R13 wrote, “I worry about the confounds because of like screen distance / computer brightness, etc.” (Dec. 02, 2020), which suggests they were considering the experiment in the activity from the perspective of the person performing the research and analysing the data. Another example of a participant assuming this perspective came in response to a question about online or in-person class differences (Q13) with R14 writing:

I feel that this would have had more robust and accurate data, and evidently analysis outcomes. This is because the differences in viewing formats (i.e., screen

size, environment of testing, etc. [sic] can be important factors and should realistically be controlled where possible. (Dec. 04, 2020)

This extract from R14 indicates that she was also considering the experiment from the perspective of the experimenter, or the researcher. These extracts, and the others in the *implicit self-identification with researcher perspective* code (see Appendix D), all contribute to the respondents' discursive constructions of their awareness of the researcher role in the activity.

Also included in this theme was the code *implicit identification of student perspective*. Occasionally throughout the dataset, in 16 extracts from seven respondents and my own observational notes, respondents and the professor would refer to being students in their discursive constructions without actually mentioning their roles as students. Such instances including references to learning, such as when R5 wrote, in response to Q6, that the subject matter of the activity “was something that i [sic] didn't know about prior so it was interesting to learn about” (Dec. 01, 2020), and R2 wrote, “[W]e learned about focusing on one question at a time, to keep our writing concise” (Dec. 01, 2020) in response to Q16, inquiring about writing confidence. References to the assignment were also included in this code – for example when R3 wrote, “No I did not pose a question. I thought this would also make the assignment more difficult” (Dec. 01, 2020), and when R9 admitted, “I did pose a question because for one, I thought it was a necessity” (Dec. 02, 2020) – as were references to feedback, such as when R14 wrote, “The grading/feedback provided let me know that the steps I was taking were correct was [sic] reassuring” (Dec. 04, 2020).

As evidenced here, the Role Awareness theme that I identified encompasses discursive constructions that suggest the respondents were explicitly aware of their roles as participants in the activity, explicitly and implicitly aware of their roles as researchers in the activity, and implicitly aware of their continuing roles as students throughout the activity.

Role Separation. In addition to their awareness of the different roles they were able or expected to perform throughout this activity, the respondents' answers also displayed an interesting tendency toward Role Separation, which I have identified as a subtheme of Role Awareness. Frequently, participants' discursive constructions would indicate that they were performing specific roles – or were aware they were supposed to be performing specific roles – at different stages of the activity, including while writing the assignment after participating in the activity. The way they discursively constructed the roles they performed or identified that they were expected to perform at different times in the activity, both explicitly and implicitly, trended the same across the responses based on the specific part of the activity being discussed. For instance, 17 of 18 of respondents (16 questionnaire respondents and one interview participant) all stated that, while completing the VIM trials on Day 1, the expected role was participant, and they mostly discursively constructed this role during Day 1. Interestingly, 13 of 18 respondents (12 questionnaire respondents and one interview participant) were in agreement that this expected role changed to researcher when they were considering and testing questions during Day 2, and most indicated that after completing the experiment, while writing the assignment, they continued to discursively construct their

role as researcher. Six of these 13 respondents indicated that they had submitted research questions to test on the class during the activity, and these six respondents unanimously discursively constructed their role as researcher during Day 2 of the activity; all five of the respondents who did not label their role or expected role during Day 2 and after as the role of the researcher (18- 13) indicated that they did not submit a research question for testing, and they unanimously discursively constructed their role during Day 2 as a participant.

There was some nuance to these patterns in the dataset; for example, some respondents stated that they felt like a researcher at specific times during Day 2, such as when testing their question or when data was being analyzed, while, at the same time, they described also feeling like a participant during other parts of Day 2. Some respondents specifically discursively constructed their role as that of a researcher while writing the paper after the activity. Additionally, one participant indicated they performed as a student on Day 1 while learning and a participant on Day 2 while helping their classmates collect data on their questions. For the most part, however, there were strong commonalities in the responses about the roles the students were expected to perform at different parts of the activity and the roles they discursively constructed themselves performing. Students were aware of the constructed roles within the activity, and their awareness of when to play those roles coincided with their discursive construction of their performance of those roles within the activity. As acknowledged above, the professor highlighted these roles during Day 1 of the activity, which may have influenced students' discursive constructions of the roles that coincided with

specific tasks in the activity; however, the specificity with which they separated these roles in their discursive constructions – constructing multiple overlapping roles at different points on and after Day 2, for example – as well as the implicitness they used to construct them suggests that the students did not separate these role in their discursive constructions of their experience of the activity based solely on the professors’ descriptions. The commonalities in their discursive constructions between expected and experienced roles were highlighted while I was completing phase four of my Thematic Analysis (see Braun & Clarke, 2006), and led me to label this subtheme of Role Separation as a particularly important part of the theme of Role Awareness.

Interactivity

Connected to the theme of Role Awareness is the theme of Interactivity, which, as I noted in my final summative memo of the dataset, became noticeable in the initial data familiarization stage of my analysis process (see Appendix C). This theme covers 101 extracts across 20 data sources (17 questionnaire responses, one interview, and two sets of observational notes). Direct references to the interactive nature of the activity – universally as a positive – were frequent through the students’ discursive constructions of the activity, which I found interesting as I did not use this word in any of the materials related to this data collection, nor did I record the professor using this term in either of the Day 1 classes that I observed. I coded direct references to the interactivity under the parent code *activity is interactive* in phase two of my thematic analysis. For example, in response to Q6, which asked what the respondents liked about the activity, R15 wrote, “I like that it added an interactive element to the course” (Dec.

04, 2020). Similarly in response to Q6, R17 wrote that she “appreciated how much the interactive activity helped in understanding the experiment [they] would have to write about” (Dec. 21, 2020). R3 mentioned interactivity in response to Q16, which asked if the activity had improved their confidence in formulating research questions: “Absolutely! It was very interactive and being able to work with others to come up with ideas [sic]” (Dec. 01, 2020). Additionally, my observational notes observing Day 1 of the activity in the Winter 2020, in-class semester, contained the following extract:

- 8:59 - “Oh, what? That was worse.” [laughter]
- “Can we do it again?”
- “Oh my god.”
- Seems interactive.
- Some students snorting. (Mar. 11, 2020)

As I noted, I was seeing the interactivity between the students in the class. In total, seven respondents directly mentioned interactivity (eight times between them) when responding to the questions.

There were other indications of the Interactivity theme besides direct reference that I included in the parent code *activity is interactive*. For example, the respondents also discussed the interactivity using different terms and phrases that expressed the same general sentiment – e.g., in response to Q6, R11 wrote that she “liked how it was very involved” (Dec. 02, 2020), and R6 wrote that she “thought it was really fun, it was nice to participate [sic]” (Dec. 02, 2020); R15, in response to Q7 asking about likes and dislikes about posing a question, wrote that the option to pose a question “allowed

[her] to engage in the project more so [sic] than if [her] instructor were to have decided on it themselves” (Dec. 04, 2020).

In addition to adjectival descriptions of the activity, respondents also made implicit reference to the interactive nature of the activity by describing how they interacted with the different stages of the activity and with their classmates during the activity. For example, during my interview with P1, we had the following exchange:

INT: How much did you engage with the VIM activity when it was being put on in class?

P1: Uh, in-class? I engaged in, like my full extent, like I tried to participate as much as I possibly could.

[...]

INT: What did your engagement look like?

P1: Just sort of participating. I also discussed it with my peers, the- the concepts and like, what we’re going to talk about in the paper and stuff... and sort of thinking... like about the data, and how it [...] how things change when I’m... participating?

[...]

INT: [...] You said discussing with your peers, was that during class?

P1: Yes, yeah. [...] I had a couple friends in that course, so we would- we were talking about the activity, and like how difficult it was [...] (Mar. 16, 2020)

P1 indicates that they interacted with their classmates during the activity, and highlights participating in the activity as a research participant as full engagement. R3, in response

to Q9 asking about the events of Day 1 of the activity, wrote: “We were all very chatty and connected as a class that day” (Dec. 01, 2020), also describing their interactivity with the class.

Interestingly, P1 and R3 both took the course in previous semesters – Fall 2018 and Fall 2019, respectively – meaning they both experienced the activity in the classroom. None of the students who experienced the activity online included references to this sort of classmate interactivity in their discursive constructions. Some did, however, refer to interacting with their classmates’ ideas; for example, in response to Q12 asking if they had gained anything from Day 2 of the activity that might help them write the paper, R16 wrote, “I was excited to see other students’ research questions... I had only thought about one aspect of the visual display... but another student included [more aspects], and that made me want to expand my initial idea” (Dec. 05, 2020; altered to preserve anonymity), and R17 wrote, “I learned different factors others had considered asking for potential impact on VIM [sic]” (Dec. 21, 2020).

Interactivity looked slightly different between semesters that were in-class and the semester that was online. While students in the Fall 2020 semester discursively constructed the activity as interactive, as the previous examples highlighted, extracts from my observational notes indicate what this interactivity looked like in practice in an online class. For example, the following are extracts from my observational notes that I ultimately coded to the parent code *activity is engaging*, which became a child code for interactivity:

Left camera (2 remained) to complete video protocol

- Original 2 not working (5 students say)

[...]

1:37 – 11 on video

1:38 – Practice flash with arrows (partial report)

- Students on video reacting; some laughing, shaking heads

[...]

1:52 – Students (3) send group messages that 1 video isn't working

Students seemed put out by the tech problems but remained communicative and seemed to want to fix them, showing at least a certain level of engagement with the material. [post observation memo]

[...]

2:14 – 10 on video to give #s

Students seemed to be paying close attention to when their number was called – there were no delays or having to call people twice because they seemed to not be paying attention [post observation memo]

[...]

2:20 – Students off-camera begin reporting scores

They still seemed to be attentive with the cameras off given their quick response time to their number being called, even though there's no way to be sure because they weren't visible. Some seemed to be paying close enough attention that they could tell when they were coming up and were ready before they were called. [post observation memo] (Nov. 16, 2020)

I coded these data extracts under the Interactivity theme because I feel they contributed to the full picture of the students' discursive constructions of the interactive nature of the activity in the Fall 2020 semester. My observational data extracts describe students interacting in the ways that were available to them in the online environment – being on camera, sending group chats, helping to identify and fix technical issues, and paying attention (even when off camera). These interactive elements help explain why students continued to label the activity as interactive despite not being in the same physical environment as the students who took the course prior to Fall 2020 were, who included the physical social interaction with classmates as part of their discursive construction of the interactive nature of the activity. Accordingly, I included these extracts in the identification of the Interactivity theme. Based on all these students' discursive constructions of the activity and their participation in them, I was able to identify and label the theme of Interactivity.

As shown in my thematic map, I connected the Interactivity theme to the theme of Role Awareness. In my interpretation of the data, the students' discursive constructions of their role awareness, and especially their role separation, were contingent on their discursive constructions of the interactivity. For instance, when students implicitly referred to themselves as the researcher by discursively constructing their actions in the activity from the perspective of a researcher, often what was also implied was the interactive role they were taking in the activity; for example, when R3 wrote, "this was my first experience with running an experiment and then having to write an actual research paper" (Dec. 01, 2020), both the role and the interactive aspect

of the activity that prompted the role were implied. Additionally, when R13 explicitly discursively constructed the role they were enacting on Day 2 of the activity, they wrote: “[I felt like a] researcher during day two. Because [sic] I suggested and had input on one of the arrays used” (Dec. 02, 2020). Their explicit discursive construction of their enactment of the researcher role on Day 2 was contingent on their implicit discursive construction of their interaction with the activity. The same was true for R15 when they wrote, “On Day 2 I felt more like a researcher as I was testing my own research question” (Dec. 04, 2020), and for almost all other respondents who explicitly discursively constructed their roles in the activity.

Personal Experiential Preference. The Interactivity theme also has a sub-theme, which is related to the nature of the interactive experience. Personal Experiential Preference is a COVID-19 pandemic-related sub-theme that covers 21 extracts from 14 different respondents, which is all of the students who were presented with Q13 on the questionnaire because they experienced at least one day of the activity online (two respondents from Winter 2020 and 12 from Fall 2020). This theme refers to the way the participants discursively constructed their perceptions of their interactions with the activity. To a significant degree, participants discursively constructed arguments that supported the medium through which they experienced the activity – online or in a physical classroom. Many respondents even discursively constructed their experience as the objectively superior way to experience the activity. The interactivity participants discursively constructed was present in both the mediums of the activity, as discussed

above, with only a difference in the implicit discursive construction of their physical interactivity with their classmates.

The students' discursively constructed opinions about their preferred medium for the activity typically aligned with whichever medium they experienced, especially on Day 1. For example, in Q13, I asked respondents in Fall 2020 how they thought their experience of the activity would have changed if they had experienced it in class. Ten out of 12 respondents who took the class in Fall 2020 online discursively constructed an argument, if not an outright preference, for the online environment. Aggregated under the parent code *Online is better*, some of these students' responses were coded as *Online is better- Research purposes*, which I used for extracts in which the students discursively constructed their argument in favour of the online medium by discussing experimental concerns; for example, in response to Q13, R11 wrote: "I think it would have been more difficult because there would be other distractions of classmates and sounds and [sic] lights. As well, the distance from the screen would have impacted the reaction time" (De. 02, 2020), and R6 wrote:

I think it was best to be online because the fact that the experiment was done online means that we had possibly fewer distractions (given a controlled environment) as well as a singular screen for the array presentation as opposed to a classroom screen that is shared by all of the students. (Dec. 02, 2020)

R11 and R6, as well as other respondents, discursively constructed a preference for the online medium over the in-class medium. Other Fall 2020 respondents whose responses I coded with *Online is better- Research purposes* discursively constructed an argument

for the online medium but not a preference. For example, R10 answered Q13 with: “I don’t think that there would have been difference [sic], other than the overall visual experience of having visual distractions from peers around us, while online it is just you in a room” (Dec. 02, 2020). In addition, R8, after stating that in-class might have been better due to technical problems experienced in the online class, added: “However, it could also propose some bias, since being physically around other people may make one want to up their score to fit socially” (Dec. 02, 2020).

Some responses from Fall 2020 were coded with the child code *Online is better-personal preference*, which I applied to five extracts from four respondents. These respondents indicated their preference for experiencing the activity online for reasons other than experimental concerns. For example, in response to Q13, R16 wrote: “I think being able to use our own computers online and work through the arrays at our own pace was nice” (Dec. 05, 2020), and R17 wrote:

I think I would have messed up recording my answers and might have fudged some numbers, or just left the class out of anxiety to keep up if it had been in person [...] I would have been more distracted and I also would likely not have submitted a research question. Online was less scary. (Dec. 21, 2020)

These two personal preference extracts and the other three within the dataset contributed to the formation of the parent code *Online is better*, and the subtheme *Personal Experiential Preference*.

Another code under this sub-theme, *In-class is better*, was used to code nine references from seven respondents. The two respondents from Winter 2020 who

experienced Day 1 of the activity in class and Day 2 online – R4 and R5 – both discursively constructed preferences for in-class; for example, in response to Q13, R4 wrote that Day 2 of the activity would have “felt more like an experiment if it was in class because you are with the other participants. Also, everyone [...] is sitting the same distance away from the screen but when it’s online, participants can be sitting at different distances” (Dec. 01, 2020). Of the other seven references in this code from respondents from Fall 2020, three of the respondents (R7, R9, and R14) expressed a clear preference for experiencing the activity in class four times total, while one of these (R9) and two other Fall 2020 students discursively constructed an argument for both online and in-class delivery.

For the most part, the respondents who experienced the activity online discursively constructed a preference for the online medium. In other words, the way these students interacted with the activity was discursively constructed to be a good or better way to interact with the activity. This realization led me to identify the Personal Experiential Preference sub-theme of the theme of Interactivity.

Control

The final theme I identified in the dataset is the theme of Control, which encompasses 89 referenced data extracts. This theme covers codes related to ownership, personalization, and understanding, as can be seen in my final codebook (see Appendix D). The Control theme is the most interpretative theme I identified from the participants’ responses, meaning it “go[es] beyond the participants’ meanings and provides an *interpretation* about the data content” (Braun & Clarke, 2012, p. 61). While

respondents frequently explicitly indicated the interactive nature of the activity, as well as explicitly and implicitly discursively constructed the different roles they felt they played at different stages of the activity, only one respondent mentioned control in their discursive constructions. For example, in response to Q8, in which I asked the respondents' what affect the opportunity to pose a research question may have on their ability to write the assignment, R14 answered: "It has given me more control to focus on what I personally found the most interesting" (Dec. 04, 2020). No other respondents directly mentioned control. Instead, I identified the theme of Control in the dataset as an underlying connector for different discursive constructions of the experience; in my interpretation of the students' discursive constructions, Control is where the themes meet, what holds them together and gives them all meaning. In the following section, I justify this interpretative theme by explaining how I arrived at the codes and parent codes, as well as how I extrapolated the Control theme from those parent codes.

I arrived at this code by analyzing past the surface level of slightly different codes and parent codes in order to arrive at their latent meanings, all of which seemed to lead back to the concept of control. The parent code *activity provides opportunities for ownership* included the code *activity promotes ownership*, which was used on data extracts in which respondents discursively constructed their experience of the activity using words that evoked a sense of ownership over the research process, the data, and/or the written assignment. For example, in response to Q6 (likes or dislikes about the activity), R1 wrote, "I like that we were able to create our own variables and experiments" (Oct. 24, 2020); R2 responded that they "liked that it was a simple way for

us to conduct our own experiment that we were writing about” (Dec. 01, 2020); and R9 wrote, “it was enjoyable to participate in a study of which you know [sic] you will have to analyze your own data at the end” (Dec. 02, 2020). R9 also wrote, in response to Q8, that: “I am much more invested in the writing of my paper as it is a subject of my choice ... this feels like my work” (Dec. 02, 2020). In response to Q7 (likes or dislikes about the opportunity to pose a question), R12 responded, “I felt like I was able to make the experiment my own” (Dec. 03, 2020), and R16 responded: “I really enjoyed being able to pose my own research question because it allowed me to be selective” (Dec. 04, 2020).

Admittedly, in Q7 I used the phrase ‘pose your own research question,’ and it is possible, if not probable, that seeing this phrasing influenced some students’ discursive constructions. However, in response to this question as well as others (e.g., Q6, Q8, and so on), respondents discursively constructed a sense of ownership that went beyond ownership of the question; as these examples show, they discursively constructed ownership of the experiment, the variables, the data, the question, and the assignment. Additionally, in my interview with P1, the closest I came to implying ownership (as I did in Q7 of the questionnaire) was using the phrase “pose a research question,” and they still discursively constructed a sense of ownership of different aspects of the activity throughout the interview. For example, P1 wrote that one of the things they enjoyed about the activity was “generating [their] own research to then... write about” (Mar. 16, 2020). Based on the students’ broad range of references to the concept of ownership, I was confident to use the code *activity promotes ownership* for these examples, which

was eventually subsumed under the parent code *activity allows opportunity for ownership*.

Also include in the parent code *activity allows opportunity for ownership* were data extracts that were initially coded with other related concepts, which include the codes *activity allows personalization* and *activity allows creativity*. For the code *activity allows personalization*, most of the data extracts involved some reference to tailoring the activity to personal interests. For example, in response to Q7, R5 wrote that the opportunity to pose a research question “gave [the students] an opportunity to focus on what [they] found the most interesting” (Dec. 01, 2020), and R2 wrote, “I was able to inquire about something that I was interested in” (Dec. 01, 2020). Other extracts that were included in this code were more direct about the personalization of the activity; R15, for example, in response to Q8, wrote that the ability to pose a research question “add[ed] a personal and engaging element” (Dec. 04, 2020) to the experience, and R9 indicated that posing a question was beneficial because it made the activity and the paper “much more aligned to [their] own interests as researcher [sic] (and a person)” (Dec. 02, 2020). Under the code *activity allows creativity* I coded explicit reference to creativity, for example in response to Q7 when R1 wrote, “I liked that we could be creative with our research question” (Oct. 24, 2020). I included the codes *activity allows personalization* and *activity allows creativity* under the parent code *activity provides opportunities for ownership* because, as extracts such as these indicate, the ability to personalize the activity and the ability to be creative within the activity directly contributed to the ownership the respondents discursively constructed. They seemed to

be discursively constructing ownership partly through personalization and creativity, which, I felt, justified the use of this parent code.

Another code under the theme Control was named *activity deepens students' understanding*, which became its own parent code during the second phase of my thematic analysis (see Braun & Clarke, 2006; 2013). Most of the extracts under this code referred to understanding specifically, or its synonyms. For example, in response to Q6 (likes and dislikes about the activity), R11 answered, "I really liked how we could understand the data better because we were part of the data" (Dec. 02, 2020), directly referring to understanding. Additionally, R12 wrote that the activity "allowed [them] to grasp exactly the method that [they] used" (Dec. 03, 2020), and R10 wrote that participating in the activity gave them "insight into what was actually going on" (Dec. 02, 2020) in the experiment, using synonyms for understanding.

The third parent code under the Control theme, *activity improves the writing experience*, consisted of extracts in which students discursively constructed how their participation in the activity related to their feelings about writing the final assignment on which the activity was based, coded originally as either *increased confidence in writing the paper*, which constituted the majority of this parent code and consisted of responses to Q17 (in which I asked if the students felt more confident in their ability to write the journal article assignment after completing the activity), or *other writing assignments are boring*, which consisted of only two extracts from two different respondents. Examples of extracts to which I applied these codes are (respectively), when R3 wrote: "This was my first experience with running an experiment and then

having to write an actual research paper. I feel 100% more confident” (Dec. 01, 2020), and when R16 wrote, “I’m interested in [this assignment]. Personally, if I am not interested in a subject matter, I will procrastinate starting it until I absolutely must” (Dec. 05, 2020).

I included the parent codes *activity deepens students’ understanding* and *activity improves the writing experience* in the same theme because their discursive constructions of their understanding were largely connected to their discursive constructions about their ability to write the paper. For example, R1 wrote that they were “able to use [their] understanding . . . to write the methods and results section” (Oct. 24, 2020), and R2 wrote, “Because I understood the topic material, I was able to effectively write a good paper” (Dec. 01, 2022). The connection between these two codes was common throughout the data; the respondents indicated that their understanding of the VIM material, the experiment, the activity, and the participant experience made writing the assignment easier, which I interpreted as providing them with a sense of control over the information. Often, the codes under all three of these parent codes – *activity provides opportunity for ownership*, *activity deepens students’ understanding*, and *activity improves the writing experience* – would overlap ; much of this data was double-coded, or coded side-by-side in answers to the same questions. In interpreting the data, I concluded that the extracts coded with these three parent codes overlapped on a latent level through the concept of control. The respondents’ discursively constructed sense of ownership, understanding, and improved writing experience all seemed to contribute to a sense of control (i.e., ownership and

understanding) or were the result of a sense of control (i.e., understanding and improved writing experience) over different aspects of the activity. This process is how I came to identify the theme of Control within the data.

Interconnectedness of Themes. As indicated in the thematic map, I interpreted the Control theme as related to the other two themes, Role Awareness and Interactivity, and their respective subthemes, Role Separation and Personal Experiential Preference, at the latent level. I interpreted Role Awareness as related to Control in that the respondents exercised a measure of control through their awareness of their roles. In other words, to some extent, it seemed that the participants felt they were able to control how they interacted with the roles of the activity. The discursive construction of this connection was highlighted in some of the responses of those who did not pose questions yet indicated that they believed they would have felt they had performed the role of researcher if they had posed a question, or that posing a question would have improved their role as research writer. For example, in response to Q15, in which I asked the respondents to identify which roles they felt they were performing on each day of the activity, R11 wrote, "I felt like a participant for both because... I did not make a question" (Dec. 02, 2020). In response to Q8 (effects of posing a question), R4 wrote that "[they] believe[d] thinking about the different possibilities and researching... VIM [to come up with a question] ... would have helped [them] write the paper" (Dec. 01, 2020), which I interpret as implicitly discursively constructing the perspective of the research writer as connected to posing a question in the activity. The respondents were aware of the researcher and writer roles, as well as the Role Separation that indicated

where they fit within the activity, and through their discursive constructions of their interaction with the activity indicated that they were aware they had some sort of control over whether they took on that role.

Alternative to this interpretative connection between Control and Role Awareness/Separation, I interpreted the Control theme as interacting with the Interactivity theme in a more strictly literal sense, in two ways. First, the respondents had at least some measure of control over their level of interaction with the activity. As was evident from the instructions provided to the students about the activity, and as they indicated understanding in their discursive constructions, the students had control over whether they posed a research question to test on the class. Both the respondents who posed a question and those who did not discursively constructed posing a question as a more involved – or interactive – part of the activity. The second way in which I interpret Control being connected to Interactivity is specifically for the students who took the class during COVID, in a virtual classroom. As I indicated in my observational notes from Day 1 of the activity in the Fall 2020 semester, which took place online, what I observed as interactivity during that class involved actions and behaviours that were unique to the online setting, including whether students' cameras were turned on at any point. In the online classroom, students had some control over their level of interactivity by having the choice to turn on their cameras. Both the control of whether or not to turn their camera on and the control of whether or not to pose a research question to test during the activity indicated a literal interconnectedness between the themes of Control and Interactivity.

Conversely, the COVID-19-related subtheme of Interactivity is related to the theme of Control in a more interpretative fashion. I determined the subtheme of Personal Experiential Preference to be connected to the theme of Control based on the reasoning they discursively constructed for their preference. As exemplified above through examples of data extracts, the respondents indicated their preference for either the online medium through experimental or personal concerns. In my interpretation, these concerns were often related to the amount of control they did or did not have within that environment. Experimental concerns were often linked to an inability to control extraneous variables in the classroom, for example when R6 wrote, "I think it was best to be online because the fact that the experiment was done online means that we had possibly fewer distractions (given a controlled environment)" (Dec. 02, 2020). Personal concerns were often related to some amount of control over aspects of the activity that was only possible in the online environment, such as when R16 wrote, "I think being able to use our own computers online and work through the arrays at our own pace was nice" (Dec. 05, 2020). I interpret these concerns as being related to the type of control the students were able to take in the online environment, and through this relation, the theme of Control is related to the subtheme Personal Experiential Preference.

In this section I have attempted to provide evidentiary justification for the identification of the themes that I constructed from my data. In explaining the active process of my thematic analysis, and then explaining the results of that analysis, I have shown how I have attempted to "shape and craft [my] 'raw data' (e.g. [my] piece of

marble) into an analysis (like a work of art, such as Michelangelo's *David*)" (Braun & Clarke, 2013, p. 225). In the next chapter, I discuss the results of my analysis in relation to the literature and answer my research questions. I also discuss the relation between my themes, my theoretical framework, and the course professor's interview.

Chapter 6: Discussion

In this chapter, I address my research questions. First, I discuss how the results of my analysis answer my first research question, contextualizing it within the literature on the use of experiential learning elements in undergraduate science writing instruction and facilitated rhetorical genre acquisition. Following this discussion, I then address my research objectives in relation to my analysis. In following section, I answer my second research question, comparing it to the literature on emergency remote teaching (ERT). This section is followed by a consideration of the class professor's interview responses in relation to the results of this study and my theoretical framework. I conclude the chapter by considering the implications of my data on the wider questions concerning the efficacy of using constructed situations to help undergraduate students acquire genres to write effectively within their discipline.

Answering the Research Questions and Relating to the Literature

The purpose of this research was to investigate if and how students discursively constructed their experiences of an authentic learning activity in an undergraduate neuroscience course. Here, I restate my research questions:

1. If and how do students who have taken SCWR 2000 discursively construct their experiences within the in-class activity? If and how do they discursively construct the social roles they performed throughout the experience?
2. What, if anything, is the difference in students' discursive constructions of their roles within this activity before and after COVID-19 safety measures were enacted?

Additionally, my research objectives, the “tangible subset of stated research questions” that “includes reference to specific object or phenomenon” (Mills & Birks, 2014, p. 11) which I outlined in Chapter 4 are the following: to discover (1) if the in-class experiential activity in any way allows the students to discursively construct their role as that of the researcher; and (2) whether the students find the roles they adopt beneficial to writing the accompanying assignment within the discipline. These questions and objectives are those of the current case iteration after COVID-19.

To answer my research questions, I performed TA (Braun & Clarke, 2006; 2013) on qualitative data I collected from my class observations, a singular interview, and an open-ended questionnaire. As this is an exploratory case study using an inductive framework, the answers to my questions evolved from the data in a bottom-up process (see Yin, 2018). The themes I identified in Chapter 5, and the evidence I presented as justification for those themes, provide insight into how the students discursively constructed their experience with the activity generally, how they discursively constructed the roles they enacted during the activity specifically, and how the discursive constructions differed between the in-class and online groups (pre- and during COVID-19). In the following subsections, I answer my research questions and address my objectives based on the analysis I provided in the previous chapter. I also discuss how and why the data reflects or differs from the literature, providing references and making connections to relevant research and theory.

Question 1.1: Discursive Constructions of Experience

Question one contains two separate but related questions both concerning *how* the students discursively constructed their answers to the qualitative questionnaire. In the first half of Question one, I ask how students discursively construct their experiences of the activity in general. As can be seen in my theme descriptions and justifications in Chapter 5, the students' discursive constructions of their experiences were generally positive. Their positive experiences of the course were often discursively constructed in ways that aligned with previous research on the use of authentic learning experiences in undergraduate science writing instruction, as well as previous research on genre facilitation using authentic learning experiences. Similar to previous literature, students in this course discursively constructed a deeper engagement with the material and the assignment (e.g., Blakeslee, 2001; Cyr, 2017; Jones et al., 2011) and a greater interest in the outcome of the assignment (Jones et al., 2011). They also indicated that they spent more time and effort on the assignment for this activity than other writing assignments (e.g., Cyr, 2017; Jones et al., 2011), and that this assignment improved their understanding of the course material (e.g., Cyr, 2017; Holstein et al., 2015).

Additionally, the students in this case study discursively constructed the activity as an interactive experience (i.e., the Interactivity theme), and as can be seen from the example data extracts I used in Chapter 5, the interactivity was referred to in a positive light. Unlike other indications of positive experience found in the data, the experience of interactivity was not reflected in findings from previously reviewed literature. Perhaps because previous literature on authentic learning experiences for writing and genre

instruction consistently had students work alone (e.g., Deiner et al., 2012; Holstein et al., 2015; Prichard, 2005; Reynolds & Thompson, 2011) or in smaller groups of two to five (e.g., Blakeslee, 2001; Campbell, 2017; Cyr, 2017; Dias et al., 201; Freedman et al., 1994; Jones et al., 2011), rather than experiencing and participating in the experiential activities as a class. Much of the data extracts that were ultimately coded to the Interactivity theme referred to interactions with classmates, which appeared to affect the interactivity students experienced.

Alternatively, or perhaps additionally, students' discursive constructions of interactivity in their experience of this case could be due to the fact that they were also acting as research participants within the experiential activity and sharing the experience of interacting as participants in a group setting. Their discursive constructions of the interactivity, for example that it "helped in understanding the experiment" (R17, Dec. 21, 2020), as well as my classroom observational notes in which I reported that students were laughing together while undergoing the VIM trials, provide support for this supposition. Their status as research participants within the activity contributed to the interactive nature of the experience, according to their discursive constructions.

Students also discursively constructed their experience of the activity as something that gave them control, particularly through interest and ownership, which are some of the prominent parent codes that constitute the Control theme. This finding is also quite absent from previous literature on the use of the experiential methods of scaffolding with reflection (e.g., Köver et al., 2014); interestingly, however, it does not

reflect results of previous research on authentic learning experiences for undergraduate science writing instruction or facilitated genre acquisition.

Contrary to the results of this previous research, control and ownership of the learning process are important aspects of experiential learning perspectives, especially in discussions of authenticity (Jackson & Maclsaac, 1994; Purcell-Gates et al., 2003). The concept of providing control to students to promote learning is based in the experiential learning principle of meeting students where they are in terms of their current experiences and understandings (e.g., Piaget, 1988/2014; Stein et al., 2004; Vygotsky, 1978), to help students achieve new experiences and understandings, for example through scaffolding (e.g., Wood et al., 1976) or authentic learning experiences (e.g., Stein et al., 2004). This discrepancy between the results in the literature and this case study's findings may stem from the fact that very little of the literature that used experiential learning elements included or acknowledged the concepts or theories of experiential learning. In other words, the intentional use of authentic learning experiences – as conceived in theories of experiential learning (e.g., Jackson & Maclsaac, 1994; Lewis & Williams, 1994; Stein et al., 2004) – is not present within research on science writing instruction. This absence could have resulted in slight differences in methodology, such as a different questionnaire focus that did not elicit discursive responses related to ownership or control.

Additionally, it is possible that the difference in the actual experimental design of the authentic learning activity contributed to the presence of the control theme in the current case study that was not found in previously reviewed research. Previously

reviewed research that included an experimental component as an authentic learning experience took place in laboratory settings and involved either structured, predetermined experiments (e.g., Deiner et al., 2012 Holstein et al., 2015) or experiments constrained to specific independent and limited dependent variables (Jones et al., 2012).

The design of the authentic learning activity in this present study was different than previous research using experimental designs, as it provided students with choice. Specifically, it provided students with two choices: 1) they could choose whether or not to craft and propose a research question concerning VIM that would then be implemented in an array and tested on the class; and 2) once all the proposed research questions and the professor's example arrays had been tested on the class, the students were allowed to choose data collected from any of the arrays to write about in their journal article assignment. Due to these choices, students were allowed to tailor the experiment towards their interests, to a degree, which was a common sentiment in their discursive constructions that contributed to the Control theme.

Providing the opportunity for students to tailor an activity to their personal interests made the activity "authentic on a personal level" (p. Stein et al., 2004, p. 241). It contributed to the authenticity of the authentic learning experience by acknowledging that "students are participating members" (p. 241) of the discipline. Thus, within this case study, Control was a major theme based on the parent codes of extracts concerning interest, ownership, and personalization, and these codes indicate that the

activity had the potential to provide personally authentic learning experiences to the students.

Within this case study, the students' discursive constructions also indicate that their experience of the activity was different than their experiences of other assignments. They discursively constructed the activity as different from other assignments, indicating that their experience of the activity was unique. This finding is somewhat reflected in those of some of the reviewed literature on experiential methods in facilitated rhetorical genre acquisition (Blakeslee, 2001), as well as in undergraduate science writing instruction (Jones et al., 2011). However, in the study by Blakeslee (2001) concerning classroom/workplace collaborations, students expressed this idea in relation to the lack of authenticity of the supposedly authentic learning experience. Blakeslee's (2001) student participants indicated that, while the assignment was not authentic to the workplace, it was not quite a school assignment either; it "stood on its own" (p. 179). This finding is quite different from the discursive constructions of the uniqueness of the present case.

Students in this study discursively constructed the case as unique for reasons that contributed to the Control theme and the experiential authenticity of the assignment: ownership, personalization, and interest (e.g., Jackson & MacIsaac, 1994; Stein et al., 2004). This activity was still seen as an assignment by the students, but for almost all of them, it was a unique, enjoyable assignment that granted them control, according to their discursive constructions. Students discursively constructed their experience of the activity as positive. Themes identified within their discursive

constructions indicate that the activity was engaging and interactive and provided a unique, authentic learning experience.

Q1.2: Discursive Constructions of Roles

In the second half of my first research question, I aimed to discover how students discursively constructed the genre roles they experienced in the activity. It is evident from the extracts I provided in Chapter 5 for the Role Awareness theme that the students discursively constructed their experience of the social roles they were playing both explicitly and indirectly. Primarily, they indicated through their discursive constructions that they experienced the role of the researcher in the activity, especially if they performed the actions of the researcher (i.e., posed a research question). This finding also fulfills my first objective of discovering if students discursively construct their role in the activity as that of the researcher; students discursively constructed their experience as that of researchers in multiple ways.

The ways students discursively constructed the researcher role were interesting. Particularly interesting was when they implicitly placed themselves indirectly in the role of the researcher by referring to their classmates as their research subjects, or as participants who were subject to experimental concerns. This awareness of the simulated role of their classmates when testing their own research questions or discussing experimental validity, especially as a role different than their own, reflects aspects of genre knowledge. As Devitt (2004) explains, part of recognizing a genre is recognizing not just your own role within the genre but “the roles being played by other people” (p. 12). To perform the social action of a genre, it is required that one

understands what identities that genre constitutes (Bawarshi, 2000), as these participant roles are part of the “mutual, cultural knowledge that enables individual actors to communicate” (Miller, 1994, p. 72) through genre. This recognition – or role awareness – for themselves and others that students discursively constructed regarding their experience in the activity is interesting in that it suggests, at the very least, that they have some form of generic awareness of the situation.

This finding, however, does not indicate that the students are beginning to acquire the journal article genre. Despite their awareness of their classmates’ roles in relation to themselves in the researcher role within the experiential activity, the students could not completely refrain from discursively constructing themselves in the role of student. The continuing role of student is comparable to previous research that investigated students’ genre roles within an authentic learning experience (e.g., Blakeslee, 2001; Freedman et al., 1994), though not identical. Blakeslee (2001) reported that she asked students in interviews about their roles participating in the workplace projects as well as their perceptions of the clients’ roles. Unfortunately, students’ answers are not reported. It can be inferred, however, that students in Blakeslee’s (2001) study identified their roles as students, as she reported that they did not consider the assignment overall to be authentic to the workplace context. In the current study, students identified themselves as researchers within the activity, but also as students. Though the student role is not exactly a common discursive construction within the data compared to their discursive constructions of the other identities, it is

not insignificant; there are 38 references for self-identification as a researcher and 15 for self-identification as a student.

Interestingly, the students did not extend this identification of typical classroom roles to the professor in their discursive constructions. Within the entire dataset, she was referred to as fulfilling the teacher role twice (indirectly) and the researcher role twice (directly). She does not seem to take on the role of facilitator for the students. From their discursive constructions, they seemed to have more recognition of the roles they and their classmates were meant to play in the activity than any role the teacher was enacting. Within the literature, there is no direct comparison that can be made to this finding, as previous research did not report students' discursive constructions of the instructor's role in an authentic experiential activity. However, there are some contrasts with different kinds of data concerning instructors within the literature (e.g., Dias et al., 1999; Jones et al., 2011).

In previous research on authentic learning experiences, researchers have observed that the instructor's role is changed within the experience, becoming either akin to an editor when students are submitting manuscripts for publication (e.g., Jones et al., 2011) or a supervisor when moderating student interactions with a real-world client company (e.g., Dias et al., 1999). It is not known, however, whether the students in these courses observed these differences in their instructors' roles. Within the present study, the students did not discursively construct a cohesive role for the instructor within the experiment the way they did for themselves and to an extent their classmates.

Much of the students' recognition of their own as well as other students' roles is discursively constructed indirectly, perhaps unintentionally. This finding suggests that this recognition may be an underlying understanding of the roles in the activity that is revealed in their discursive constructions, rather than a perspective that is parroted from the professor's descriptions. It is possible students' discursive construction of their own and others' roles mimics the awareness of the roles of researcher and participant in professional research contexts. Students who discursively constructed themselves as researchers and their classmates as participants also discursively constructed their awareness of these role differences as a result of performing the actions of the researcher (i.e., asking a question; testing their question; writing the assignment). Students indicated in their discursive constructions that performing these actions specifically is what caused them to discursively construct the researcher role, as opposed to performing only the actions of the participants.

This finding seems to diverge from Freedman et al.'s (1994) results concerning student roles in a financial analysis simulated case study course. Freedman et al. (1994) found that students participating in a role-play simulation in which they had to dress and present to the class like professional financial analysts could not take on the role intended by the simulation. Part of the reason for this inability, Freedman and colleagues (1994) argued, was that the students' classmates, to whom they were presenting, contributed largely to the inauthentic nature of the simulation. To the presenting students, the audience of their classmates could not be seen as board members (Freedman et al., 1994). Conversely, in the present case study, students

discursively constructed their classmates in the role of research participant in the activity. This difference may be due to the fact that, in the presentation simulation, students “saw the audience . . . as fellow students who would soon be taking their places in front of the class” (p. 203), in a turn-taking fashion. In this case study, however, all the students were participating and performing genre roles at the same time. Even students who proposed research questions were constantly participating as research subjects for their classmates’ questions.

The fact that all students were participating in the activity at the same time calls attention again to the Interactivity theme. All the students were interacting with and within the activity at the same time, filling one or more roles. This cooperative nature of the experimental design over the turn-taking in Freedman et al.’s (1994) study may have played a part in their discursive constructions of interactivity. Students discursively constructed their roles in relation to their classmates’ roles in the activity because the roles functioned together interactively.

Conversely, when students implicitly and/or unintentionally discursively constructed the role of researcher without referring to other classmates – for example when their answers to questions discussed experimental validity and reliability, as exemplified in Chapter 5 – they seemed to be, as Bazerman (2002) suggests, “thinking in productive ways that result in the utterances that belong in that form of life” (p. 14) – or within that discipline. Here, Bazerman (2002) is describing part of the process of a person becoming a member of a particular rhetorical community; after they become immersed in the context and activity of the community, they begin to use the genres of

that community, which shapes how they come to understand and know things within that community. He goes on to say that the person “develop[s] and becomes committed to the identity they are carving out” (p. 14). It seems that in their discursive constructions of their experiences of the activity, students use discipline-specific language and logic to discursively construct the point of view of a researcher.

Findings indicating improved use of discipline-specific thought patterns and language are aligned with some of the literature investigating the implementation of foundational concepts of theories of experiential learning for writing and genre instruction (e.g., Freedman et al., 1994). Students in the case study simulation research conducted by Freedman et al. (1994) demonstrated knowledge in the “ways of construing, constructing, and persuading” (p. 220) common to the discipline after participating in the case study course. Students developed “a stance and an ideology [that] were realized through [their] writing” (p. 220). Put differently, they adopted the perspective of members of the financial analysis discipline to complete their writing assignments.

These findings are very similar to those in this study; however, they come from very different measurements. Freedman et al. (1994) state that this stance was evidenced in the writing the students produced for the financial analysis course after participating in the case study simulations, as well as observed in their composing processes. Conversely, my findings come almost exclusively as an interpretation of the neuroscience students’ discursive constructions of their experiences participating in the

activity, as I did not analyze the journal article assignments the students produced for this activity.

Within this case study, the students' discursive constructions of this experience indicated that they felt that they adopted the role of researcher to varying degrees. Like the results from Freedman et al. (1994), many of the discursive constructions that I analyzed that lead to this conclusion suggested the students were developing a stance that aligned with the goals and concerns of professional researchers. According to Freedman et al. (1994), whose analysis was far more in depth than the extent of this case study, this finding may suggest that students are experiencing enculturation into the neuroscience discipline, possibly as a result of participating in the authentic learning experience, but not necessarily because they are acquiring the role of researcher in the journal article genre.

In analyzing students' discursive constructions, I concluded that they discursively constructed their role as that of the researcher within the experiential activity. This construction was especially visible if they indicated that they proposed their own research question, in which case they discursively constructed their role in relation to their classmates as their participants. It is possible that this finding reflects an ongoing enculturation into the neuroscience discipline (e.g., Freedman et al., 1994). In addition to the researcher role, however, they also discursively constructed themselves in the role of participants, as well as students to a lesser degree. They also discursively constructed an understanding of the differences between these roles and why they

were or were not enacted – illustrating they were quite clear of the differences between these different social roles.

Having answered my first research question concerning discursive constructions of experience and social role, I turn now to address my research objectives using these answers.

Research Objectives

Research objectives are the “tangible subset of stated research questions” that “include reference to specific object or phenomenon” (Mills & Birks, 2014, p. 11). My research objectives for this case study concern discursive constructions of the researcher role, and the benefit students received from the roles they discursively constructed experiencing in the activity. I addressed the first objective in the previous section; the students discursively constructed their role in the activity as researchers in multiple ways, which were elucidated in Chapter 5 and above. My second research objective was to discover if students found the roles they adopted within the activity beneficial to completing the journal article writing assignment.

As discussed in the previous section, the students discursively constructed the roles they experienced in the activity as researcher, participant, and student. The theme of Role Awareness indicates that students discursively constructed knowledge of these roles within the activity. Additionally, the subtheme of Role Separation highlights that students discursively constructed knowledge of where the roles were intended and performed.

In their questionnaire responses, students discursively constructed how their experience with the activity affected their ability to write the assignment. Universally, the effect was positive, as opposed to negative or even neutral; all student subjects discursively constructed at least minor positive effects of the activity on writing their journal article assignments. The positive ways that students discursively constructed that the activity improved their ability to write the assignment included increased confidence leading to improved understanding, and personalization leading to elevated interest.

Within their discursive constructions, many students indicated that they were more confident in their ability to write the assignment after experiencing the activity. Some students indicated that this confidence stemmed from seeing their own research question being tested. Most students, however, indicated that their increased confidence was a result of their experience of the activity increasing their understanding of the topic (i.e., VIM), the experimental process, and the activity itself. Reports of improved understanding of the material after participating in an experiential activity in an undergraduate science writing class are aligned with the literature (e.g., Cyr, 2017; Jones et al., 2011; Köver et al., 2014; Prichard, 2005).

The most common reason students gave for their discursively constructed perception of their improved ability to write the assignment was the participant role in the activity. While students discursively constructed benefits of the researcher role in understanding the research process and feeling like a researcher, they also credited the participant role with understanding the activity and the concept of VIM. Students

discursively constructed improved confidence in their ability to write the methods and results sections of the journal article assignment because of the enhanced understanding they acquired while performing the research participant role in the activity. For example, as R12 wrote, “running through these tasks made me have an excellent understanding of the methods . . . also the theory of the VIM tests” (Dec. 03, 2020). As indicated by R15, the participant role in the activity gave them an understanding of “exactly what [they] did and why” that they believed would “increase the effectiveness of [their] writing” (Dec. 04, 2020), a sentiment that was reflected throughout the dataset.

In addition to discursively constructing the participant role as helpful, the students also indicated in their discursive constructions that they believed the perspective of the researcher role would improve their writing. Through their discursive constructions, the students attributed an increased their interest in the assignment to the greater sense of personalization that resulted from taking a researcher perspective in the activity. Students discursively constructed their belief that performing the actions of the researcher throughout the activity (e.g., formulating and posing a research question, gathering data on their question) would make the assignment “easier to write” because they were “genuinely interested in writing about [their question]” (R6, Dec. 02, 2020). As R7 wrote, personalizing the assignment would “make sure the writer is actively thinking about their paper [which will] make it easier to write” (Dec. 02, 2020).

Using the analysis I conducted on my dataset, I was able to fulfill my research objectives. I discovered that students did, in fact, discursively construct themselves as the researcher within the in-class activity. Additionally, students discursively constructed the opinion that enacting both the role of participant and of the researcher in the activity would contribute to their ability to write the assignment. They were more confident in their knowledge of content after experiencing the role of the research participant, and they were more confident in their knowledge of context after experiencing the role of the researcher.

In my second research question, I asked if and how these and other discursive constructions may have changed between semesters that took place before and during the COVID-19 pandemic. Students experienced many changes between semesters due to the COVID-19 health and safety measures that were enacted by post-secondary institutions. In the next section, I discuss my data in light of these changes and answer my second research question. I also consider suggestions of my limited quantitative data, as well as data from the course professor's interview.

Q2: Discursive Constructions Through COVID-19

For my second research question, I investigated how the sudden shift to emergency remote teaching (ERT) affected the students' discursive constructions of their experiences of the activity. Students in the Winter 2020 semester, the semester of the original iteration of this case study, experienced the pivot to online learning between Day 1 and Day 2 of this in-class activity. Day 1 took place in the physical classroom while Day 2 took place in a virtual classroom, after the implementation of

COVID-19 safety protocols by the university. The following semester of the course was the Fall 2020 semester, which occurred exclusively in the online format.

As outlined in the previous chapter, I received two responses from students in the Winter 2020 semester on the qualitative questionnaire created for the present iteration of the study. I also received four responses from students from semesters prior to Winter 2020, (pre-COVID), and 11 responses from students in the Fall 2020 semester, which took place entirely online. Here, I discuss how the responses to my qualitative questionnaires from before, during, and after the move to ERT occurred correspond to my themes. I also discuss how they relate to the literature on ERT. I also consider their relation to the course professor's interview answers.

My main theme regarding COVID-19 differences was the subtheme Personal Experiential Preference. As discussed in the previous chapter, within their discursive constructions, students tended to express an argument or a preference for the way in which they experienced the activity, especially on Day 1. For example, students who took the course in Fall 2020 discursively constructed arguments in favour of the online medium, if not outright preferences. The two students from Winter 2020 who responded, however, expressed a clear preference for the in-class delivery they experienced on the first day of the activity.

There are a few possible explanations that this preference suggests. First, it is possible that the medium through which the students experienced Day 1 of the activity may have influenced their discursive constructions of their preferences. It is also possible that the medium through which students intended to take the course –

whether they registered for an online or in-person course – may have influenced their discursive constructions; perhaps their registration was influenced by a previous preference for online instruction. This finding may align with the literature, as some research found that some students had preferences for online instruction (e.g., Jeffery & Bauer, 2020; Selco & Habbak, 2021).

Alternatively, another explanation for these differences in discursive constructions between Winter 2020 and Fall 2020 students may have been the immediateness and unexpectedness of the shift in Winter 2020 compared to the preparation that went into planning the Fall 2020 term. There were mixed results within the literature about whether ERT improved between the Winter 2020 and Fall 2020 semesters. In a survey of students across five different American universities, just over half of students surveyed indicated that there had been an improvement in the online learning they experienced between Winter 2020 and Fall 2020, and half indicated there had not been (e.g., Selco & Habbak, 2021). The former cited improvements such as instructor preparedness and knowledge of technology, as well as well-adapted assignments and exams (Selco & Habbak, 2021). The latter cited disorganized course websites and a lack of feedback and flexibility (Selco & Habbak, 2021).

In my interview with the course professor, we discussed the changes she made between the Winter 2020 semester and the Fall 2020 semester that may have affected students' discursive constructions of their experiences with the activity online. One major change included presenting the trials to students recorded as opposed to in real time, which lessened technological glitches. This answer echoes results from the

literature about reasons students indicated improvement between semesters; it showcases instructor preparedness and a well-adapted assignment/activity (see Selco & Habbak, 2021).

In addition to the Personal Experiential Preference theme based largely on answers to questions directly related to ERT, there are some interesting findings related to other themes. For example, as discussed above, the Role Awareness theme I identified in my dataset concerns the students' knowledge of what roles they are meant to be performing in the activity. In answer to the qualitative questionnaire, the two respondents from Winter 2020 both explicitly discursively constructed themselves in the role of participant on both days of the activity. One also indirectly discursively constructed her perspective as the student role, and the other discursively constructed her actions as those of a researcher. These responses do indicate a certain amount of role awareness. One of the two respondents' discursive constructions also provided evidence for the subtheme Role Separation, as she explained her reasoning for discursively constructing the participant role on both days of the activity.

This finding does not directly relate to anything in the current ERT literature, as there have been no studies regarding social roles; however, many studies discuss students' reported problems stemming from the quick shift to ERT. Reported issues include a loss of motivation (e.g., Jeffery & Bauer, 2020; Shin & Hickey, 2021) and a reduction in level of engagement with the course (Jeffery & Bauer, 2020; Wester et al., 2021). The Winter 2020 students experienced this shift directly in the middle of the activity and it is possible they may have been experiencing some of the reported

negative effects of the pivot to ERT. Their qualitative discursive constructions do not suggest they are experiencing these effects, however. Therefore, this connection to the literature remains speculative.

Conversely to a speculative connection to the literature, the Interactivity theme appears to contrast the literature on students' experiences with ERT. Within the literature, students reported loss of peer interaction as a major drawback of ERT (Jeffery & Bauer, 2020; Lee et al., 2021; McWatt, 2021; Supriya et al., 2021; Wester et al., 2021). Science students specifically discussed the loss of the interactive element of the authentic learning experience of laboratory classes (Jeffery & Bauer, 2020; McWatt, 2021; Wilhelm et al., 2022), and lack of engagement in online courses (Jeffery & Bauer, 2020; Wester et al., 2021). In contrast to these findings is the Interactivity theme within my dataset, which was discovered in large part due to the discursive constructions of students from the Winter 2020 and Fall 2020 online semesters.

As shown in Chapter five, students clearly and explicitly discursively constructed the interactive nature of the activity. Despite the fact that the course was moved online, and the authentic learning experience was taking place online, SCWR 2000 students discursively constructed the activity as interactive and engaging. One similarity with the results of the literature, however, concerns loss of peer interaction (e.g., Jeffery & Bauer, 2020; Lee et al., 2021; McWatt, 2021; Supriya et al., 2021; Wester et al., 2021). As discussed in the previous chapter, students in this case study from the Fall 2020 fully online semester discursively constructed the interactivity of the case differently than students from other semesters. The discursive constructions of students from semesters

prior to Fall 2020 made references to the physical and spatial interactivity with peers; however, the way Fall 2020 students discursively constructed the interactive nature of the activity did not rely on peer interaction, which aligns with the literature on students' perception of a decline in peer interaction in ERT.

Unlike in the literature, however, students in this case study continued to discursively construct this authentic learning experience as interactive, despite the lack of direct peer interaction. As noted in the previous chapter, they indicated interacting with their peers' ideas, as well as engaging in the roles in the activity, such as the participant role for their peers' research questions. My observations of their behaviour in the online class on Day 1 also provided evidence for the way students interacted: in the chat, paying attention, sometimes having cameras on, helping with troubleshooting. This finding aligns with the observations the professor described in her interview; she indicated that there was "a lot of back and forth" as they discussed the trials, both on video/audio and through the chat, and that she "got a lot of feedback" on what was and what was not working as they followed along (Dec. 08, 2020). Unlike previous literature on students' perceptions of authentic learning experiences that pivoted to ERT (e.g., Jeffery & Bauer, 2020; Wilhelm et al., 2022), students' discursive constructions of this activity indicated that, even through ERT, this activity still provided an interactive and engaging, and beneficial experience.

Here, I have answered my second research question regarding differences in students' discursive constructions resulting from ERT. The results of this case study align with some of the results from the literature related to ERT, such as loss of peer

interaction (e.g., Jeffery & Bauer, 2021; Lee et al., 2021), and improvements between the Winter 2020 and Fall 2020 course delivery (e.g., Selco & Habbak, 2021). These results also diverge from the literature regarding ERT. In contrast to literature (e.g., Jeffery & Bauer, 2020; Wilhelm et al., 2022), changing the setting of the authentic learning experience from in-class to online did not seem to affect the underlying sentiments in students' discursive constructions. Students still found the activity interactive and engaging and appeared to be aware of the possible social roles that could be adopted within the activity. Based on the findings of my analysis, the safety protocols enacted by the institution due to the COVID-19 pandemic did not negatively impact the implementation or the experiential goals of the authentic learning activity in this class.

Having answered both of my research questions and addressed my research objectives, I now provide a more thorough discussion of the course professor's interview responses and how they relate to the literature and my findings.

Context Recontextualized: The Role of the Student Researcher

In this final section of this chapter, I discuss the intersection of my findings, responses from the course professor's interview, and my binocular theoretical lens. I consider whether the findings from my analysis and answers to my research questions reflect the goals of the activity as stated by the course professor, and how they relate to RGT and theories of experiential learning, as well as to the literature on undergraduate science writing instruction. I then propose a reimagining of the roles and context of the activity to reflect these results.

Purpose of the Activity

The activity in this case study was a two-day pseudo-experiment on visual iconic memory (VIM) in which students generated data for a journal article writing assignment. The purpose of this activity, as stated by the course professor in her interview, was to allow students to “experience the experiment” (Dec. 08, 2020). Students were provided with the opportunity to craft research questions to test on their classmates and collect data. Ultimately, the goal was to make them “better able to . . . compose a journal article” for the assignment. As the professor asked, “How can we expect students to write like they [have developed and tested their own research questions] when they’ve never experienced that?”

Alluding to the exigence of the professional journal article, the professor explained “that’s what the journal article is . . . you’re writing about an experiment that you’ve performed.” As an “authentic-like science experience,” the professor intended the activity to act “like a genuine experiment” for the students to perform. It provided “the opportunity to perform an experiment that isn’t fake” in the sense that neither the students nor the professor herself “know what the data is going to be.”

From the perspective of theories of experiential learning, this activity as described by the professor constitutes an authentic learning experience. The activity provides “features ... [that] match or approximate relevant performance contexts” (Jackson & MacIsaac, 1994, p. 22), such as personalized research questions, data collection, and tabulation, and allows students to “direct and control the process” (p. 23) of learning by allowing them to choose to pose a research question. From the

perspective of RGT, however, this may not be characterized as an authentic use of the genre in context, as the authenticity of the rhetorical situation and the exigence are not authentic to the context of the professional journal article. The actions performed in this activity are still based in the educational context, and “school writing ... [is] a solution to a quite different set of exigences” (Freedman & Medway, 1994, p. 13-14).

Another approach to authenticity, however, from the Australian genre perspective, comes from research on adult literacy instruction (Purcell-Gates et al., 2002) and research comparing the efficacy of authentic versus explicit writing instruction in elementary science classes (Purcell-Gates et al., 2007). Purcell-Gates et al. (2002) created a scale to measure authenticity by degrees. For the purposes of the pedagogical context, they define authenticity in opposition to school-only writing that is used solely for the purposes of learning in educational settings. Fully authentic texts, conceptualized through the theoretical lens of RGT, are genres that occur in natural contexts for natural purposes, which are school genres at school and non-school genres outside of school. However, within Purcell-Gates et al.’s (2002) scale, there also exists highly authentic, somewhat authentic, and somewhat school-only writing instructional tasks, achieving varying levels of authenticity through different combinations of genres and purposes existing outside of the school context. Purcell-Gates et al. (2007) found that degree of authenticity was positively correlated with “growth of genre-specific writing abilities” (p. 8), suggesting a genre activity does not have to be 100% authentic for students to derive benefit from it (see Purcell-Gates et al., 2002; 2007).

Applying Purcell-Gates et al.'s (2002) perspective to my findings, however, it may be possible to conceptualize this activity as having *some degree* of rhetorically authenticity. It has been suggested, from a constructivist perspective, that rhetorical authenticity may be built on persuasiveness (Bazerman, 1998). If a student finds a learning activity “persuasive . . . [it is] thus authentic, engaging, and motivated” (p. x), with persuasive in this context referring to “what may appear as real and motivating to the students” (p. x).

Engaging is a sentiment that is easily discernable within the students' discursive constructions, as it contributed to both the Interactivity and Control themes, as explained in the previous chapter. The students' motivation was also discernable in their discursive construction of the benefit of having the assignment reflect their own interests. Students discursively constructed other assignments as boring or uninteresting, implying more motivation for the assignment under investigation because they were allowed to tailor it to their own interests. Additionally, some students explicitly discursively constructed increased motivation based on the ability to personalize the assignment. Their discursive constructions seem to support the idea that they were engaged and motivated with this assignment.

The question is, then, was this assignment persuasive enough to appear real to the students? There were authentic elements about the assignment that students acknowledged in their discursive constructions. Most importantly, students were given the opportunity to create research questions that they were genuinely interested in testing; the opportunity for students to “introduce [their] own variables ... made the

situation more realistic” (R17, Dec. 21, 2020). Second, they were generating novel data to write about. While this novelty was less explicitly acknowledged within their discursive constructions, they did allude to it through their discursive constructions of their sense of ownership over the experiment and the data.

In contrast to these authentic elements, however, there were some features of the activity that clearly did not “approximate relevant performance contexts” (Jackson & MacIsaac, 1994). Most notable was that students were acting as research participants within their own data collection, which is unlike any professional research context. This circumstance was, however, a feature of the activity, not a bug. In the next section, I discuss the intersection of my results, the professor’s interview, and my theoretical lens regarding the roles and context of the activity.

Roles in Context

In the professor’s interview responses, she described the role of research participant as “an important feature of [students’] writing” (Dec. 08, 2020). Enacting the role of participant, according to the course professor, provided students insider knowledge of the topic and experimental paradigm to be able to attempt to craft a research question. In this sense, having students first experience the participant perspective of VIM and the trials before they attempted to craft a research question acted as a scaffold for students who were not familiar with VIM or experimental procedure (e.g., Wood et al., 1976). It was an introduction to the topic of VIM and the experimental design that met students where they were in their current understanding. This scaffolded introduction likely the reason the students discursively constructed the

participant role as helpful in understanding VIM and the experimental procedure of the activity.

Both the professor and the students stressed the importance of both the participant and researcher roles in the activity in terms of their discursive constructions. However, there were some differences in the ways they discursively constructed these roles. In her discursive constructions of the activity, the professor stressed the importance of the participant role, stating that she believed students who did not pose a question to voluntarily take on the researcher role benefited just as much from the activity as those who only engaged with the activity as participants. In contrast, students' discursive constructions revealed a clear difference between the roles. While students discursively constructed the participant role almost universally as helpful to writing the assignment, both those who posed questions and those who did not discursively constructed added benefits of submitting and testing their own research question.

According to the students' discursive constructions, actively choosing to take on the role of the researcher by posing a research question resulted in a more authentic adoption of the perspective of the researcher while collecting the data and writing the assignment. While the activity is not fully authentic, it seems to have provided students with the opportunity to step into the shoes of the researcher in more than just a superficial way. They adopted the perspective of the researcher in this activity by performing the actions of a researcher, if not the rhetorical actions. By making decisions that researchers make and collecting novel data based on their questions like

researchers do, they were persuaded that the control they enacted within the activity was authentic enough to discursively construct their identity as that of a researcher (e.g., Bazerman, 1998).

It is unavoidable that the rhetorical situation and exigence of a classroom-based activity would be unable to fully recreate the rhetorical situation and exigence of the professional journal article genre (see Freedman, 1993; Freedman & Medway, 1994). While students discursively constructed themselves as researchers, the journal article assignments they were required to write had different exigences than the rhetorical situations of professional research contexts, resulting in differently constructed genres (e.g., Devitt, 2004). However, students' discursive constructions indicated that they saw parts of the activity as authentic, engaging, and motivated, including performing the actions of the researcher within the context of the activity.

It is clear the role of the researcher within this activity is far removed from the role of the professional researcher in professional research contexts. I suggest a reconceptualization of the rhetorical context of the activity that allows for a more authentic – closer to real – interpretation of the roles students adopted within the activity: the context of student research, in which the neuroscience students performed the roles of student researchers.

Students discursively constructed their roles within the rhetorical situation of the activity as participants and researchers. It is possible based on their discursive constructions that their roles as participants in the activity were extensions of their student roles, as it was through the participant roles that they developed understanding

of the disciplinary content of VIM. Given that premise, students discursively constructed their roles in the activity as student and researcher. Like the student researcher, they were performing the role of researcher with the epistemological concerns of a student.

Like the professional context, the exigences of the context of student research are usually greater than solely epistemological. In that perspective, based on RGT, the context of this activity is still not authentic to the context of student research. It is, however, *more* authentic, from a scale perspective of authenticity (see Purcell-Gates et al., 2003; 2007). Rather than completely adopting the new role of professional researcher, students can be considered to be adopting the *additional* role of the researcher in this activity. This would explain why they discursively construct benefit from both the student/participant and researcher roles. Additionally, it provides an explanation for why they considered elements of an activity in which they enact both student and researcher roles to be authentic.

The gap between student and researcher is large. The rhetorical situations, exigences, and genres to which these roles belong are very different. The student researcher role, as performed by undergraduate and graduate thesis writers and doctoral students, is an attempt to bridge that gap by occupying both worlds. There is also a gap, however, between students and student researchers. When undergraduate science students begin conducting and writing their about own research, for example for their undergraduate thesis, they begin an entirely new style of writing that is “perhaps the first authentic writing experience that science students have” (Reynolds & Thompson, 2011, p. 209).

The neuroscience students in this case discursively construct their experience of the activity as “practice,” “exposure,” and “experience” of the research and writing process. Their discursive constructions also suggest that the control to perform the actions of the student researcher available in this activity is persuasive enough to be an authentic experience of student research (see Bazerman, 1998), providing them with an experience of the student researcher role. It is possible to look at the practice this activity provides as a sort of steppingstone on the way to thesis writing. While a journal article and a thesis are not the same genre, the student researcher may perform a role in both, from the context of conducting research while still a student. Additionally, this reconceptualization is supported by the professor’s discursive constructions, in which she says she plays a mentor role for the students, discussing their ideas with them, and helping them implement them – just as supervisors do for student researchers writing theses (e.g., Reynolds & Thompson, 2011). Students’ discursive constructions in this case suggest that they perform the student researcher role, and that performing this role may aid in students’ enculturation into the neuroscience discipline (see Freedman et al., 1994) from the student researcher perspective that may help prepare them for thesis research.

In this chapter, I have answered my research questions and addressed my research objectives through discussion of my themes in the context of the literature. Additionally, I have discussed the intersection of the results of my analysis, the course professor’s discursive constructions from her interview, and the theoretical binocular

lens of this study. In the next chapter, I conclude my thesis, providing a recap of the study, its limitations, and ideas for future research.

Chapter 7: Conclusion

In the first section of the conclusion, I reiterate the impetus for this study. In the following section, I provide a brief review of the methodology, analysis, and results. In the next section, I outline the limitations of this study, including limitations related to design, methods, and the COVID-19 context. Following this section, I suggest avenues of future research on this case, this theoretical framework, and the online learning context.

Impetus

It is important for post-secondary neuroscience students to learn to write the genres of their discipline (e.g., Petersen et al., 2020; see also, Brownell et al., 2013b; Freedman & Artemeva, 1998). Struggles with writing can negatively affect graduate school applications (Appleby & Appleby, 2006), as well as grant proposal and publication acceptance (Petersen et al., 2020), which may hinder a student's entire professional career. Despite the importance and necessity of writing within the sciences, science students often enter university ill-prepared for the writing demands of their discipline (Carlson, 2007). Learning to write the genres of scientific disciplines can be challenging for undergraduate students, as proper acquisition of these genres and genre roles depends largely on authentic use of the genre in context, and students do not operate in professional disciplinary contexts (Freedman, 1993). Additionally, evidence has shown it is difficult for students to perform professional genre roles within academic contexts (Freedman et al., 1994).

Given these challenges, the question of how to help neuroscience students begin to acquire the genres of their discipline is a pressing one. A suggested answer to this question is an authentic learning experience that provides a context and genre role authentic enough for students to begin to experience performance of the professional genre role. It is important to understand students' experiences with such activities to gauge whether such activities may be useful in helping neuroscience students experience professional genre roles in ways that help them acquire disciplinary genres and, ultimately, improve their writing within those genres.

Recap of the Study

This case study was an investigation into students' experiences participating in an experiential learning activity in an undergraduate neuroscience writing course. The case was an in-class activity that took place over the course of two classes each semester, and the goal was to provide students with both the experience of the research process and the opportunity to experience posing and testing a research question in order to write a journal article. The activity was an authentic learning experience (e.g., Jackson & MacIsaac, 1994), and it was run like an experiment, following what the professor referred to in her interview as "an experimental paradigm" (Dec. 08, 2020). The subject matter was visual iconic memory (VIM), and students participated in the activity as research participants, generating their own data for their assignments. They also had the opportunity to pose a research question concerning VIM to test on their classmates on the second day of the activity, following which they were required to choose sets of data to compare to write the journal article.

In my investigation of the activity, I observed the students on Day 1 of the activity in two semesters (Winter 2020 and Fall 2020), conducted one student interview, and collected substantial qualitative questionnaire data from students who experienced the activity in one of five semesters. In responding to the questionnaire, students discursively constructed their experiences of the activity. I conducted Thematic Analysis (TA; Braun and Clarke, 2006; 2013) of their discursive constructions to identify common themes and discover how they discursively constructed the genre roles they were performing during the activity. I identified three themes and two subthemes within the data: Role Awareness and the subtheme Role Separation; Interactivity and the subtheme Personal Experiential Preference; and Control. I used these themes to answer my research questions and address my research objectives.

My first research question asked if and how students discursively constructed their experience of the activity and their role in the activity. I referred to the Interactivity and Control themes to answer the first part of question one. Students discursively constructed their experience as interactive and enjoyable, as well as an opportunity for ownership and personalization which led to discursive constructions of the ability to exercise control within the activity.

To answer part two of the first research question, I referred to the theme Role Awareness and its subtheme Role Separation, as well as the theme of Control. Within their discursive constructions, students indicated that they were aware of the different roles available and expected in the activity, and they were aware of when they were adopting those roles. Through their discussions of when they adopted different roles

throughout the activity, the students discursively constructed performing those different roles, including researcher, research participant, and student. Through the Control theme, I discussed how students discursively constructed themselves as researchers based on the level of control and choice they were provided within the activity.

My second research question concerned differences in discursive constructions due to emergency remote teaching (ERT) before and after the beginning of the COVID-19 pandemic. I used the Interactivity theme as well as the Personal Experiential Preference subtheme to answer question two. The Personal Experiential Preference subtheme indicated that students who experienced the first day of the activity online during ERT discursively constructed arguments or preferences for the online medium, while those who experienced Day 1 in class before the pandemic was declared discursively constructed preferences for the in-class medium. Additionally, the online medium changed the ways in which students discursively constructed the activity as interactive, as they did not include peer interaction in their discursive constructions of interactivity, but the interactivity theme was still clearly present.

My research objectives were to discover if the students discursively constructed their role in the activity as that of the researcher, and if they discursively constructed any of their roles as helpful in writing the assignment. My findings illustrated discursive constructions of the researcher role, which addressed the first objective. In addressing the second objective, I discussed how the students discursively constructed their belief

that their roles as researchers and participants would be helpful in writing different parts of the assignment.

Finally, I discussed how these results intersected with the professor's interview responses, RGT (Miller, 1984), and experiential learning theories (e.g., Dewey, 1897). I discussed how this activity can be reconceptualized as an authentic learning experience of student research, allowing students to have authentic practice with the student researcher role prior to their undergraduate theses. I showed that, while this activity is not completely authentic through the lens of RGT, it has authentic elements that students are adequately persuaded to find engaging and motivating (e.g., Bazerman, 1998), such as the ability to pose a research question and perform the actions of the student researcher.

Limitations

This study had some significant limitations that must be acknowledged. The main limitation at this time is the COVID-19 pandemic, as it affected all aspects of this study, most especially my inability to conduct in-person interviews or a proper mixed methods study. As the safety procedures resulting from COVID-19 were implemented, I was forced to abandon my plan to conduct hour-long, semi-structured interviews with students, as I could not entreat students to meet for virtual interviews in the beginning stages of the pandemic; I received two cancellations as soon as the interviews were moved online, and no further responses to my recruitment emails. While the data I collected through the open-ended questionnaires was rich and provided much insight, I was not able to follow-up on the answers or pursue natural conversational tangents as I

would have been in interviews. Additionally, I was unable to recruit enough participants for the quantitative questionnaire to achieve statistical significance. As a result, I was unable to use the quantitative data to verify the results of my qualitative analysis, as in the original study design.

Another limitation is my status as a novice coder. This status may have affected the quality and depth of my TA (e.g., Braun & Clarke, 2013). To offset this limitation, I provided detailed explanations of the extracts and codes that constituted my findings. This case study was also limited in its comparisons between semesters due to a small sample size. My participants were disproportionately from the Fall 2020 semester, and therefore comparisons with previous semesters are limited and speculative.

A further limitation in this case study is the dearth of literature on which to compare this research in my discussion. As the framework and perspectives I used for this study fit into multiple large gaps within the literature, most of the literature is only tangentially related to the topics in this study. Therefore, I have limited ability to compare my results against those found in other studies for similarity and difference.

Implications for Future Research

It would be beneficial for future research to expand the literature on the efficacy of experiential learning theories facilitating students' genre acquisition in neuroscience as well as other disciplines. Additionally, research on the effects of ERT on experiential learning activities would provide some interesting contextualization to the current literature which suggests that ERT is detrimental to some experiential learning activities, contrary to the results of this study.

Future research into the activity in this case may consider rhetorical analyses of the journal articles students produce for this assignment. Additionally, further research into this case would ideally acquire a more even spread of students across the semesters in which the course has been run. It would also be prudent to do a comparative rhetorical analysis on the journal article assignments produced by students who experienced the activity and posed a research question, and students who experienced the activity without posing a question. This type of study would address questions about the effectiveness of the activity if the student is only a participant, versus a participant and a researcher, and if the students in SCWR 2000 are receiving equivalent benefit from this activity.

In addition, it would be pertinent to compare the short-term and long-term effects of experiencing the student researcher role in the activity on students' writing. As the course is voluntary, a longitudinal study in which the work of neuroscience students from this course and neuroscience students who did not take this course are compared during SCWR 2000 as well as in their thesis writing may reveal if there are long-lasting benefits to this early introduction to the student researcher role. This type of research may provide evidence for the reconceptualization of the context of the activity as well as the efficacy of the writing activity as a writing instruction intervention, for teaching and learning purposes

Final Thoughts

This case study began with a general inquiry into the effects of a pre-established experiential learning activity. Having found that students discursively construct

themselves in the role of both student and researcher within the activity, adopting the role of the student researcher, I feel akin to them, as I myself am a student researcher, fulfilling two roles while writing this thesis. I am a student, undoubtedly, and have the exigence – the recognized social goal – of (finally) passing my program to earn my degree. I have not been able to forget this role that I play throughout this entire research and composing process, just like the students were unable to refrain from indirectly referencing their roles as students. However, there is an exigence for this project that exists outside of my pedagogical goals; the neuroscience course under investigation is a real course, the in-class activity I am investigating is real, and there was an exigence – recognized by the professor of the course and the director of the university's Writing Services Centre, as well as myself and others – to understand the impact of this activity on the students who took the course. I responded to this second exigence by enacting the role of researcher – and of the writer, presenting the research. I was constrained by my student role in how, exactly, I could respond as a researcher – I could not respond with a longitudinal study, for example, given the (official) timeframe of my program – but I am still able to respond as a researcher; to knowingly enact both social roles to complete this project.

As I am writing this, I am anticipating that my reader recognizes me as a student who is attempting to show knowledge and capability within her field, but also as the researcher who conducted this research, and ultimately as the student researcher who is using the thesis genre to add these findings to the larger academic conversation around undergraduate neuroscience writing instruction and genre acquisition.

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Appendix A

Open-Ended Questionnaire

This appendix contains the open-ended questionnaire for both pre-winter 2020 students and students from the Winter 2020 and Fall 2020 semesters, which was hosted on Qualtrics.com. There were two questions that were only shown to specific students based on when they took the course. This is indicated below.

This questionnaire consists of 5 questions for the purposes of classification and 12-13 open-ended questions about your experience with the in-class Visual Iconic Memory (VIM) activity that took place over two classes in your NEUR 2004 course.

Classification Questions:

Please answer the following questions for classification purposes.

Q1 What is your gender?

- Man
- Woman
- Nonbinary
- Other/Prefer not to say

Q2 What is your age?

- 16 - 20
- 21 - 25
- 26 - 30
- 31+

Q3 What is your major? Please type it in the box provided.

Q4 What was your undergraduate year standing when you took NEUR 2004?

- 1st year
- 2nd year

- 3rd year
- 4th year
- N/A - I was not an undergraduate

Q5 In which semester did you take NEUR2004?

- Fall 2018
- Winter 2019
- Fall 2019
- Winter 2020
- Fall 2020

Opinion Questions: Please answer the following open-ended questions by a typing a response of 250 words or less for each question in the boxes provided. Consider each question carefully and be as honest as possible, to the best of your ability to remember. There are no wrong answers.

Q6 What did you like or dislike about the VIM activity?

Q7 What did you like or dislike about the opportunity to pose your own research question? Did you pose a question? Why or why not?

Q8 What affect do you think being able to pose a research question had/will have on your ability to write the paper for this activity?

Q9 Explain what you experienced on Day 1 of this activity.

Q10 What, if anything, did you gain from Day 1 of this activity (introduction to VIM) that you believe helped you/will help you write the paper?

Q11 Explain what you experienced on Day 2 of this activity.

Q12 What, if anything, did you gain from Day 2 of this activity (testing new research questions) that you believe helped you/will help you write the paper?

Display This Question:

If In which semester did you take NEUR2004? = Winter 2020

Or In which semester did you take NEUR2004? = Fall 2020

Q13 How do you believe your experience of testing yours/your classmates research questions would have been different had Day 2 taken place in class as opposed to online?

Display This Question:

If In which semester did you take NEUR2004? != Fall 2020

Q14 Explain how you used what you learned in this activity to write the paper.

Q15 Did you feel more like a student, a researcher, or a participant during Day 1 of this activity? During Day 2? Why?

Q16 Did completing this activity improve your confidence in your ability to formulate research questions? Why or why not?

Q17 Did/do you feel more confident in your ability to write the paper after completing the activity? Why or why not?

Q18 What do you believe was the overall purpose of completing this activity?

Thank you for taking the time to complete this questionnaire. You now have the option of consenting to receive follow-up questions via email. This is not a requirement. Your responses are anonymous unless and until you provide your name/email. If you decide to consent to receive follow-up questions, your identity will be pseudonymized and protected.

Do you consent to being contacted with follow-up questions?

- Yes
 No

Display This Question:

If Do you consent to being contacted with follow-up questions? = Yes

Thank you for completing this questionnaire and consenting to follow-up questions. Please provide your name and email address in the boxes below. Your \$15 Amazon gift card will be emailed to this address within 4 weeks.

Display This Question:

If Do you consent to being contacted with follow-up questions? = Yes

Name:

Display This Question:

If Do you consent to being contacted with follow-up questions? = Yes

Email:

Display This Question:

If Do you consent to being contacted with follow-up questions? = No

Thank you for completing this questionnaire. If you would like to receive a \$15 Amazon gift card, please enter an email address in the box below where you would like the gift card to be emailed. It will be emailed to this address within 4 weeks.

Appendix B

Interview Protocols

This appendix consists of the interview protocols for conducting semi-structured interviews with pre-winter 2020 students, Winter 2020 students, and the course professor. Questions about the rubric do not apply to the most recent iteration of this study.

Open-ended Interview Questions (Previous Students):

Please state your age, gender, and in which semester you took NEUR 2004.

What did you like or dislike about the in-class VIM activity?

What did you like or dislike about the ability to pose a research question to investigate VIM?

What did you like or dislike about the opportunity to choose your own research question to complete the writing assignment?

What did you like or dislike about the rubric provided for this assignment?

How much did you engage with the VIM activity, and what did your engagement look like?

How did the activity make you feel about your ability to write the paper?

How did the rubric make you feel about your ability to write the paper?

What effect did the activity have, if any, on your ability to write the paper?

What effect did the rubric have, if any, on your ability to write the paper?

If, for a future assignment, you only had access to either the activity or the rubric, which would you prefer and why?

Has what you learned from the experience of the VIM activity had any effect on your writing for other courses? If so, how?

Open-ended Interview Questions (Current Students)

Please state your age and gender.

What did you like or dislike about the in-class VIM activity?

What did you like or dislike about the ability to pose a research question regarding VIM?

What did you like or dislike about the opportunity to choose your own research question to complete the writing assignment?

What do you like or dislike about the rubric provided for this assignment?

How much did you engage with the VIM activity, and what did your engagement look like?

How did the activity make you feel about your ability to write the paper?

How does the rubric make you feel about your ability to write the paper?

What effect do you believe the activity has had, if any, on your ability to write the paper?

What effect do you believe rubric will have, if any, on your ability to write the paper?

If you only had access to either the activity or the rubric to write this paper, which would you prefer and why?

What do you believe is the overall purpose of completing this activity?

What benefit, if any, do you believe you gained from completing this activity?

What do you believe was impact of having to complete Day 2 of the Activity through online video, rather than in class?

Open-ended Interview Questions: Instructor

Describe the in-class activity on Visual Iconic Memory.

What was the purpose of creating this activity?

How did you come up with this activity?

What do you hope the students' gain from this experience?

From your experience of running this activity over the past four semesters, do you believe it has impacted students' ability to write the paper?

How?

What gives you this impression?

Do you notice a difference in students' engagement and/or confidence levels from Day 1 to Day 2 of this activity? In what way?

Do you notice a marked difference in the papers students produced after this activity and what they produced before it?

What differences?

Difference in quality? Engagement with the material? Writing ability?

Do you believe students feel more like a student, researcher, or research subject while participating in this activity?

What is your role in this activity?

Describe how Day 1 of this activity usually goes.

Describe how Day 2 of this activity usually goes.

Describe how Day 2 of this was different in the Winter 2020 course.

What changes were made to comply with the university's COVID-19 response?

How effective were they?

What do you believe was impact of having to complete Day 2 of the Activity through online video, rather than in class?

Appendix C

Data Familiarization Memo

This appendix contains the concluding memo I wrote at the end of phase one of my thematic analysis (Braun & Clarke, 2006; 2013), which relates my observations after familiarizing myself with the raw data.

Data Familiarization Concluding Thoughts

After thoroughly reviewing and 'familiarizing' myself with the dataset, I have generated an initial list of common sentiments or ideas (too early to say themes).

1. Many of the respondents say that completing the activity improved their 'understanding,' both for the specific VIM material and the process of how to conduct experiments and collect data

- They generally claim to believe this understanding improved or would improve their ability to write the paper, or at the very least parts of it such as the methods section.

2. Many Respondents discussed the benefits of being able to choose a research question, whether they posed one or not. The ways they expressed this - varying statements from being able to choose something that "interested" and "excited" them to not being "boring" and causing them to avoid "procrastinating" - remind me of the professor's description of "buying in" that she says is the main purpose of the activity.

3. Most respondents who disliked an aspect of the activity had similar complaints about the data-reporting process being long and/or unnecessary.

4. Many students described the "interactivity" and "creativity" of the activity as positives.

5. Virtually all students stated that they believed there was some additional benefit to posing a research question, even the ones that didn't pose one.

- Some seem to imply the opportunity to pose a question prompted them to think of possible questions even if they didn't pose them, and provided its own benefit.
- This benefit came in the form of engagement in the activity (again "buy-in"), but also in writing the paper.

6. The way most fall 2020 (and a couple winter 2020) students discussed the benefits and drawbacks of the activity online vs in-class was interesting. Their opinions were approximately evenly split, but the vast majority were based on research-type concerns of validity of data and possible confounds. In other words, they were considering it from the perspective of researchers conducting research.

7. Most students (exception of 3 or 4) did not articulate that they felt like a student for either

day of the activity, despite that being an explicitly stated option. "Participant" was common for day 1, and both "participant" and "researcher" were common for day 2.

- Whether students said they felt like a researcher on day 2 seemed to have some correlation with whether or not they posed a research

question - many specified that feeling was because their ideas were being tested.

- A few students indicated that they felt like a researcher specifically while writing the paper, because the activity allowed them to think about the experiment from a researcher's perspective.
- Many students identified their perspective on the activity and/or their participation as that typical of a researcher (concerns about validity, indicating that their classmates were "their" research subjects, etc.), without explicitly stating or claiming that perspective.

8. Only two-thirds of the students indicated anything about writing the paper when articulating their opinions about the purpose of the activity. They used words like "practice" and "experience" and "understanding" regarding the research process to describe the purpose of their participation in the activity, but a full third of them didn't relate this to the writing assignment at all, which is interesting for an activity in a course specifically about writing.

Appendix D

Codebook

This appendix contains my codebook, which provides definitions for my codes and themes. It also indicates the number of files each code was used in (under *files*), and the number of instances of that code across the dataset (under *references*).

Codes\\Themes – TA

Themes that synthesize the codes.

Name	Description	Files	References
Control	Students indicated, both explicitly and implicitly, that the opportunity to pose a research question and test it in class provided them with a sense of ownership over the data and the paper, and that this improved their ability to write and/or interest in writing the paper. They also indicated that the activity helped them understand the material and research process better, and that this helped with their writing. These things provide a sense of control over the material and their interaction with it.	20	89
Activity deepens students' understanding	When respondents indicate, directly or indirectly, that participating in the activity (including having the opportunity to pose a research question) improved their understanding of the research methods/topic (VIM)/activity.	14	25
Deeper understanding helpful in writing	When respondents indicate that participating in the activity improved their understanding and that they believe this understanding directly positively impacts their ability to write the paper. This understanding can be referred to indirectly, (e.g., "going through the experiment" or "insight")	17	29
Activity improves the writing experience	When a respondent indicates that participating in the activity and/or proposing a	15	16

Name	Description	Files	References
	research question specifically made writing easier/better/more enjoyable, etc.		
Increased confidence in writing the paper	When a respondent states that they are more confident in their ability to write the paper after completing the activity.	14	14
Other writing assignments are boring	When a respondent states that other writing assignments they've had have been "boring"/"impersonal"/"a chore" (in comparison to this activity/paper).	2	2
Activity provides opportunity for ownership	When students indicate, explicitly or implicitly, that they felt a personal connection with some aspect of the activity.	17	48
Activity allows creativity	When the ability to be creative is mentioned as a positive aspect of the activity.	3	4
Activity allows personalization	When respondents mention things related to being able to choose things that are interesting of interest.	13	20
Personalization allows for enjoyment in writing	When a respondent expresses that being able to pose/choose a question has made writing more enjoyable.	3	4
Activity promotes ownership	When they mention anything related to personalization or possession of the ideas, actions, writing, etc. Related to the activity in general or any aspect of it, i.e., posing a question.	13	24
Interactivity	Students have indicated that the activity was interactive, engaging, and enjoyable - they have stated, directly and indirectly, that the experience was beneficial (for their writing and their understanding) due to the hands-on, involved nature of the activity, including the parts where they were acting as participants. This applies to the COVID contrast as well - generally, students believed however they experienced the class (online or in-person) was the best way to experience it.	20	101

Name	Description	Files	References
Activity is engaging	When respondents or observational notes indicate that the activity is engaging, directly or indirectly. This can be describing it as fun, interesting, interactive, etc. (Aggregate of "engaging," "enjoyable," and "interactive" codes.)	17	58
Activity is interactive	When respondents positively refer to the interactivity of the activity.	13	20
Activity is engaging	When it is indicated that the students engaged with the material during the activity, either when they state they found it engaging (or something similar like interesting or fun) or when observational notes and memos indicate that they are engaged.	9	21
Enjoyable experience	When respondents indicate in some way that they enjoyed participating in the activity, it was fun, etc.	11	17
Posing a question enhances experience	When respondents indicate that there were (or that they believe there would be) positive effects from posing a question.	16	22
Posing a question is beneficial	When respondents indicate that they found some benefit in posing a question (or see some benefit even if they didn't pose one). Subcode for benefits specifically related to writing the paper; everything coded to main code does not specifically mention writing.	15	16
Specifically related to writing		9	9
Posing a question is practice	When respondents refer to posing a research question as practice	5	5
Posing a question was preparation for further studies	When a respondent indicates that they believe the opportunity/experience of posing a research question helped them further along in their academic career (later classes, grad school, etc.)	1	1

Name	Description	Files	References
SUB-THEME - Personal Experiential Preference	Most students stated that whichever method they experienced the activity in (online or in-class) was the best one, particularly the first day of the activity (i.e., students who experienced Day 1 in class and Day 2 online preferred in-class). The reasons given for either preference were mostly related to research concerns, such as validity and reliability. The content of these considerations changed between online/in-class, but the researcher perspective was consistent.	14	21
COVID consideration - Online v. In-class	Respondents' statements about whether they believe the activity was better performed in class or online; only applicable to Winter 2020 and Fall 2020 students who experienced at least one day online.	14	21
In-class is better- Research purposes	When respondents indicate that they think the activity would have been more effective if (both days were) performed in class due to reasons relating to the experiment or data collection (e.g., validity, controlling variables such as distance, etc.).	7	9
Online is better	When respondents indicate that they preferred the online class or that it was better.	10	12
Online is better- personal preference	When a respondent indicates that they think completing the activity online is better because it works for them for personal reasons.	4	5
Online is better- Research purposes	When respondents state that they believe the activity worked better online for reasons involving the experiment (e.g., validity, confounding variables, etc.).	7	7
Role Awareness	Students expressed an awareness of the fact that they are expected to perform different roles during the activity and the writing of the report (i.e., student, participant, researcher), and indicated a sense that they have performed those roles to some extent. They seem aware that this activity is attempting to take them beyond the student role to perform	20	164

Name	Description	Files	References
	this genre, and believe it has been to some degree successful.		
Dual roles	When there is an indication that the activity allows or expects students to perform more than one role.	13	14
Students identified as participants	When the students are referred to as or implied to be participants in the activity.	16	22
Self-identification as a participant	When respondents identify themselves as a participant in the activity/experiment. Does not include when they indicate that their classmates were their participants, only self-identification.	16	22
Participant experience was beneficial	When respondents mention they benefitted from the participant experience (either by directly labelling themselves a participant indirectly describing their experience as that of a participant in an experiment). either in their understanding or their writing directly.	11	16
Students identified as researchers	When students are identified or labelled as researchers within the context of their participation in their activity or writing the paper.	9	13
Self-identification as a researcher	When a student identifies their own role in the experiment as that of the researcher. This can be directly in response to the specific question, or in response to another question, e.g., when describing what they liked the experience.	9	13
Testing own question directly relates to feeling like a researcher	When respondents specifically state that they felt like a researcher at any point in the activity due to posing a question.	4	4
SUB-THEME - Role Separation	Students tended to suggest, implicitly and explicitly, that they felt like they were performing the role of participant on day one and the role of researcher on day two. This was especially true for students who submitted research questions to be tested on	20	115

Name	Description	Files	References
	day 2. Some students suggested that they felt like participants in class, but they felt like researchers while writing the paper. Ult., students seemed to make clear delineations between the roles they were attempting at different stages of the activity.		
Implicit identification of student perspective during activity	When respondents or observational notes indicate that the students are being treated/acting/reminded that they are students throughout the activity/the paper (indirectly, without explicitly stating their role as a student); by the students themselves or the professor	9	16
Overall purpose is participant experience	When respondents indicate that they believe (one of) the main purpose of the activity is related to being the participant.	2	2
Posing a question is beneficial	When respondents indicate that they found some benefit in posing a question (or see some benefit even if they didn't pose one). Subcode for benefits specifically related to writing the paper; everything coded to main code does not specifically mention writing.	15	16
Specifically related to writing		9	9
Self-identification as a student	When students explicitly state that their role in the activity was that of a student.	5	5
Self-identification as a participant	When respondents identify themselves as a participant in the activity/experiment. Does not include when they indicate that their classmates were their participants, only self-identification.	17	38
Participant experience was beneficial	When respondents mention they benefitted from the participant experience (either by directly labelling themselves a participant indirectly describing their experience as that of a participant in an experiment). either in their understanding or their writing directly.	11	16

Name	Description	Files	References
Self-identification as a researcher	When a student identifies their own role in the experiment as that of the researcher. This can be directly in response to the specific question, or in response to another question, e.g., when describing what they liked the experience.	16	38
Implicit self-identification with researcher perspective	When a respondent indicates implicitly or indirectly that they were considering the activity and/or the assignment from the perspective/role of a researcher, for example when they mention problems with data collection, considerations of validity, seeing their classmates as their research participants, etc.	14	29
Description of other students as participants in their research	When the professor or the students state or imply that the other students in the class are the participants/subjects for any one student researcher.	4	5
Online is better- Research purposes	When respondents state that they believe the activity worked better online for reasons involving the experiment (e.g., validity, confounding variables, etc.).	7	7