“I've forgotten what I wanted to say”: An exploration of online learning experiences by students with acquired brain injuries (ABI).

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Abstract

This PhD thesis uses a remote (auto)ethnography research method to explore the lived experiences of higher education (HE) students with acquired brain injuries (ABI) in online learning environments. Based around a framework of: (1) inclusion, (2) flexibility in design, (3) meeting participants where they are at, and (4) building trust through up-front disclosure, I combined observations, questionnaires, interviews, and journal artefacts to collect data and build a holistic picture of how these students with ABI navigate between their roles as online student and disabled student. This study identifies ways in which students with ABI find and capitalise on learning opportunities presented in online environments, outlines the differences between individual and dis/abling (system) barriers, and reviews the students' strategies for mitigating obstacles to their full and equitable participation in HE. Providing instructional designers, curriculum developers, and online course instructors with signposts for recognizing potential dis/abling (system) barriers facilitates the identification and implementation of barrier reduction strategies in existing and future delivery of technology-enhanced instruction. Increasing the existing body of knowledge surrounding the experiences of (a) students with ABI in their role as online learners, (b) disabled students as participants in research, and (c) disabled researchers as designers and leaders of research project, this thesis provides three original contributions to knowledge in its (1) provision of an insider perspective, (2) introduction of an inclusive data collection framework, and (3) examination of the importance of instructor impact on student experience.

Keywords & Search Terms

Online learning, acquired brain injury, disability, dis/ability, disclosure, inclusive research, accessibility, student voices, universal design for learning, UDL, ABI

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Through life, but especially during the completion of post-graduate degrees and research projects, no one journeys alone. Mature students often lack the opportunity to dedicate themselves fully to their coursework without impacting the lives of friends and family. Disabled students rely on more than just internal grit to accomplish their goals. I would be remiss if I did not take the time to acknowledge the assistance of others during my studies.

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Author’s declaration

This thesis is original and results entirely from my own research. It has not been previously submitted for publication or award for a higher degree elsewhere. It does not infringe upon anyone’s copyright, nor does it violate any proprietary rights. References to my own, and any other author’s, previously published works have been cited.

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Chapter 1: Introduction

1.1 Adventures of the misfiring brain

Always inquisitive, I studied at university post brain injury twice in two decades; each experience was drastically different than the other. This PhD is an analysis of these experiences.

As a result of a motor vehicle accident (MVA) in 1995, I left my place at a traditional on-campus undergraduate university. At that time, the symptoms and impacts of head injuries weren't as well understood, or well-treated, as they are today. Post-injury, I experienced no difficulties relating to reading, memory, or light sensitivity; all things I now struggle with since suffering a second MVA-related brain injury in 2019. Instead, the filter between my eyes and mouth seemingly disappeared overnight! Anything I read would come out of my mouth. If I walked by a billboard or poster while talking, the text on it would be interspersed with my conversation. Notes presented on screen during lectures would be read aloud. Unaware of my actions until others mentioned it, I was disruptive. Struggling with balance, pain, and concentration, I was perpetually tired. I left school for the semester and focused on improving my physical health while relearning how to re-establish the filter between my inputs (eyes & ears) and output (mouth). Over the next decade, I made several unsuccessful attempts to return to classroom-based learning, continuing to struggle with focus and sense-making.

I returned to my studies 12 years later to complete a Bachelor of Arts degree through an online blended classroom offering; selecting the programme in large part because of the way it was structured. It allowed sufficient flexibility to juggle full-time work commitments and complete the coursework. More importantly, the online components allowed me to work within the constraints of my brain injury. In pursuit of the degree, I discovered my struggles to learn effectively in classroom settings were rooted in new-to-me audio-processing issues. I began to rely on recorded lectures, audio transcripts, and tutor uploads of slide decks from class lectures; all common components in the blended and early online courses I attended.

It wasn't until I discovered online learning options during my second attempt to complete my bachelor's degree that I began to find my niche – and passion - for learning once again. With online learning, I could remain at home, work at my own pace, re-read content as many times as necessary, and then post my assignments to asynchronous discussion boards. There were set deadlines and opportunities to "think aloud" via the written word. I developed systems to keep me on schedule, for researching new materials, note-taking, and file keeping.

Years later, these systems enabled me to complete a Master of Education through an online programme. While I struggled with the synchronous elements, I was able to continue my studies without once disclosing my brain injury to fellow students or professors. My history of not completing my undergraduate degree on schedule as a late teen remained safely hidden; the injury itself a closely guarded piece of my personal history that only a few close family members were privy to. The shame of being perceived as brain-damaged, different, or other was vigilantly concealed.

My carefully re-built persona of a competent, normal student was shattered on Sept 16, 2019, when I experienced yet another acquired brain injury (ABI) as a result of a second MVA. Unlike my previous accident, I suffered no physical injury. Much has changed in the intervening years – both in how the medical community understands and treats ABI and in how the academy responds to students who have experienced it. This time, instead of dropping out of my programme of study, I turned to the literature to see what others in my situation were doing to cope with the challenges of completing online coursework post-brain injury. This led to my discovery that little to no research relating to the *student with ABI's experience* existed from the perspective of an online learner. My journey to fill this gap in the literature began.

1.2 **Overview of this chapter**

This chapter begins with an introduction to my personal education and disability history and continues on to introduce the impetus behind the research topic selection. The terms "online course" and "acquired brain injury" are defined for

the purpose of the study. The chapter goes on to introduce the project's research questions, rationale, and potential contributions to the overall body of knowledge, and ends with an overview of this thesis' structure.

1.3 **Research design**

Concerned with exploring the experiences of individuals with ABI in a non-traditional (online) learning environment, this thesis explores dis/ability, higher education (HE), and the process of research itself, navigating between the medical, social, and educational sciences. While gently touching on the medical component through depictions of participant injuries and resulting symptoms, the thesis' focus is firmly on the social sciences. Inseparable from a disabled student's lived experiences, these areas are never fully isolated from one another.

The inspiration for this project came from my personal experience of a tertiary traumatic brain injury part-way through my PhD programme. Upon reflecting on the reasoning behind my research topic selection and design decisions with my Supervisor, I noted

> One thing I've learned since the accident is that I am no longer a reliable narrator of my own story. Or any story anymore. The blank patches in my memory, constant struggle to recall words, and gaping black holes where thoughts generated from reading or writing should be, have left me second guessing not only what I know, but what I am doing on a regular basis. Perhaps that explains why I spend so much time following a project management method for my research work. By detailing everything I am doing, when I am unable to trust myself, I can trust the process. I can review the reasoning behind decisions made during research design and data gathering phases and use these emails, re-read notes to myself, and revisit interview transcripts as memory aids. They help remind me why I made the decisions I did and provide guidance to move forward when I find myself stagnant or confused (S. Semper, transcript from virtual meeting (VM) with PhD Supervisor, June 7, 2023).

The journey into online learning through the lens of ABI students facilitates an examination of dis/ability, accessibility in HE, and inclusion from an understudied perspective. Students with ABI experience multiple disabilities unique not only from other HE students or disabled student populations, but

also from one another. These students may experience a range of disabilities to cognitive, physical, or psychosocial functions which can vary in combination and severity from student to student (Childers & Jux, 2016; Williams, 2017) and may present differently in military veteran students with ABI (Kritsch, 2019; Owens, 2020) or in students with “invisible” disabilities unrelated to ABI (Kent, 2016). Despite these differences, there exist attitudes, experiences, and symptoms common to both the student with ABI’s experience and those of other disabled student groups. While they may face similar issues as other disabled students when viewed from a macro lens, the nature of ABI fosters distinct experiences unique to this group of students.

For a variety of reasons, I chose to design this research as a remote auto-ethnographic study. To balance my reflections, this thesis includes the experiences of eight other online students, five women and three men, who sustained an ABI between the ages of 4 and 35, to critically explore the experiences of HE students with ABI in online learning.

Throughout the process, I have taken the opportunity to reflect upon and reconsider my own experiences as a student with a predominantly invisible injury that at times presents with physical symptoms. Coming to terms with my own academic journey, including the limitations and challenges of existing and succeeding in an academic environment, has reinforced my decision to employ the social model of dis/ability as the lens through which to view the process of “enrolling > attempting > completing” in an online environment as a student with ABI.

Self-reflection is an integral part of this research process. It is important to highlight the differences in perspectives between being researched “with” as opposed to researched “on”. This thesis provides an opportunity to present how able-bodied privilege impacts research projects; allowing them to proceed at a different pace, or without consideration of the physical, emotional, or cognitive requirements of disabled participants or researchers during research design, data gathering, analysis, or writing-up phases.

1.3.1 **Summary of research design**

Through the co-creation of knowledge between researcher and participant, this research aims to have a meaningful, real-world impact on current and future online students with ABI.

The research presented here challenges ableist assumptions that students with ABI are unable to work, learn, or participate within the academic sphere post-injury. Students with ABI may experience both physical and cognitive symptoms on a systemic level, yet with the right opportunities and accommodations, this study's participants demonstrate how students with ABI can successfully navigate HE delivered online.

The following section provides operational definitions for "online learning" and "acquired brain injury"; concepts which underlie the development of the research questions, methodology, and guide data analysis, outlines the rationale, practical use, and contribution of the research, and ends with an overview of the study's theoretical framework.

1.3.2 **Operational definitions**

As a researcher with ABI, I often joke about playing a game of "guess what's in my head" with fellow students, family, and co-workers. Due to difficulty with memory recall and word-finding, I frequently experience challenges articulating ideas. At times, I am convinced others understand what I meant, only to learn later that their understanding of the terms I was using were completely different than my own. To ensure we're all working to build our knowledge using the same foundation, it is important to me to clearly define the parameters I used to define the terms "online learning" and "acquired brain injury" when designing my research project. These definitions provided guidelines for selecting qualifying study participants from the pool of volunteers.

1.3.2.1 **Disabled and dis/abling**

In this thesis, I use the term "disabled" when referring to people, and "dis/abling" when referencing systemic barriers experienced by people.

1.3.2.2 **Online course**

Depending on who you are speaking to, the terms “online courses” or “online learning” evoke different images. For the purposes of this study, I have chosen to adopt the following definition of an online course.

> A course delivered via the internet, providing a means for content delivery, assignment completion, and synchronous and asynchronous communication for learners in different locations. (Mawn & Davis, 2019, p. 434)

1.3.2.3 **Acquired brain injury (ABI)**

Not all brain injuries are obtained in the same manner. Injuries may be present at birth (congenital) or develop post birth (acquired). Additionally, while traumatic brain injuries (TBIs) are acquired brain injuries, not all ABIs are TBIs (Goldman et al., 2022). For the purposes of this research study, ABI is defined as any non-degenerative, non-congenital injury to the brain taking place after birth and leading to temporary or permanent impairment of cognitive, physical, or psychosocial functions. ABI can be acquired through a traumatic injury, such as a fall or MVA, or through a non-traumatic event, such as a stroke or tumour (Barber et al., 2015; Goldman et al., 2022; Williams et al., 2018).

1.3.3 **“Gaps large enough to drive a truck through”**

Representation matters. How can we be confident that others see us and consider our perspectives if we cannot see ourselves in the research?

While there is a wealth of research focusing on educators, instructors, information technology (IT), and disability support personnel who work with people with ABI, there is a notable gap in studies that directly address the lived experiences of those with ABI themselves.

By increasing the available research relating to the student’s experience, as opposed to the perspective of those approaching the topic from the outside through the lens of a medical, social, or academic service delivery lens, this thesis increases the body of knowledge relating to students with ABIs’

experiences as online learners. To assist educators and instructors in identifying whether design and delivery decisions in online course environments are helping or hindering student progress, university students with brain injuries were asked to describe their experiences with online learning; allowing them the freedom to express what barriers they may or may not have encountered in this learning environment and describe the strategies they use(d) to mitigate them.

Motivated by a search to see my own experiences as an online student with an ABI reflected in the literature, I aim to promote a deeper understanding of the unique challenges and experiences of students with ABI. I anticipate this research will be useful to fellow disabled students with ABI as well as individuals interested in learning more about access needs, impacts of existing accommodation policies, tools, and techniques, and current gaps in both implementation and use of accessibility support process and tools from a wide variety of disciplinary perspectives, including, but not limited to education, disability, computer science, assistive technology, psychology, neurology, and organizational development.

1.3.4 **Research questions**

Currently, there is little to no research relating to the students with ABIs' experience as online learners. Much of the existing literature on ABI in HE education centres around the roles and perspectives of educators, instructors, IT, and disability support services.

As an instructional designer by trade, I am immediately inclined to ask, "How can we as educators possibly know if what we're doing is helping or hindering student progress if we never ask them what is or isn't working?" This led to the guiding question for my research project: How do HE students with acquired brain injuries (ABI) experience online learning?

> RQ1: In what ways do students with ABI experience learning opportunities in an online context?

RQ2: In what ways do students with ABI experience encounter barriers in an online context?

RQ3: What mitigation[1] strategies (if any) do students with ABI experience use?

The lack of established literature led to the adoption of an iterative data analysis and literature review process. The first round of interview questions were drafted based on the initial research questions, while patterns within participant responses drove the development of additional questions and guided future conversations with study participants, which, in turn, led to subsequent searches through the literature for new avenues of exploration.

1.4 **Rationale**

Brain injury is one of the most common neurologic conditions and is a major cause of death and disability worldwide (Johnson & Griswold, 2017; Maas et al., 2022). In the USA alone, approximately 15% of high school students self-report sports-related brain injuries (DePadilla et al., 2018). Other sources of injury, such as illness, falls, motor and non-motor vehicle accidents, conflict blast injuries, physical altercations, and domestic violence, increase the potential number of students entering HE (Childers & Hux, 2016; Krause & Richards, 2014). With self-reports of having experienced brain injury or concussion ranging from 16% to 28% of students attending HE in the USA (Childers & Hux, 2016; Krause & Richards, 2014), improving accessibility to online learning environments should be of great interest to HE institutions competing for students on a global scale.

[1] The decision-making process behind the deliberate selection of the word “mitigation” in RQ3 is detailed in Chapter 3, Section 3.1.1.1.

1.4.1 **Spatiality, mobility, and inclusion**

When it comes to disability related research, especially research where the researcher is also a person with a disability, one must also consider the impacts of ensuring that the researcher is not isolated from home during the process (Rothenbuhler & Coman, as cited in Bengetsson, 2014). Ethnography can be a time-consuming and draining process for an individual who already suffers from fatigue (Bengetsson, 2014). By selecting a remote ethnographic methodology, I am able to retain access to my medical team, including occupational therapy. Additionally, in academia and in society, there are financial considerations for part-time, unfunded, disabled students that must also be considered. Without work, studies cannot continue. Remote ethnography provides an opportunity to continue working, funding both the researcher's studies and the roof over our heads while the work is done.

1.4.2 **Practical use of research**

There is a saying in the disability community, "if you've met one person with X, you've met one person with X," where X is substituted for the disability's name. Ultimately, each person with a brain injury is unique in how their injury presents itself and impacts their day-to-day lives. As Henry, a study participant, explained

> It can be frustrating, but you can't get frustrated at head injury because it is all different. And just because you have one good experience or one bad experience, the next one is not likely to be the same. (Interview)

People with ABIs may share similar symptoms, challenges, and barriers. In sharing their experiences as online students, it enables others with ABI to place themselves into the picture, potentially opening doors to spaces previously believed to be closed to them, as well as providing potential strategies for students and instructors to navigate through the murk of accessibility in online education environments.

Not discounting the possibility that another HE student like me might experience a brain injury in the course of their studies and attempt to seek out

literature to help them navigate their new reality, the potential value of this research includes.

- Instructional designers, course developers, and instructors in HE and the public and private sectors may find the details of student experiences useful when considering accessibility and the potential unintended consequences of their decision-making during the design and delivery of online courses.
- Disability and Accommodations departments within HE and Human Resources departments in public and private sectors may benefit from considering these students' experiences when designing support programs for students, staff, clients, and the general public.
- IT departments within HE and public and private sectors may benefit from considering the experiences of students when procuring software or hardware and in designing IT policies for software and systems access and use.
- Researchers may reconsider concepts of inclusion, participation, and co-design when conducting research involving members of marginalized communities; attending to whose voices they are amplifying, and why, as they plan and design future research projects.
- Parents, guardians, and students may discover new strategies to help them succeed in academic and workplace environments, as well as in social situations.

1.4.3 **Contribution**

This research records how nine university students with ABI might be impacted by online learning. Limited research has been conducted from a student perspective, and what research has been conducted has been completed through the lens of an on-campus student (Schlessman, 2010), disability and student support services staff (Williams, 2015; Williams, 2017), instructional designers (Pettinato, 2013; Kritsch, 2019), or that of former military members who may have experienced unique traumas (Kritsch, 2019; Owens, 2020). As more adult students with non-combat-related ABIs enrol in online courses or

degree-granting programs, it is important to seek out student perspectives relating to how they experience online learning in order to identify potential barriers, learn about mitigating strategies, and determine how these factors might influence design and/or delivery decisions when implementing technology-enhanced instruction.

This thesis provides a valuable and useful contribution to the knowledge and scholarship relating to ABI in the fields of online learning, disability in HE, and disability research by increasing the existing body of knowledge surrounding the experiences of (a) students with ABI in their role as online learners, (b) disabled students as participants in research, and (c) disabled researchers as designers and leaders of research project. This thesis provides three original contributions to knowledge in its (1) provision of an insider perspective, (2) introduction of an inclusive data collection framework, and (3) examination of the importance of instructor impact on student experience.

1.5 Thesis structure

This thesis is composed of six chapters, which are described below:

- **Chapter 1: Introduction –** Introduces the research, beginning with an overview of the personal connection and impetus behind the study, followed by a description of a typical online learner, considerations in research design, the rationale and aims of research, and an overview of the thesis structure.
- **Chapter 2: Literature Review –** Reviews the literature in relation to disabled students and students with ABIs in HE environments, provides an overview of the Literature Review process employed, and introduces challenges of accessing resources for online students.
- **Chapter 3: Methodology –** Introduces the study methodology, context for the study design, location, population and sampling procedure, data collection methods, and a review of ethical considerations for research when partnering with disabled individuals.
- **Chapter 4: Findings** – Presents the findings from the survey, interview and journal artefacts collected in the research as individual case studies,

which involved nine (9) participants from four (4) countries across two (2) continents.

- **Chapter 5: Discussion –** Analyses and discusses the findings from Chapter 4 within the contents of the literature and with reference to the three (3) research sub-questions.
- **Chapter 6: Conclusion –** Presents a reflection on the research project from the perspective of a student with ABI, visits the original aims of the research and key findings, and introduces potential implications for policy, practice, and future research as a practical output of the thesis.

1.6 Summary and next chapter

This chapter began with an introduction to my personal education and disability history and continued with an introduction to the impetus behind the research topic selection. It defined the terms “online course” and “acquired brain injury” for the purpose of the study, introduced the project’s research questions, rationale, potential contributions to the overall body of knowledge, and ended with an overview of the structure of the thesis. The next chapter will provide an overview of the Literature Review process employed during the research project.

Chapter 2: **Literature Review**

2.1 **Overview of this chapter**

This chapter begins with a description of my experiences seeking out pre-existing literature relating to students with brain injuries in online learning environments. It continues with an introduction to theoretical models of disability and outlines their influence on and use within this thesis. It moves on to explore what the literature tells us about features, challenges, and opportunities of online learning and how these may correlate to the experiences of online learners with acquired brain injuries. Later, I provide an overview of the processes I used to collect, collate, and evaluate related literature resources stemming from adjacent disciplines, in order to shed light on challenges I experienced and mitigating strategies I employed during this stage of the research project. The chapter ends with an overview of challenges accessing resources as a part-time online student located on a different continent from their home university, who does not work in an academic environment.

2.2 **The search for self: Empty shelves**

Now in possession of a memory that behaves as part locked box and part sieve, I often find myself relying on external inputs to trigger access to existing memories. Over the years, I have become accustomed to consulting the literature whenever I encounter an unfamiliar symptom, terminology, or experience. Through this search, I discovered that the existing literature on ABI in HE education predominantly centres around the roles and strategies of educators, instructors, IT, and disability support services. There is a significant lack of research focusing on students with ABI from their perspective.

This thesis was motivated by my post-injury search for tools, techniques, and practical support suggestions within both the scholarly and grey research domains. Unable to find research addressing students with an ABI inclusive of our lived experiences, I sought to address this imbalance by prioritizing the

voices of students with ABI, offering a more comprehensive understanding of online learning and the disabled student experience.

Since the onset of COVID-19 in early 2020, there has been an explosion of papers relating to disability and/or online learning. Yet the experiences of students with ABI continue to lack representation, despite the elevated level of cognitive impairments and strokes reportedly resulting from infection (Boldrini et al., 2021; Kormaroff, 2023). Disabled students continue to be a topic of research, as opposed to a partner within a new realm of knowledge development; we are researched on, not with (Fichten et al., 2009; Nind, 2017). In an attempt to explain the thought process behind the research project in an email to a friend, I wrote

> That was also how I discovered there was this big gap in research relating to university students with brain injuries and online learning. Because when I came back, I went looking to the research to help me figure it out how to continue. I wanted to know “what did other people do?” I had problems reading on a screen. I had problems with lights; I had problems with flickering videos. I had problems listening to stuff. So, I began seeking out resources to figure out how to deal with all this. What if you get a video on screen and there's no closed captioning? Or there's no transcript?
>
> I went out looking for a document that said, “Hey, by the way, you have a head injury. Here’s what you need to know to keep up as an online student…” and I couldn’t find it. Instead, I read about the experiences of on-campus disabled students or the perspectives of disability support service providers, instructors, or course designers. Our voice was missing from the conversation. I didn’t need someone who has worked with disabled people to tell me what it’s like to be disabled, I needed someone who has a brain injury to share what worked (or doesn’t) for them and why.
>
> So, I've gone off looking for other people with head injuries who have experience with online learning and said, "Come talk to me, tell me about your experiences. And let's see what we can together come up with to help other people, either other students, or the course designers who are designing the courses or the instructors involved in teaching those courses, to try to make it a better experience all around for everybody. And we'll see what we can learn together." Because right now there's not much out there to help anybody. (S. Semper, email to D.R, March 25, 2021)

Shortly after receiving approval to proceed with my research project, Owens (2020) completed a phenomenological study relating to the online learning experiences of USA military veterans with a combat-related TBI. Describing how the experience of learning has changed for veteran learners with TBI, Owens also explored learning methods and activities her participants used to mitigate their symptoms through the lens of educational and human developmental theories including Bandura's theory of social learning, Zimmerman's theory of self-regulated learning, Schlossberg's transition theory, and Vygotsky's sociocultural learning theory, rather than disability theory (2020). Not unsurprisingly, Owens' (2020) description of participant symptoms and the individualistic nature of disability associated with TBI align with those provided by the participants in this study.

2.3 Disability models and theories: A brief introduction

How we view dis/ability can impact the work we produce and the experiences of disabled students. Less in favour in recent years are the medical and moral models of disability (Berghs et al., 2016; Retief & Letšosa, 2018). The medical model of disability views disabled individuals as deviating from the norm and requiring correction or rehabilitation. Primarily viewing disabilities from a physical framework, it precludes the existence of mental health and neurological-related disabilities (Berghs et al., 2016; Retief & Letšosa, 2018).

The moral model positions dis/ability as being related to the individual or family's character, past deeds, or karma (Olkin, 2022). It can be used as an excuse not to accommodate the needs of disabled students or result in shame and lack of willingness to disclose a dis/ability to others (Kent, 2016; Retief & Letšosa, 2018). While not the lens through which I prefer to view dis/ability, I would be lying if I denied its impact on my own experiences with disclosure. The medical and moral models heavily influenced my decision to hide the nature of my brain injury in the past at both work and educational environments, and in social situations. Throughout my interactions with study participants, I actively worked to overcome my natural tendency to hide my disabled self.

The social model of disability situates disability in the world between socially constructed barriers, physical environment, and policy structures that, by design or default, exclude or disable people from full participation (Berghs et al., 2016; Retief & Letšosa, 2018; Purtell, 2013). This model distinguishes between “impairment”, the reduction in function resulting from an individual’s constant physical or mental state, and “disability”, that which becomes the dis/abling factor for someone with an impairment to function or participate on an equitable basis. In the social model, the focus on the “barriers, discrimination and oppression” experienced by disabled people acknowledges that individuals can be “‘disabled’ by the society they live in and by the impact of society’s structure and attitudes” rather than by their impairments. (Purtell, 2013, p. 26).

McRuer’s (2006) Crip theory expanded the social model to include queer disability studies and emphasizes an intersectionality between disability and other forms of inequality, including race, gender, and sexuality (Hanebutt & Mueller, 2021). Highlighting the compounding inequities experienced by disabled individuals in their day-to-day lives (McRuer, 2006), At its core, Crip theory challenges the deficit perspective of disability, encourages researchers to seek a more holistic understanding of disability, and encourages educators to rethink how they support and engage with disabled students (Hanebutt & Mueller, 2021). Hanebutt and Muller (2021) emphasize the reciprocal relationship between disability studies and educational practices. Noting that when disability is viewed as an integral part of one’s identity, rather than a medical condition to be fixed, or an external or systemic barrier existing within society, recognition of the inherent value and richness of disabled experiences can occur (Hanebutt & Mueller, 2021).

“Crip tax”, a concept likely introduced by Weeber (1999), and sometimes recognised as an offshoot of Crip theory, is a colloquial term used in the disability community (Blanchard, 2020; Katzman et al., 2024). “Crip tax” recognises the additional, often hidden to non-disabled members of society, costs associated with being a disabled individual in society (Blanchard, 2020; Katzman et al., 2024). Blanchard (2020) expanded the financial and social

understanding of “crip tax” to include elements of the concept of “crip time” noting that not only is “crip time” inclusive of the experience of lived time by disabled individuals, but it also encompasses the temporal time it takes disable individuals to accomplish tasks (Katzman et al., 2024). Emens (2021) further expanded the idea of disability taxes, or the “crip tax” to include non-financial costs imposed on disabled individual, which place additional stress on their time, mental, and physical wellbeing and are often related to administrative burdens placed on the disabled in their attempts to interact within established society (Katzman et al., 2024).

2.3.1 **Use of models and theories**

When reviewing the experiences of disabled students through the lens of the social model, it quickly becomes apparent how frequently disabled students encounter barriers to participation because of social and environmental factors inside and outside of the classroom. Examples of social or environmental (technical) factors which can disable impaired students from equitable participation in online learning courses include (1) an instructor policy surrounding enabling transcription or recording functions in a virtual classroom (VC), (2) a choice to scan degraded photocopies or hand annotated articles and uploading the scanned file as a reading assignment, or (3) setting a requirement to verbally participate in seminar sessions to meet grade requirements.

Employing the social model for disability to deconstruct the disabled student’s experiences helps identify elements outside of the control of students as they participate in online learning but does not fully encapsulate the whole of the disabled student’s experience. While the social model addresses societal barriers broadly, Crip theory delves deeper into how these barriers intersect with other forms of discrimination and oppression. This thesis incorporates Crip theory’s intersectional examination of the factors influencing disability (McRuer), along with the inseparable nature of disability from the self (Hanebutt & Muller, 2021), with the concept of “crip tax” (Blanchard, 2020; Katzman et al., 2024) to emphasize the unique and multifaceted challenges experienced by

individuals with disabilities, providing a more comprehensive understanding of their experiences.

Positioning the thesis within these frameworks underscores the importance of addressing both societal barriers and intersecting inequalities to create a more inclusive and equitable environment for individuals with disabilities.

2.4 **Choices of prior research**

Initially unable to find prior research available on the topic of the experiences of students with ABI in online learning, I branched out into related fields of research to provide the initial grounding for the project, including assistive devices, distance education, disability studies, instructional design, and technology-enhanced learning.

Along with examining journal articles and books, I spent time reviewing grey literature; reading blogs, newspaper and magazine articles, memoirs, and social media posts in established online communities on Facebook, Reddit, and Twitter, searching for connections to or a reflection of my own experiences to learn from.[2]

2.4.1 **Online learning**

The term “distance education” was coined by the University of Washington in 1892, and its meaning has evolved over the centuries, shifting and changing as technologies advance (Oxford Learning College (OLC), n.d.). In the 1700s, distance education took the form of correspondence courses, with Caleb Phillips' shorthand correspondence course, advertised in Boston, MA, in 1728, being one of the first documented examples (Gershon, 2020; OLC, n.d.; World Wide Learn (WWL), n.d.). The first distance learning degree course was offered by the University of London in 1858, and by the 1920s, distance education

[2] Participation in Twitter disability communities occurred prior to the company’s sale and rebranding to “X”. Twitter alternatives, such as Bluesky and Threads had not yet launched.

courses were broadcast via radio signals, with American colleges and universities in Pennsylvania and Iowa becoming some of the first early adopters of this delivery method (Gershon, 2020; OLC, n.d.; WWL, n.d.). In 1953, television options were introduced, followed by phone-based learning for physicians in 1965 and, in the same year, the University of Alberta launched its first online course (OLC, n.d.). Computer-based learning became more popular in the 1980s, while a mixture of synchronous and asynchronous internet-based learning became more prevalent in the mid to late 1990s (Gershon, 2020; OLC, n.d.). Massive Open Online Courses (MOOCs), introduced by the Massachusetts Institute of Technology in 2012, opened access to online learning opportunities to the general public.

Online learning has seen steady growth in academic and professional development course enrolment ever since in both in the USA and Canada (Grinder et al., 2019; Johnson, 2019; Kotera et al., 2019), while appearing to be on the decline in the United Kingdom (UK) (Gardner et al., 2021; Kemp, 2019; Kotera et al., 2019) prior to the introduction of the Covid-19 virus (OLC, n.d.). There has been a movement in recent years to shift professional and apprenticeship programs in the UK to online courses, which may counteract this trend in the UK as HE institutions resume face-to-face course delivery options post-COVID closures of physical locations (Higher Education Statistics Agency (HESA), 2020; Kotera et al., 2019).

2.4.1.1 **The (typical) online learner in HE**

Prior to COVID-19 forcing the world-wide adoption of online course delivery as a response to Government initiated pandemic safety measures (Wong, 2020), the typical online learner enrolled in HE courses is older (24-50 years), works full time, and is often seeking to improve work prospects through the quickest and most affordable path to completion (Gardner et al., 2021; Ilgaz & Gulbahar, 2017; Magda et al., 2020). They frequently reside off-campus and attend courses part-time (Grabowski et al., 2016, National Centre for Education Statistics, 2017). While online learning is global in nature, 70 percent of online learners in the USA self-identify as being located within 100 miles of their HE

campus (Clinefelter & Aslanian, 2015; Magda et al., 2020). Due to their age, online learners are often caregivers of children or other family members, which may limit their ability to attend traditional classroom-based courses due to scheduling and family commitments (Dos Santos, 2022; Gardner et al., 2021; Ilgaz & Gulbahar, 2017).

2.4.1.2 **Benefits of online learning**

In my earlier research relating to adult student persistence factors in successful completion of an online Master's degree, I noted the influence marketing emphasizing the flexibility of "time, place, and space" (Semper, 2020, p. 2) in adult learners' selection of and enrolment in online learning options (Dos Santos, 2022). Along with the potential for improved employment prospects and higher future earnings (Daniel, 2016; Gardner et al., 2021; Naidu, 2017b), online learning has been presented as an option for adult learners to balance work/life and economic factors, including financial situation, transportation access, caregiving roles, and employment schedules (Dos Santos, 2022; Gardner et al., 2021; Semper 2020). Online learning has the potential to increase access to educational options by enabling students to participate from anywhere in the world.

Attracting students by offering flexible scheduling, increased physical accessibility through a reduced dependence on transportation and encounters with physical space, and less time to completion, online learning often comes at a reduced overall cost (Gardner et al, 2021; Ilgaz & Gulbahar, 2017). With online learning, students can learn anytime, anywhere, enabling them to remain within their current communities or existing employment while improving their career prospects through knowledge and skill development, while continuing to fulfil existing familial roles such as parent or caregiver (Gardner et al. 2021; Semper 2020).

In 2004, Bernard et. al noted the potential for media to "transform the learning experience in ways that are unanticipated and not regularly available in face-to-face instructional situations" (p. 382), highlighting online learning's linkages to increased reflection, improved writing skills, and development of problem-

solving and critical thinking skills (Dos Santos, 2022). Advancements in VC and social networking platforms have continued to offer online learners a variety of methods to connect with instructors and develop social connections with their peers through collaboration and interactions both inside and outside of structured education settings (Dos Santos, 2022). Online learning offers students multiple avenues to acquire information, demonstrate what they know, and remain engaged with the learning process (Alamri & Tyler-Wood, 2017; Cumming & Rose, 2021).

For the disabled student, online learning opens a world of choices including scheduling, cost, content/topic focus areas, level of study (single course, certification, degree, etc.), preferred level of engagement, student and institution locations, resource access, along with delivery options including synchronous and asynchronous lectures and activities geared toward cohort and/or individual study (Daniel, 2016; Gardner et al., 2021; Naidu, 2017b). When supported within the online learning environment, Fotiadou et al. (2017) highlight students' ability to become more autonomous in their learning, allowing for the self-directed and self-paced manner of many online learning activities, and online learners' requirement for instructor support in developing their self-efficacy and self-responsibility for task completion. Allday and Allday (2011) found no significant difference between students with or without disabilities in terms of learning and performance in online learning environments, unlike the traditional classroom environments, where disabled students are more prone to falling behind in relation to their non-disabled peers.

2.4.1.3 **Challenges of online learning**

Semper (2020), identified challenges facing online learners in a graduate degree program as “coursework, difficulties accessing materials or services, geographic location impacting technology, juggling time zones, access to study spaces, and stressors relating to time, family, and employment” (p. 11) while other researchers have noted that technological challenges and student technical skill levels are often inseparable from online learning (Chang & Kang, 2016; Gardner et al., 2021). Gardner et al. (2021) highlighted that the time

management challenges faced by adult learners “may be some of the factors that influenced them to enroll in online courses in the first place” (p. 179).

In their exploration of group work online, Chang and Kang (2016), identified “unsynchronized communications between the instructor and learners and learners and learners, different time zones, lack of visual cues, students’ hidden identities, and limited verbal communication cues” (p. 73) as part of the overall “nature of online learning” (p. 73). However, these characteristics are not limited to online group work and can play a larger factor in the online learner’s general experiences of their programs and courses.

Blake (2013) notes that while technological advancement “represents a catalyst for change, or even reform” (p. 13) in how and where we learn, technology itself is “theoretically and methodologically neutral” (p. 12) and requires constant updating and continuing education on the part of its users. Blake (2013) highlights that while technology may be neutral, how it is employed is not. Student success levels in online courses are subject to the skills, knowledge, and attitudes of policy makers, technology support staff, and the pedagogical beliefs of course instructors (Blake, 2013).

Koutsoupidou (2014) discussed the potential for online learning to foster feelings of isolation and disconnect from peers, while instructor interaction levels, including frequency and immediacy of feedback, can cause disengagement with the course materials (Aguerrebere et al., 2018; Farley, 2010). Naidu (2017a) outlined how the “degree of structure and guidance“ (p. 1) provided as part of the course design or instructor interaction has the capacity to promote student independence as well as increase student isolation, procrastination, or attrition. While there’s often a legal obligation for educational institutions and their staff to provide “reasonable adjustments” (Fossey et al, 2017, p. 3) to support disabled student learning, teaching, and support staff may not have sufficient knowledge, skills, and experience to provide the required accommodations (Katzman et al, 2024).

Institutions and individuals are becoming more aware of privacy concerns and regulations within online environments, leaving course developers, instructors,

technology support services, disability support services, disabled students, and their peers struggling to find an appropriate balance (Chang, 2021). When disabled students' access needs conflict with instructors' or peers' skills, knowledge, or personal preferences, disabled students may find themselves being refused accommodations, regardless of their inclusion in an official individual student learning plan from the institution or the organization's policy guidelines (Griful-Freixenet et al., 2017; Kent, 2016; Katzman et al., 2024).

2.4.2 **The (disabled) online learner**

Much of the limited research relating to disabled students enrolled in online HE does not limit their participant pools to specific disabilities (Ilgaz & Gulbahar, 2017; Kotera et al., 2019), making it harder for individuals with those disabilities to find research applicable to their own experience. Those that do focus on specific, invisible disabilities, such as mental health-related disabilities, are often limited to the experiences of on-campus students or on learning disabilities such as dyslexia (Habib et al., 2012; McManus et al., 2017; Reyes et al., 2023).

Singleton et al. (2019) report that over half of HE students in the USA receive their disability diagnosis after completing their lower-level or K-12 studies. These students are less likely to self-identify as disabled and more likely to be unaware of available support services and accommodations (Cumming & Rose, 2021; Katzman et al., 2024; Singleton et al., 2019). Regardless of the time of diagnosis, many disabled students are wary of disclosing their disabilities to others (Grimes et al., 2021; Katzman et al., 2024; Pickup et al., 2024), signing up for accommodations and support services (Fichten et al., 2009; Katzman et al., 2024), or using assistive technologies in view of others (Pickup et al., 2024; Piculo dos Santos et al., 2022).

While more able to hide their disability than someone with a visible physical disability, McManus et al. (2017) explain that students with invisible disabilities may encounter additional barriers relating to "lack of awareness from staff about their disability and what would constitute reasonable study adjustment" (p. 337). These students may experience additional stress, isolation, and

negative pressures on mental health as a result of attempting to hide an inherent part of themselves (Katzman et al., 2024; Nario-Redmond et al., 2012; Nario-Redmond, 2019).

Disability accommodations are typically based upon a medical model of support, requiring students to initiate contact with disability support services and disclose their disability (Cumming & Rose, 2021; Dolmage, 2017; NEADS, 2018; Singleton et al, 2019). Funding for disability accommodations varies widely based on country or region, nature of the disability, and financial need. Additionally, funding may be assigned directly to individual students or to institutions for the provision of disability related services. Service access often includes a requirement for the provision of supporting documentation in the form of academic or medical records (Cumming & Rose, 2021), raising the potential for privacy concerns and additional financial burdens for the student (Dolmage, 2017; Katzman et al., 2024). Once these barriers are surmounted and an inclusive learning and support plan (ILSP) has been generated for the student, they must continue to disclose their disability to each new instructor they encounter in order to access the recommended accommodations (Cumming & Rose, 2021; Dolmage, 2017; Katzman et al., 2024).

Distributed across four categories of impairment, including visual, hearing, motor, and cognitive (Crow, 2008), disabled learners face unique challenges (Katzman et al., 2024; Pittman & Heiselt, 2014). They are more likely to have lower levels of access and ability to navigate existing websites, learning platforms, and instructional resources (Crow, 2008; Fichten et al., 2009; Pittman & Heiselt, 2014). Disabled students spend more time and effort in coursework than students without disabilities (Kent, 2016), may experience higher stress levels and anxiety, as well as experience reduced self-esteem and imposter syndrome (Katzman et al., 2024; Kotera et al., 2019; Pickup et al., 2019).

Institutional course deployment and delivery decisions, such as those made by staff in IT departments, course developers, and instructors, can create additional barriers for disabled students. Instructor attitudes and behaviours

remain a key barrier for disabled students (Cumming & Rose, 2021; McManus et al., 2017). Absent training in instructional design, effective teaching methods, and the needs of disabled students, some faculty members challenge the notion that disabled students should be provided reasonable accommodations in the name of fairness to other students (Cumming & Rose, 2021; Griful-Freixenet et al., 2017; Nario-Redmond, 2019) while others struggle with understanding their role within the accommodations process (Cumming & Rose, 2021; Singleton et al., 2019). Decisions relating to which features to enable or disable within the learning management system (LMS) and educational software settings, selection of font size and colour, and file navigation designs may make the system inaccessible to visually or cognitively impaired students (Fichten et al., 2009; McManus et al., 2017). Bostic (2022) and Pickup et al. (2024) describe design activities such as inconsistent file structures and naming conventions, dis/abling or disregarding accessibility functions such as ALT Text, scanning poor quality annotated print documents into PDF files, locking a PDF file or webpage to disable print functions, and the timing of document release within a course can all negatively impact disabled students in ways not experienced by non-disabled students, increasing the inaccessibility of online learning platforms and materials and creating what McManus et al. (2017) describes as “learning environments that are chaotic and confusing for students” (p.337).

2.4.2.1 **The online learning environment for disabled people**

Online learning has many benefits for disabled students. It removes the requirement for physical transportation to a traditional brick and mortar school, reduces reliance on time and space considerations when selecting programs and institutions, allows students to continue to work full-time or manage family caregiving responsibilities, enables repetition of educational tasks, such a repeated listening to a recorded lecture, and offers flexible scheduling options (Ilgaz & Gulbahar, 2017; Magda et al., 2020).

In an online educational environment, disabled students may no longer encounter obvious physical barriers such as broken elevators or non-

functioning automatic doors, which impact wheelchair users and students with mobility issues. However, these environments are not without their own barriers to access and learning (Crow, 2008; Pittman & Heiselt, 2014; Fichten et al., 2009).

Software companies such as Microsoft are actively working on improving the accessibility of their programs (Smith, 2021; Velush, 2023). However, decisions made at the deployment and delivery levels by IT departments, developers, and course instructors can impact disabled students in easily anticipated ways (Fichten et al., 2009; Pickup et al., 2024). Use of “a chat interface which cannot be accessed using dictation software”, “inaccessible content, such as image-based PDFs which cannot be read by screen reading software”, “fixed font size of materials on websites”, and confusing online structures “to access online maps and images” create barriers to access for students with visual impairments (Fichten et al., 2009 pp. 250-51). Offering “video clips without captioning (subtitles)” make these resources inaccessible to students with hearing impairment, while “confusing structures for web pages for students with learning disabilities” make these resources inaccessible to students with cognitive or motor impairments (Fichten et al., 2009, pp. 250-51). Something as simple as not releasing presentation and or resource files in advance of a lecture, limiting a student’s ability to pre-load the files into their preferred disability support software, such as screen reader or text magnification software, are all examples of how design and implementation decisions made during course development can negatively impact disabled students. Some of these decisions may be related to cost, ease of access, personal preferences of instructors, or misunderstandings relating to accessibility and privacy-related legislation (Fichten et al., 2009; Pearson & Koppi, 2002); regardless of the underlying motive, the burden of learning to manage through these decisions is often borne by disabled students.

2.4.2.2 **Using existing technology as assistive technology**

Technology has evolved significantly between my initial injury and today. The internet was in its infancy in the public realm in the mid-1990s; today, we carry

computers in our pockets and purses. Our understanding of online learning design and delivery, and of how we treat individuals with ABIs, has continued to evolve throughout the decades, as have the incidences of ABIs in the general public. Yet despite this, we have yet to investigate how students with ABI experience online learning or what common everyday technologies they may be using to assist them in their attempts to complete their online coursework (Hart & Vaccaro, 2017; Pickup et al., 2024; Wong et al., 2019). This provided an avenue for additional exploration.

As computer and smartphone applications continue to evolve, they have begun to replace universities as the source for development and provision of assistive technology services and systems to students (Fichten et al., 2014; Pickup et al., 2024). Foley and Ferri (2012) argue that technology developers should step back from the current mindset of developing assistive technology to address a disability specific use-case and instead focus on the development of inclusive and accessible technology as a whole. As with much of the research involving disabled individuals, the inclusion of disabled voices during the design, development, and testing phases for technology development is often lacking (Fichten et al., 2014; Winters et. al., 2020).

2.4.2.3 **Universal Design for Learning (UDL)**

Studies relating to the challenges and necessity of designing accessibility into online learning date back at least 20 years (Asuncion & Fichten, 2003; Fichten et al, 2009; Pearson & Koppi, 2002). Inspired by Mace's architectural concept of "universal design", the process of designing the physical environment to include built-in accessibility features from the onset, UDL, is based in neuroscience and neurocognitive fields (Black et al., 2015; Center for Applied Special Technology (CAST), 2018; Cumming & Rose, 2021). The UDL framework, introduced by David H. Rose in the 1990s, was intended to reduce barriers to learning for all students, regardless of location, ability, or preferred learning style (CAST, 2024; Evmenova, 2018). Foley and Ferri (2012) have critiqued UDL's premise of creating learning resources and experiences capable of providing equitable and universal access to all students, "even when

products that have gone through a UDL design process might not be universally accessible in practice" (p. 199).

While similar to UDL in origin and often referred to interchangeably, Universal Instructional Design (UID) and Universal Design for Instruction (UDI), should not be confused with UDL (Black et al., 2015; Cumming & Rose, 2021; Rao & Tanners, 2011). UID and UDI centre the instructor and course developers in the development of inclusive classroom instruction with UDI guidelines focused on the creation of alternate means for content delivery and UID focused on the selection and adaptation of instructional strategies to benefit a larger range of learners (Black et al., 2015; Cumming & Rose, 2021). Implementation practices for UID and UDI appear to rely more upon selecting the appropriate tool from a pre-existing toolkit to support an individual student's accommodations needs as identified in their ILSP than on the provision of usable and accessible materials or methods for every student at all times (Cumming & Rose, 2021). UDL is student-centred, offering the potential to create multiple pathways to learning for students with and without disabilities, minimizing the need for individual accommodations (Evmenova, 2018; Rao & Tanners, 2011; Singleton et al., 2019).

UDL Framework principles include presenting information in different formats, allowing students to approach learning tasks in a variety of ways and to demonstrate their learning using their preferred method, and offering options to engage students and keep their interest (CAST, 2018; Rao & Tanners, 2011; Singleton et al., 2019). Implementation guidelines built upon this framework have a goal to "ensure that all learners can access and participate in meaningful, challenging learning opportunities" (CAST, 2018).

In the USA, accessible learning environments are described as ones that provide those with disabilities with

> the opportunity to acquire the same information, engage in the same interactions, and enjoy the same services as a person without a disability in an equally effective and equally integrated manner, with substantially equivalent ease of use. The person with a disability must be able to obtain the information as fully, equally, and independently as a person without a disability. Although this might not result in identical ease of use compared to that of persons without disabilities, it still must ensure equal opportunity to the educational benefits and opportunities afforded by the technology and equal treatment in the use of such technology (US Department of Education, 2013, para. 3).

Relying on technology to connect learners with their instructors, peers, and learning materials, online learning environments are well-suited to UDL and can result in improved academic outcomes for learners (Evmenova, 2018). Griful-Freixenet et al (2017) argue that the success of UDL relies on disabled students both recognizing themselves as disabled and having sufficient self-awareness to self-advocate for their accommodation needs, while Singleton et al. (2019) note that the discrepancies between what faculty members perceive about their use of UDL strategies and their actual implementation play a significant role.

2.4.3 **Online learning with ABI**

It is estimated that 69 million people worldwide sustain an ABI each year, equating to 1.3 million individuals in the UK with a lifetime prevalence of between 8-12% of the population (Dewan et al., 2018; Parsonage, 2017; Williams et al., 2018). Steadily rising in the UK since 2005 at an overall rate of 9%, ABI is the leading cause of acquired disability for individuals under 40 worldwide (Dewan et al., 2018; Parsonage, 2017; Williams et al., 2018). The resulting physical, cognitive, emotional, and behavioural impacts mark significant changes to people's lifestyles, coping methods, learning abilities, and cognitive and motor skills (Maas et al., 2017; Parsonage, 2017; Williams et al, 2018). While the incidence of ABI remains highest in males overall, incidents of ABI in the UK have shown an overall increase in females of 18% from 2005-2017, and individuals falling under the classification of head injury

have increased 23% over the same period (Headway, 2018; Williams et. al., 2018). Head injuries and ABI are being reported at an increasing rate, and the overall number of students enrolling in UK universities with known disabilities increases each year (HESA, 2020); however, little is understood about how their injuries may impact students' ability to participate in an online learning environment.

Students with invisible disabilities, such as brain injuries, neurodevelopmental disorders (Habib et al., 2012), or mental health disabilities, may share common physical symptoms such as lower vision, audio processing issues, motor impairments, or cognitive deficits (Davis et al., 2019; McManus et al., 2017; Williams, 2017). What makes a student with ABI unique is the potential for multiple cognitive, physical, and psychological impairments to be combined in a single individual (Goldman et al., 2022; Kent, 2016; Williams, 2017). Further complicating matters, the symptoms or deficits experienced by students with ABI will present in a unique fashion and may be any combination of "somatic symptoms (e.g., nausea, dizziness, headache, blurred vision, auditory disturbance, and fatigue), cognitive complaints (memory and executive function), emotional, and/or behavioural problems (e.g., disinhibition and emotional lability)" (Polinder et al., 2018, p. 2). Notwithstanding ABI-specific symptoms, the potential also exists for a student with ABI to have been previously diagnosed with a chronic illness, physical disability, learning difficulty, or mental health disability (Goldman et al., 2022). Combined, these physical and cognitive impairments have the potential to confound students with ABI, as well as their instructors, course developers, and disability support staff, when they participate in online learning.

Executive function deficits, also associated with neurodevelopmental disorders such as attention deficit hyperactivity disorder (ADHD), are a common result of ABI (Kotera et al., 2019; Williams, 2017). Impaired executive function may reduce a student with ABI's ability to plan or organise thoughts and materials, or sustain attention and focus on tasks, visual, or auditory input (Kent, 2016; Kotera et al., 2019; Williams, 2017). Additional challenges relating to information processing, memory and recall, concentration, problem solving,

and time management may also present in students with ABI (Kent, 2016; Williams, 2017). Similar to students experiencing mental health disabilities, students with ABI may experience emotional dysregulation and stigma (Davis et al., 2019; McManus et al., 2017) or experience challenges with social interactions (Kotera et al., 2019; Williams, 2017). Students with ABI may also share skill deficits associated with reading, note-taking, and organizing written text to demonstrate knowledge, commonly experienced by students with dyslexia and dyspraxia (Habib et al., 2012; Kent, 2016; Kotera et al., 2019).

The multi-faceted nature of many students with ABIs disability may help to explain the “slower rate of progression through their degrees” (Kent, 2016, p. 125) experienced by these students. Management and mitigation of cognitive and physical fatigue resulting from their injury may result in significant delays in program completion (Kent, 2016). This, in turn, places additional financial stress upon students with ABI.

Learning systems and educational resource design may compound students’ physical and cognitive issues (Fichten et al., 2009; Kotera et al., 2019). It may be difficult to find information on university or college websites, or the content on these sites may not be accessible to all users. These barriers may be mitigated through the use of accommodations such as the provision of materials in alternate formats, assistive technologies, and disability support services (Davis et al., 2019). Assuming they are aware of the existence of accommodations to begin with, students with ABI are often expected to self-advocate in order to receive them (Cumming & Rose, 2021; Davis et al., 2019; Griful-Freixenet et al., 2017). This may result in the student opting out of pursuing accommodations, in fear of being characterised as different from their peers (Childers & Hux, 2016; Griful-Freixenet et al., 2017; Davis et al., 2019).

The implementation of UDL principles in the creation of learning resources and content management systems can improve student access to online learning environments (Burgstahler, 2021; CAST, 2018), increase student engagement, and reduce reliance on instructors for the provision of students’ accommodation-specific needs (Cumming & Rose, 2021). Designing learning

with intent, such as designing materials around the use of screen readers, text-to-speech technologies, and enabling the ability to enlarge fonts, improves access for students experiencing lower or decreased vision because of their injuries. Students experiencing audio processing challenges may benefit from access to session recordings, closed captions, or transcripts; functions that exist in many virtual learning meeting platforms but may not be enabled for student use.

2.5 Bias and assumptions

Despite sharing a number of potential symptoms, including physical and/or neurological impairments, no two individuals with ABI will experience the same injuries and outcomes (Belmont et al., 2009; Johansson et al., 2009; Johansson & Rönnbäck, 2014). As someone with ABI, I primarily sought out disability research relating to ABIs as opposed to research relating to neurodivergent student bodies where participants were born with neurological conditions such as Autism, ADHD, or Cerebral Palsy. Moreover, much of the pre-existing disability research reviewed was performed on, as opposed to with, disabled participants. This methodological choice by other researchers informed my later decisions to centre participants and their needs in alignment with the crip theory (McRuer, 2006) and the critical disability perspective described in Chapter 2, sections 2.3 and 2.3.1, when designing my research project.

2.5.1 Products of our environments

Our experiences are coloured by the worlds we live in and the systems we interact with. Disability related laws and regulations that influence HE institution-wide decisions relating to the development and delivery of online programming and disability support services vary from country to country, and, at times, from region to region within the same country.

Self-selected, volunteer participants for this research project hailed from Canada, the United States of America (USA), England, and Scotland. They participated in online courses offered by HE institutions in their Home countries and in Australia. Their countries of origin, selection of HE institutions in relation

to where they lived, or enrolment in courses offered through HE institutions in a country that was not their primary residence, not only coloured their experiences in online learning environments but also provided additional unique areas of exploration during the research process.

I am Canadian, steeped in USA-based media, completing PhD studies at a university in England, and concurrent professional development studies offered through Canadian and USA-based institutions.

To provide additional context for both the data and analysis presented throughout this thesis, an effort has been made to provide the country of origin for references to statistical data. Additionally. participants' physical locations, and where different, the locations of participants' HE institutions, have been provided in the Chapter 4 case study titles to help provide additional context relating to the world(s) participants operated within.

2.6 **Managing incoming literature**

My ABI has changed how I think, which in turn impacts my decision-making and behaviour. Over time, I've come to realise that once you accept that you are an unreliable narrator with a faulty memory, you recognise that you sometimes need to make an extra effort to explain both the *why* and the *how* behind your work. How I move from point A to B to C is not always clearly understood by others. It is important to me to explain the processes I used to collect, collate, and evaluate related literature resources stemming from adjacent disciplines, in order to shed light on challenges experienced and mitigating strategies employed during this stage of the research project.

I conducted a literature search of Taylor & Francis, SAGE Journals, EBSCO Host Journal, and ERIC database, using key words "brain injury", "disability", "online", "student", "higher education", "college", and "university". Literature alerts using the same terms were created in content alert services Scopus, Stork, and Google Scholar. As search results were found or email alerts were received, the resource abstracts were reviewed to determine potential applicability to the research topic.

Resources flagged for review were downloaded in PDF format and saved within a folder structure that broke out the resources based on the topic area. These focus areas included but were not limited to Accessibility, Brain Injury, Brains, Co-produced Research, Disability Recruitments, Identity-first Language, Inclusive Research, Online Disability, and Research Methodologies.

The content of the resources within the folders was skimmed and renamed to include a prefix flag to indicate the major area of focus. For example, a resource relating to traumatic brain injury was flagged as “TBI” while others relating to time management or perception of time were flagged “TIME”. An additional flag of “READ” was added to any resource selected to be reviewed in detail.

After the initial classification of resource contents was completed, all documents were organised into a “To Read” or “Archive” sub-folder within their designated focus area. Once resources from the “To Read” folder were reviewed in detail, a determination was made regarding their relevance to the study. Papers deemed relevant were moved to a “Lit Review” folder.

The Reference lists of resources contained within the “Lit Review” folder were reviewed to determine if the cited content could also be relevant to the study. Google Scholar was then used to determine if these documents had been cited by others. Resources retrieved from cited references searches were managed in the same manner as previously described.

Once the classification of documents was completed, I printed and read the seemingly relevant documents. Handwritten notes were made on the documents, and specific passages were highlighted where appropriate for the project. These notes and quotations were transferred to an Excel file, which contained the citation details for the resources.

The choice to use Microsoft (MS) Excel to manage project-related literature over more academically oriented software packages such as Clarivate’s EndNote, QSR International’s NVivo, or Elsevier’s Mendeley was born of necessity. In an example of the type of how “crip tax” (Blanchard, 2020; Katzman et al., 2024) creeps into the everyday life of disabled students with

ABI, during the recovery period immediately following my accident, I discovered that it was difficult for me to learn new software packages or how to use new hardware systems.

New information doesn't "stick" in my brain as easily as it did in the past, and new skill development is impeded by difficulty in encoding information from short-term to long-term memory since my most recent ABI. Reviewing my research journal notes from this period, I found repeated mention of attempts to manage documents and notes through NVivo and Mendeley being a constant source of frustration. I had to re-learn the steps to access or edit information each time I opened the software. In my research journal, I had written

> I don't know where I've placed things anymore. Words. Written notes. My mind. I've tried using an iPad to read papers – or have the software read the papers to me – but it hasn't been the miraculous solution to my problems that I had hoped. When it comes to technology, I'm fine with anything I knew how to use in the past but struggle to use new-to-me hardware and software. (Research journal, November 16, 2022)

While in another research journal entry, I noted

> I can't remember the steps to find documents or open apps. Sometimes I'm sure I spend more time trying to document all the systems I now have in place to help remember how to do simple tasks, to continue to function, than I do in completing the tasks themselves. Unless it's reading or writing of course. (Research journal, February 9, 2023)

MS Excel, which I had been familiar with for over 25 years, had been the backbone of data entry and analysis throughout my undergraduate and master's program research projects. Luckily for me, I was able to recall how to use the software with limited challenges once the program was loaded. I couldn't remember where I had put down my pen, but I could remember how to use a spreadsheet program. In this one area, I could rely on "past me" to help "current me" navigate this step in the literature review process.

2.7 **Resource access challenges**

While the World Wide Web and connected digital libraries are a boon to modern students, researchers in online-based programs who do not work in academic environments experience additional challenges accessing literature for their projects. Frequently, these students are limited to materials accessible through the digital library collection for their home university and do not typically qualify for access to evaluation copies of resources from publishers. This can limit researchers to relying on materials available within their Home university or local public library's digital collections or may result in their paying hundreds of pounds (or dollars, depending on the physical location of the student) to access resources through local or online bookstores or direct from the publisher when open access license materials are not available.

Additionally, some libraries may not purchase licenses for digital copies of physical resources held within their collections. Obtaining physical copies of books, or inter-library loans of print materials, comes at a cost as well. While not always accompanied by a monetary fee, costs may be paid through the research schedule. If available, print resources are typically shipped through standard mail services and can take weeks to arrive at their destination. Service shutdowns, such as postal strikes or work-from-home mandates as experienced during COVID-19, can further impede access to print materials.

These challenges accessing research materials may prompt researchers, like me, to choose between pausing and restarting their literature review process as they wait for materials to arrive, or to continue on with their research, relying more heavily on accessible academic journal articles than on books, which may provide more in-depth explorations of a topic. In another example of "crip tax" (Blanchard, 2020; Katzman et al., 2024) and intersections of identities and societal barriers for disabled researchers, when my own research was impacted by geographical, financial and temporal constraints, I opted to make use of the accessible options within the university library's digital collection, and books I could access through the local library system.

2.8 Summary and next chapter

This chapter began with a description of my experiences seeking out pre-existing literature relating to students with brain injuries in online learning environments. It continued to introduce theoretical models of disability and positioned the research within these critical disability frameworks before moving on to explore what the literature tells us about features, challenges, and opportunities of online learning and how these may correlate to the experiences of online learners with acquired brain injuries. Later, I explored what the literature tells us about features, challenges, and opportunities of online learning and how these may correlate to the experiences of online learners with acquired brain injuries. The chapter ended with an overview of challenges accessing resources as a part-time online student located in a different continent from their Home university who does not work in an academic environment. The next chapter will introduce the research project's methodology, theoretical framework, and data collection and analysis methods.

Chapter 3: **Methodology**

3.1 **Overview of this chapter**

This chapter introduces the chosen study methodology – remote ethnography – as enacted through practical, inclusive data collection methods designed to support each participant's unique requirements. It introduces the study design, location, population, and sampling procedure, describes how I and the participants worked together to co-construct data collection processes, the data collection instruments, and how the resulting data were analysed. The chapter ends with a review of ethical considerations for research when partnering with disabled individuals.

3.1.1 **Research aims**

This research intends to increase the body of knowledge surrounding the online student experience as it specifically relates to students with ABI. By exploring how this student population perceives and responds to their experiences as online learners, educators can be better equipped to support these students during the design and delivery of their online courses.

In exploring how students with ABI experience online learning, the following research questions were used as a guide:

> RQ1: In what ways do students with ABI experience find learning opportunities in an online context?
>
> RQ2: In what ways do students with ABI experience encounter barriers in an online context?
>
> RQ3: What mitigation strategies (if any) do students with ABI experience use?

3.1.1.1 **Mitigation: The element of control**

The choice to include the word “mitigation” in RQ3, while conscious, calls attention to a wider issue within the lived experience of disabled individuals: the element of control.

At the surface level, adding “mitigation” to RQ3 reflects my own bias at the starting point for my research. Its use underlines my initial motivation to seek out practical options to assist students with ABI in succeeding in their online learning environments.

Incorporating “mitigation” in RQ3 also acknowledges the lived reality of some disabled students. These students may experience a disconnect between their accommodation needs and the real-time delivery of institutional or government-mandated services designed to support student learning. Attempts to resolve barriers to learning may take time, expend limited cognitive and physical energy, impact student finances, or affect the student/instructor relationship in ways the disabled student is unwilling to undergo. Its use recognizes student agency in the choices they make as participants in online learning opportunities by focusing on methods within their direct control.

3.2 **Methodology**

This reflective, remote auto-ethnographic study provides an opportunity to explore the experiences of other students with ABI as they navigate their online courses.

Ethnography involves learning with research participants as well as learning about them; studying people within their everyday contexts, enabling participants to share a contextual and reflexive view of their world where truth is generated between myself as the researcher and the participants (Bamkin et al., 2016; Savage, 2000). In critical ethnography, the researcher is intrinsically linked to those being studied; inseparable from their context (Savage, 2000). I would argue the same is also true when the researcher shares the disability under study. As a disabled researcher, elements of my own story are woven

throughout this thesis, beginning with my self-introduction on page 1 and continuing throughout the planning, analysis, and reflections upon the findings of this research.

The practice of remote ethnography is not a new concept. During WWII, U.S.-based ethnographers studied Japan and Germany through the films, novels, poetry, and other artefacts gathered from their cultures (Postill, 2016). Remote ethnography has often been used to address the safety concerns of the researcher in times of war, religious conflict, and national disaster (Postill, 2016). Modern technologies provide us the freedom to experience events from across the world in real-time via streaming video, or extract data from archived moments by watching recordings of those same videos hours later (Postill, 2016; Bengtsson, 2014).

Remote ethnography should not be confused with netnography, which provides a method for studying the social interaction, values, and customs of online communities (Bowler, 2010; Kozinets, 2010). While the characteristics of the participants under study factor into the choice for remote ethnographic methods, the participants may not share an online or in-person community, being part of the larger disability community. Bengetsson (2014) argues that while closeness between subject and researcher is preferred in ethnography, proximity is not. Participants who lack a shared location and shared personal connection, such as the members of this study, dramatically reduce the requirement for the researcher to complete physical travel to an on-site location (Bengetsson, 2014).

Krefting (1989) notes that disability ethnography is uniquely positioned to capture the voices of persons with disabilities by offering participants a method of “recording a person’s feelings, thoughts, perceptions, beliefs, and experiences”, acknowledging all as “critical units of analysis” (p. 62). The technologies proposed for remote ethnography – journaling, emails, voice memos, and video journals – all provide participants the option of choice in how they will tell their story while respecting their physical or cognitive limitations based on their individual symptoms resulting from their ABIs.

When trust is established between the researcher and study participants, ethnographic methods of sampling and observation are preferable to grounded theory interviews as they provide the researcher with a greater pool of data to draw upon (Bamkin et al., 2016). More importantly, they address the possibility that observed behaviour may be different from self-reported activities, and they allow the researcher to include in the research that which is not said (Bamkin et al., 2016; Bengetsson, 2014).

Finally, these are not typical times, nor is this a typical project. As in WWII, the emergence of SARS-COV-2 has forced researchers to explore new ways to conduct their research. Consideration of remote ethnography becomes more important in times of crisis, such as the COVID-19 pandemic. With the possibilities of travel restrictions being in place for an unknown time, and the medically fragile nature of the study's sample population and myself, this lends an additional level of support to the proposed method.

3.2.1 **Criticism of remote ethnography**

Critics argue that remote ethnography cannot be considered true ethnography; it does not allow researchers to directly observe study participants in their real-world environment (Howell, 2017; Ingold, 2014) and challenges the researcher's ability to create genuine, trusting relationships between ethnographer and participants (Howell, 2017). Howell (2017) maintains that without the inclusion of an embedded fieldwork component, there is no way to validate that participants' descriptions of their actions or values match their behaviours. However, in the disability community, where so many voices are silenced and ignored (Ashby, 2011; Stone & Priestley, 1996; Taussig, 2020), providing participants with an opportunity to tell their own stories and be believed provides a powerful message to others facing the same cognitive or physical challenges arising from their ABI. Where remote research designs can be viewed as an elite and privileged form of practice (Margolin, 2007; Noel, 2016), they can also provide accessibility and participation options for researchers who belong to marginalised populations, equalizing the playing

field and enabling disabled researchers' additional opportunities to work (Denzin, 2017; Kuntz, 2016).

Others suggest that the act of participant observation, which has become synonymous with ethnography and is a founding block of the requirement for a fieldwork component, is not the same as ethnography (Forsey, 2010; Hockey & Forsey, 2012; Ingold, 2014). They argue that participant observation is one of multiple available research techniques used to collect data from both an insider's and an outsider's view, whereas ethnography is a descriptive science used to study people, cultures, and societies. Ethnography's systematic descriptions are used to generate the research product, informing how researchers write up their findings from the data collected.

3.2.2 **Alternative strategies**

Practitioners recommend that disability research provide accessible and actionable results through representation (Noel 2016; Hofmann et al., 2020). In consideration of the rallying cry for many disability support groups – "nothing about us without us" (Charlton, 1998) – I sought to ensure that participants had an opportunity to inform the research through their voices, sharing their expertise. When reviewing potential research designs, Participatory action research (PAR) was considered and rejected. While PAR provides participants' ample opportunity to express themselves and the end result of PAR projects may facilitate a form of awareness of the experiences of students with ABI, the project itself was not initiated by the participants as a form of self-advocacy nor are the parties involved in a position to change policies or processes as a result of the project (Bamkin et al., 2018; Denscombe, 2017). These design decisions and limits to participants' sphere of influence made PAR an unlikely fit for this project.

3.3 **Aligning theoretical frameworks**

When an existing body of research to draw upon is lacking, as in the case of how students with ABI experience online learning, grounded theory offers a method to gather data directly from a variety of sources and systematically

examine the collected data in order to derive a theory (Charmaz, 2014). Grounded theory offers a theoretical framework, a methodology for data collection, and a process for analysing data. In effect, it is a road map for researching the unknown, a starting point on the journey.

As a pragmatic individual, I seek solutions to problems and am willing to use any means necessary – at least when it comes to research designs and data collection tools – to achieve this goal (Kivunja & Kuyini, 2017). The world around me and my understanding of it are constantly evolving and changing, yet I recognise that my preferred interpretation of reality is not necessarily that of others. Operating from within my comfort zone may make participating in the project less of a welcoming experience for others. Grounded theory, with its focus on understanding, practical application, and directed action, provides a bridge between my pragmatic nature and the constructivist paradigm, offering participants a method to explore their experiences as online students with ABI as it relates to their specific disability context (Charmaz, 2014). While Charmaz (2014) provides the roadmap for the approach to data analysis, Braun and Clark's (2022) thematic analysis (TA) provides methods for completing the act of data analysis, providing means to identify patterns and themes in the collected data, as well as flexibility in describing the results.

Where grounded theory attempts to study one thing in many places, ethnography explores one group of people and their experiences or behaviours (Bamkin et al., 2016). Charmaz (2014) suggests that grounded theory ethnography can be a method of seeing the worlds of participants and their actions within them. As such, Grounded theory ethnography can provide a solid foundation for studying a phenomenon, such as how students with ABI injury might experience online learning, rather than defining a theory, process, or providing a thick description of a setting (Charmaz, 2014; Timmermans & Tavory, 2011). Grounded theory ethnography moves across settings. It is not limited to the moment when the student is specifically logged into online learning system, but also includes other moments relating to their education – writing, listening to lectures, looking for resources, attempting to access resources, attention span, fatigue, memory, recall, motor skills, etc. Using

grounded theory as the theoretical framework allows ethnographers to 1) compare data from the beginning of the research, rather than waiting until it's all collected, 2) compare data with emerging categories, and 3) demonstrate relationships between concepts and categories. Grounded theory increases ethnographers' involvement in the research inquiry (Charmaz, 2014) while its iterative nature allows the ethnographer to move between the gathering and analysing of data while progressing through the stages of building trust and socialization with the participants better than other research processes (Timmermans & Tavory, 2011).

3.4 **Ethical considerations**

The study was ethically approved by the Lancaster University Faculty of Arts and Social Sciences Ethics Committee.

In any qualitative study, the potential exists for inconsistent results interpretation. Disabled individuals are routinely regarded as low in competence, stereotyped as "unintelligent" or "incapable" (Nario-Redmond et al., 2019, p. 371; Katzman et al., 2024). When research results are assessed through a researcher's competency in recall or retelling tasks, as is often the case with academic papers and presentations relying on written or verbal communications, there is a built-in bias that favours individuals who do not experience cognitive disabilities (Dolmage, 2017; Lester & Nusbaum, 2017; Woodfield & Freedman, 2021). To help address this challenge, I have attempted to address the credibility, transferability, and dependability of the research process by providing a clear outline of the techniques (steps) used to a) recruit participants, b) collect, and c) analyse the data along with illustrating the influences on the decision-making process during the planning and execution of this research project (Somekh & Lewin, 2005). I have also made a conscious effort to limit use of jargon, whenever possible, to make the resulting text accessible to the layperson and other readers experiencing brain injury (Lester & Nusbaum, 2017). These decisions and steps outlined above, along with subsequent decisions relating to ethical issues raised in this thesis, have been influenced by my perspective of critical disability theory as outlined

in Chapter 2, section 2.3, and are meant to acknowledge and address societal barriers and intersecting inequalities to create a more inclusive and equitable environment for individuals with disabilities.

3.4.1 **Disability research and impacts of ABI**

There are unique challenges to consider when leading a research project that includes participants with disabilities (Krefting, 1989; Nind et al., 2015; Nind, 2017) or a researcher with disabilities (Nind et al., 2015). In selecting the research method and designing research instruments, one must take into consideration the distinct needs of the participants (O'Toole, 2013). Research participants with ABI may experience audio or visual processing difficulties, cognitive decline, poor recall or memory function, light sensitivity, speech impairments, physical fatigue, mental fatigue, and attention deficits, to name but a few common symptoms of ABI (Belmont et al., 2009; Johansson et al., 2009; Johansson & Rönnbäck, 2014). The four-step inclusive research framework introduced in Section 3.7 of this chapter, specifically step 2 (Section 3.7.2) and step 3 (Section 3.7.3), was developed to address these concerns.

3.4.2 **Power dynamics and establishing trust**

When research relates to an individual's confidential information, such as their health, careful consideration must be given to the power dynamics between researcher and participants (Kendall & Halliday, 2014; Kuntz, 2016; Noel, 2016). An element of vulnerability is present whenever individuals are asked to share their reflections on past experiences, including impressions and feelings which arise anew in the telling (Kendall & Halliday, 2014). Semper (2020) observes "participants must determine their level of comfort in exposing portions of themselves and their history in their responses; trusting in both the researcher and process that their secrets and sense of selves will be respected in the final work" (p. 4). Condie and Costa (2018) emphasise the researcher's duty of care with regard to the information shared by research participants and its disposition, emphasizing the need to provide a voice in decision-making to those participating within a digital context, such as a remote ethnography would

involve. Section 3.7.4 of the inclusive research framework introduced in this chapter addresses the process of building trust with study participants.

3.4.3 **The disabled researcher - disclosure to participants**

As someone who has experienced multiple ABIs that have directly impacted my past and current academic studies, I do not believe there is an ethical way to complete this research project without disclosing a portion of this medical history to potential study participants. As such, I included this information in a researcher profile as part of the participant information and informed consent package (Appendix A). I felt it best to disclose a portion of my own background, so they could make an informed decision about their comfort level with working with a disabled researcher prior to choosing to participate in the study.

3.4.4 **Seeking balance: Representation, the search for self, and privacy.**

Once I had decided to use a case study format to present this research's findings, I encountered what became the most challenging element of this project: balancing the expressed wishes of the study's participants to quickly identify their contributions to the research with protecting their identities. Each participant was open, honest, and incredibly vulnerable in their responses. I felt a duty as a researcher and fellow disabled person to limit the potential for participants to experience future harm in their professional or personal lives.

Concerned that the data presented in each case study might be used to track back to individual participant(s), I chose to employ pseudonyms to maintain an element of participant anonymity. In keeping with Charlton's (1998) mantra of "nothing about us without us", I approached each participant separately in a VM, outlining my concerns and requesting they self-select a preferred pseudonym. The request was favourably received by most, and prior to the end of the conversation, I had a name they wished to be referred to in this study's findings. One participant was unconcerned with being personally named in the thesis, expressing a desire to use their own name. I strongly discouraged this decision, pressing to receive a pseudonym.

I continue to question my motives behind my opposition to this participant's agency in requesting to not only see themselves and their words reflected in the results, but also to see their own name. I worry. In attempting to protect participant privacy and offset potential for future harm, have my choices become a source of the type of harm I attempted to protect study participants from?

3.5 **Participants**

Including myself, there were nine study participants ranging in age from 22 to 55. Six self-identified as female and three self-identified as male, reflective of the higher enrolment levels of adult females in online learning (Gardner et al., 2021). All self-identified as white/Caucasian. Four were full-time students located off-campus, three were full-time students located on-campus, and two were part-time students located off-campus. Two had engaged in undergraduate coursework, three in Masters level courses, and the final four were completing coursework in their PhD programmes. Four were enrolled in science degrees, four in Education-related fields of study, and one in a general studies humanities program. Three participants had completed online coursework post-injury at both the undergraduate and graduate levels of study. Eight spoke English as their first language and one as a second language.

A minimum of 2 years had passed since each participant had been diagnosed with ABI, and more than 20 years had passed for six of the participants. Each of these six participants reported experiencing more than one head injury over the course of their lives, with four of the six reporting their most recent injuries within the past 5 years. Eight reported their injury resulted from a forcible blow to the head. Seven had been hospitalised as a result of their injury. Intracranial hematoma or skull fracture was a factor in six participants' hospitalizations.

Table 3.1 provides an overview of participant demographics, using self-selected pseudonyms for identification purposes.

Participant Pseudonym	Gender	Location	Age (initial injury)	Age (during course)	Program of Study	Why enrol in online learning?
Bill	Male	England, UK	13	31	PhD - Engineering	Required course. Only offered online.
Michelle	Female	Indiana, USA	21	25	Undergraduate - Bachelor of Science	Last two classes of undergraduate program. Only offered online
Henry	Male	Scotland, UK	18	38	Master of Education	COVID
DJ	Female	Alberta, Canada	35	55	Undergraduate – General Studies	Intentional selection
Louise	Female	New Brunswick, Canada	11	24	Master of Education	Program only offered online.
Matt	Male	England, UK	20	22	PhD - Chemistry	COVID
Elizabeth	Female	Washington, USA	30	34	PhD – Special Education	COVID
Kelly	Female	California, USA	4	35	Master in Public Health	Intentional selection
Sheelagh	Female	Alberta, Canada	15	45	PhD - Education	Intentional selection

Table 3.1 Participant demographics

3.5.1 **Location of injury**

The location and severity of a brain injury will influence the types of symptoms participants experience (Mao, 2023; National Academies of Sciences, Engineering, and Medicine, 2019; National Institute of Neurological Disorders and Stroke, n.d.). Most participants reported closed-head injuries, some with multiple injury sites resulting from primary and secondary brain injuries. This overlapping of injury locations was not unexpected and may help explain the occurrence rate of common symptoms in the participant group.

Injury Location	Function	Common Symptoms	Participants
Cerebellum	• Gross and Fine Motor Skills • Balance • Coordination	• Difficulty Walking • Slurred Speech • Poor Hand-Eye coordination	2
Frontal lobe	• Behaviour and Emotional Control • Concentration • Thinking • Planning • Problem Solving • Speech	• Lack of focus • Inability to plan and sequence tasks • Irritability • Language Difficulty	4
Parietal lobe	• Perception • Sense of Touch • Pain • Temperature	• Difficulty with arithmetic, reading or spelling • Inability to attend to more than one object at a time • Inability to focus visual attention • Spatial Misperception	3
Occipital lobe	• Sight	• Blind Spots • Blurred Vision	2
Temporal lobe	• Memory • Language • Hearing • Organization	• Problems with Short and Long-Term Memory • Aphasia • Speech Processing Difficulties • Word Recognition • Poor Emotional Control	5

Table 3.2 Location of injury

3.5.1.1 **Impacts of ABI on the online learner**

The injury location details (Table 3.2) help demonstrate how individual and unique each participant is in relation to the impacts of their ABI upon their levels of impairment, equitable access to course materials and learning opportunities, and abilities to participate within online learning environments. Physical symptoms can include impairment of motor skills, which can impact a student's ability to hold physical devices such as mice, phones, or digital pens, or maintain balance when walking or sitting. Poor hand-eye coordination may make it difficult to navigate learning management systems or use interactive participation functions in virtual meeting (VM) spaces, such as responding to polls, raising a virtual hand, using emoji reactions, or participating in sidebar chats. Spatial misperceptions, blurred vision, and difficulties focusing visual attention may make navigating course sites difficult if the site's design does not

accommodate adaptive devices or manual resizing of content, such as text, buttons, and links, displayed on screen. Aphasia and speech processing difficulties may make it difficult for students to participate in verbal course elements, such as sharing opinions or asking questions in seminars, participating in group work, or completing activities requiring students to respond with recorded audio or video segments. Difficulties with executive function, attention, or memory and recall may be exacerbated when information is shared in a single format. These impairments can overlap and compound a student with ABI's ability to learn in online environments. Students experiencing attention difficulties or audio processing issues may have difficulty focusing on the content of a recorded lecture. If the lecture is not closed captioned or a printed transcript is unavailable for the student to read, the information presented in the recording may not be accessible, understood, or retained by the student.

3.5.2 **Shared symptoms**

In their survey responses, each participant provided a baseline of their constant symptoms, then indicated if these symptoms were also present after physical or cognitive activity. Participants self-reported experiencing the following common symptoms of brain injury (Appendix C and Appendix D) resulting from their injuries.

	Present Since Injury		**Present after physical activity**		**Present after cognitive activity**	
Symptom	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**
Balance problems	4	5	4	5	3	6
Dizziness	2	7	2	7	1	8
Fatigue	5	4	4	5	5	4
Headache	4	5	4	5	4	5
Nausea	2	7	2	7	1	8
Numbness/Tingling	1	8	1	8	1	8
Sensitivity to Light	4	5	4	5	4	5
Sensitivity to Noise	3	6	3	6	3	6
Visual Problems	4	5	4	5	4	5
Vomiting	1	8	0	9	1	8

Table 3.3 Physical symptoms

	Present Since Injury		Present after physical activity		Present after cognitive activity	
Symptom	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**
Feeling Mentally Foggy	4	5	4	5	5	4
Feeling Slowed Down	5	4	4	5	5	4
Difficulty Concentrating	5	4	4	5	6	3
Difficulty Remembering	4	5	4	5	5	4

Table 3.4 Cognitive symptoms

	Present Since Injury		Present after physical activity		Present after cognitive activity	
Symptom	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**
Irritability	3	6	2	7	3	6
Sadness	2	7	0	9	1	8
More Emotional	4	5	1	8	3	6
Nervousness/Anxiety	4	5	1	8	4	5

Table 3.5 Emotional symptoms

	Present Since Injury		Present after physical activity		Present after cognitive activity	
Symptom	**YES**	**NO**	**YES**	**NO**	**YES**	**NO**
Drowsiness	5	4	3	6	4	5
Sleeping Less than Usual	3	6	1	8	2	7
Sleeping More than Usual	2	7	2	7	3	6
Trouble Falling Asleep	5	4	1	8	4	5

Table 3.6 Sleep-related symptoms

Symptom	Not experienced	No impact	Mild impact	Moderate impact	Severe impact
Blurred Vision	5	0	1	1	2
Dizziness	4	1	2	1	1
Double Vision	4	3	1	1	0
Fatigue, tiring more easily	2	0	2	3	2
Feeling depressed or tearful	4	2	2	1	0
Feeling frustrated or impatient	2	2	2	2	1
Forgetfulness, poor memory	4	0	0	3	2
Headache	2	0	1	4	2
Irritability, easily angered	4	1	1	1	2
Nausea and/or vomiting	5	2	2	0	0
Poor concentration	2	1	3	1	2
Restlessness	4	2	2	1	0
Sensitivity to Light, impacted by bright light	5	0	1	1	2
Sensitivity to Noise, easily upset by loud noise.	6	0	2	0	1
Sleep Disturbances	5	0	2	1	1
Taking Longer to Think	4	0	1	3	1

Table 3.7 Impact of symptoms

3.5.3 **Recruitment**

The target population for this study was students with ABI who were, or had been, enrolled in an online course at an accredited HE institution. Study participants were solicited via purposive sampling from students who self-identified as having an acquired brain injury. No medical records were collected from participants. All data collected was anonymised prior to inclusion, and all participants will be referenced throughout this document using self-selected pseudonyms.

There were two criteria for participating in the study:

- That participants have an acquired brain injury (which can be from any source, such as a fall, sports injury, tumour, stroke, MVA, etc.), and
- That they have completed, or are in the process of completing, any online course at a college or university level.

Invitations to participate in the research project were distributed electronically through university disability services offices to students in Canada, the United States, and the UK, as well as posted online through disability and online learning related mailing lists, Facebook groups, and Twitter (Appendix B). Interested individuals were directed to an online Qualtrics form hosted by Lancaster University. The form provided a brief outline of the project and asked potential participants to enter their preferred name and contact information into the form if they would like to learn more about the study and receive a participant package.

Each potential participant received a scripted email. This message provided a brief overview of the history behind the project, including a) initial injury disclosure, b) the research questions, c) participation criteria, and d) planned project timelines. The email ended with an offer to provide the full participant information package and informed consent forms for review. Of the 13 potential participants, 12 requested copies of the participant information package and consent forms. Three participants were screened out during the initial screening process due to having a congenital brain injury as opposed to an acquired brain injury.

The participant package included a written overview of the project, a researcher introduction, an informed consent form, and a clear overview of the steps required to withdraw from the study. All participants who agreed to continue in the study after the initial intake questionnaire and interview were included in the project (Appendix A).

3.5.3.1 **Physical location**

Qualifying study participants were located in Canada, the USA, England, and Scotland. To decrease stress and impacts on their lives and schedules, interview times were set in the participants' time zones, as opposed to my own. Interviews were held on a 1:1 basis. To facilitate connecting with students during COVID times, communication was limited to virtual spaces, and participants chose the VM system they were most comfortable using: Google Meet, Microsoft Teams, or Zoom. All sessions were recorded with permission, and cameras were enabled so that both the participants and I could see each other during the interviews. Due to bandwidth and intermittent internet connectivity issues, a few participants chose to have their video disabled for a portion of a single session.

3.5.3.2 **Sample limitations**

Sample sizes are typically smaller for disability studies, given issues relating to recruitment (Carey & Griffiths, 2017; Nicholson et al., 2012). Due to the nature of the research and the estimated amount of data to be collected from participants through surveys, interviews, and remote ethnographic journaling methods, I anticipated the research sample size for this study would be 4-6 participants, including myself.

Limited responses and a small group participant base resulted in a sample that was not representative of the larger disability community. Participants self-identified as Caucasian, cisgender, and all but one were native English speakers. The study's participant pool does not account for differences in race, gender, and cultural norms originating from outside of a Western Eurocentric perspective.

3.6 **Establishing a connection - pilot conversations**

After receiving an affirmation of interest in participating in the research project, I sent an email to each participant to schedule an initial conversation. This session was intended to introduce participants and researcher, offering an

opportunity to develop a connection to the process and each other outside of the formal elements of the project's data collection methods

During our initial session, I acknowledged the disclosure letter included as part of the participant recruitment package. This letter disclosed not only my injury history, physical symptoms, and accommodation strategies, but also outlined how they might impact our researcher-participant relationship. It was intended to stave off potential misunderstandings that could arise from individuals misinterpreting behaviours resulting from disability or required accommodations as mocking their own. Mentioning the letter and its contents during the pilot conversations provided a natural opening for participants to consider their own accommodation needs and articulate them.

I was also up-front about my history of hiding my disability from friends, fellow students, and co-workers. Disability disclosure is a personal and challenging decision for disabled individuals (Blaser & Ladner, 2020; Davis et al., 2019; Melián & Meneses, 2022). In acknowledging the complicated nature of disclosure, how it impacts our experiences and relates to our identities as students, I hoped to reduce any undue pressure participants might place on themselves to disclose thoughts and experiences they were not yet ready to share.

Along with relationship building, our initial conversation provided participants with an opportunity to deepen their understanding of the project's mechanics. They were provided with an opportunity to ask questions about the project and research process, select their preferred communication formats, and outline their accommodation needs. Each participant was given an opportunity to continue the conversation in writing via email or text, through phone calls, or through a video meeting (VM). All participants selected the VM option.

The pilot conversation was intended to set expectations and build in flexibility and support for participants' physical and cognitive requirements from the onset. Ground rules were negotiated with each individual and included a) establishing participant time zones and preferred meeting dates and times, b) facilitating the rescheduling of interview appointments on little notice, c)

allowing participants to decide on a day-by-day basis if they wanted to employ cameras during video sessions, d) ensuring VM systems had closed captioning or transcription features enabled and e) allowing each participant to select the type of artefacts they would submit to the project.

3.7 **Data collection**

Data was collected over an eight-month period from February to September 2021 in three cyclical phases. Each cycle began with participants completing a survey. Participants then attended a web-based interview and the cycle with the submission of an ethnographic artefact. This process was based on a framework of:

1. Inclusion: nothing about us without us
2. Flexibility in design
3. Meeting participants where they are at
4. Building trust through up-front disclosure

This framework was developed out of a recognition of my personal physical and cognitive limitations as a disabled researcher, demonstrating the pervasive and continuing connection of “crip tax” (Blanchard, 2020; Katzman et al., 2024) to the disabled researcher's day-to-day lived experiences. When planning how to collect data, I attempted to identify potential impacts I might experience because of the different collection methods and how I might mitigate them. I then considered how I would like to be treated if I were a participant in my own study.

Influenced by the depiction of the integrative nature of disability and self, and the recommendation to adopt a holistic approach to research championed in critical disability theory (Hanebutt & Mullen, 2021), the concept of inclusion was fundamental to all elements of the project. Equally important was my own voice being heard; as a participant, I recognized that my own injuries and resulting accommodation requirements might not be the same as other students with ABI experience. I needed the flexibility to adapt the data collection to the physical or cognitive requirements of each participant on an as-needed basis.

Designing with flexibility in mind from the onset ensured that participants' individual needs could be accommodated without negatively impacting the overall outcome of the project. A level of vulnerability is required to both speak your truth to another and be able to disclose one's own accommodation needs. Ultimately, the project's success relied on the level of trust developed between the participants and me. By openly disclosing my own history from the recruitment phase, I made an active effort to establish a level of trust in myself and in the research process.

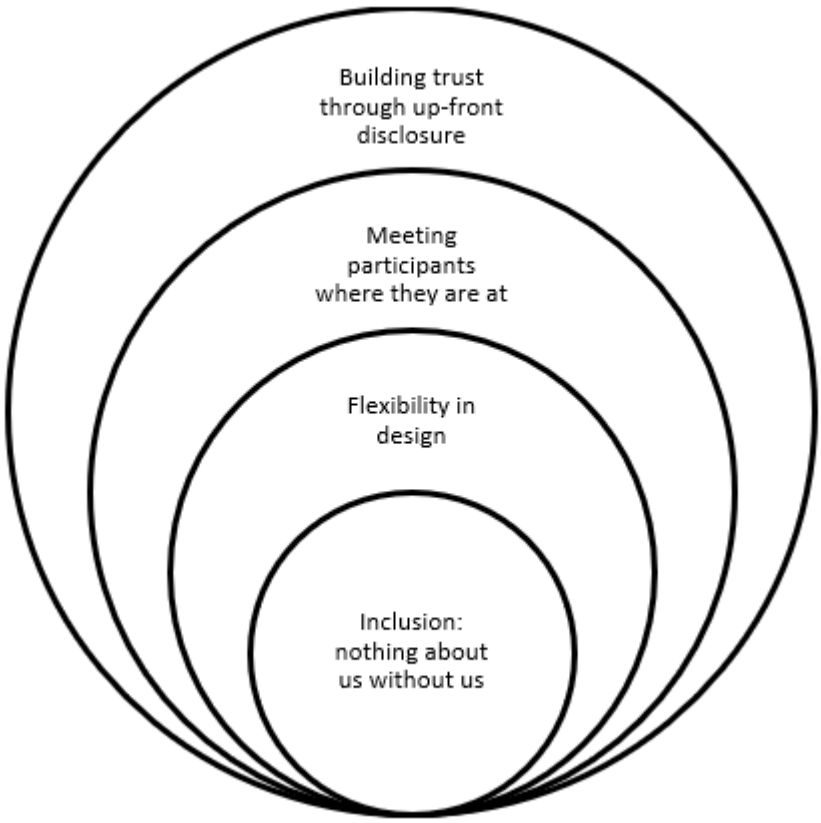

Figure 3.1 Data collection framework.

3.7.1 **Inclusion: “nothing about us without us”**

Inclusive projects recognise that participants have unique needs that might require individual accommodation (Nind, 2017). Each participant engaged in the decision-making process for how they would participate in the research. I described my design plan in my research journal as

> This project design was meant to respect the participant needs as a disabled person, as opposed to being dictated to, which is not something that's often done in research design I’ve encountered. It seems to be uncommon for a disabled person to be doing research as the project lead. And then to design a research project where disabled people are heavily involved in their own research or having a say in how they're participating in the research, that’s unique. (Research journal, April 17, 2020)

The medical model of disability promotes a view that disability is a deficit that needs to be remedied by experts, often dismissing the lived experiences of disabled individuals, and rendering them voiceless (Kuntz, 2016; Noel, 2016; Singleton et al., 2019). Typically, participants are researched “on”, rather than “with”, and results may focus on individual intervention as opposed to the collective creation of accessible spaces (Dolmage, 2017, Lester & Nusbaum, 2018; Mertens, 2015). Denzin (2017) and Dolmage (2017) outline how emancipatory research designs, such as this one, consider the multiple realities experienced by individuals, in an attempt to stabilise the power imbalance between the academic researcher and the disabled participant and acknowledge the “interactive link between researcher and participants” (Noel, 2016; p. 458).

3.7.2 **Flexibility in design**

From the onset, the research project was designed to accommodate the physical and cognitive needs of the participants and researcher (Stone & Priestley, 1996). The initial research design included a plan to host a 1:1 meeting with each participant to learn about their individual accessibility needs, then co-developing plans to accommodate each participant. With disabilities that impact individuals on both cognitive and physical levels, participants abilities and energy levels were constantly shifting. What may have worked one

month may not work the next. Decisions relating to accommodation needs or participation methods were not “one and done” but reflected a constant openness to changing plans on the fly based on how participants felt at the time. In an email explaining my methods to a fellow student, I wrote

> I built in what some in the disability community would call “crip time”. I knew the schedule would have to be fluid because I was familiar with the ever-changing nature of ABI symptoms. It’s easier to anticipate that we were going to be sick, that somebody will have a migraine, or somebody might have a seizure when it’s a part of your lived reality. I expected that at times we might just need to have to drop everything at the last minute and make plans to try again later. I'd be silly not to anticipate schedule mayhem. The “wibbly wobbly” nature of time and symptom flares are part of my daily life. (S. Semper, email to M.C, April 16, 2021)

> The inclusion of crip time is one of the areas where my project diverges from so many others relating to students with ABI. What I am finding in what I am reading is that when disabled people are involved in research projects, they're not often involved as the project lead or even as an individual researcher. From my own experiences participating in research projects, I’ve found the research team doesn’t always think to anticipate my physical and cognitive needs. Or if a disabled person says, “You should build this into the research”, they're not necessarily listened to, because they aren’t the researcher, and their input is assigned a lower value in the decision-making process. Which is a bit backwards when you really think about it since the project needs the individual with the ABI to exist. (S. Semper, email to M.C, April 16, 2021)

The simplest accommodation surrounded the timing of interview sessions. Participants’ time zones were used as the base for scheduling sessions, and participants chose both the time and dates of the sessions within a sliding timeline. This helped to ensure there was no undue stress on participants to change their normal routines or schedules. Interview lengths, dates, or times could be changed by the participant with little notice, in order to provide additional flexibility around their personal or medical needs.

Additional accommodations included providing interview questions in writing as requested post session to allow participants additional time to reflect and respond, enabling closed captioning and live transcription functions during VMs, participant member checking of their session transcriptions to enable

participants to more clearly expand upon topics discussed, providing low level lighting options during VMs, allowing participants to enable and disable camera on an as needed basis, and allowing participants to choose their journal artefact formats and delivery methods.

3.7.3 **Meeting participants where they are at**

Gendered and power-related structures exist in all spheres of research (Bengetsson, 2014; Kuntz, 2016). Hanebutt and Muller's (2021) depiction of Crip theory, wherein disability is viewed as an integral part of one's identity, encouraged me to recognize that students may often know what is best for themselves, allowing them to offer a valuable perspective through their contributions. Participants were able to choose their preferred methods of communication, set boundaries relating to participation limits (e.g., dates, times, session length), and define their artefact submission format. The concept of "meeting people where they are at" (National Health Corps (NHC), 2021, para. 7) extends beyond physical locations. It is understanding "where someone is emotionally, mentally, and physically" (NHC, 2021, para. 7) when you are actively involved in data collection along with "honoring and respecting where they're currently at in their life journey, not where you want them to be" (NHC, 2021, para. 7). When including disabled individuals in research, it's imperative to hold this concept at the forefront during all research decision-making processes.

3.7.4 **Building trust through up-front disclosure**

That trust is required for the project to be successful and relies on all of the other elements of the framework being met. I have faced my own challenges with technology-enhanced learning (TEL) as a student over the years. I encountered a number of new-to-me experiences as I moved through the design and implementation of this research project.

It is important to recognise and understand how positionality impacts research (O'Toole, 2013). As a disabled researcher sharing the experience of an online student and a person with ABI, it was impossible to divorce my own

experiences from the research (Mogendorff, 2013). Rather than attempting to deny the possibility of this bias existing, I embraced the knowledge and experience I bring to the project through upfront disclosure of my injury and its potential impacts on the project with each potential participant (Appendix A). In being open, honest, and vulnerable with my participants, I encouraged a reciprocal relationship between researcher and participant when co-constructing meaning during our discussions.

3.7.5 **Instruments**

Throughout the course of the project, I used a variety of research instruments to gather participant data. These included online surveys (Appendix C and Appendix D), semi-structured interviews (Tables 3.8, 3.9, and 3.10), and participant journals.

3.7.5.1 **Surveys**

Using Lancaster's online survey tool, Qualtrics, I deployed King et al.'s (1995) "Rivermead Post Concussion Symptom Questionnaire" (RPQ; Appendix C) and a symptom self-evaluation questionnaire (Appendix D) to research participants in February 2021 to establish baselines for cognitive, emotional, and somatic factors for 16 common symptoms experienced after ABI. The selection of these survey instruments should not be equated with acceptance or promotion of a medical model of disability. Frequently used by medical teams in brain injury assessment and recovery, many research participants were already familiar with these instruments, their language, and the questions contained within. Their use allowed the researcher and participants to share a common baseline to describe ABI symptoms and establish the participant's impression of the severity of the symptoms' impact.

Recognizing that brains are remarkable organs and may heal over time, participants completed the RPQ and self-evaluation questionnaire periodically throughout the project (February and September 2021) to check for changes in their perceptions of how they experienced their injury. This data was cross-referenced with their interview and ethnographic artefacts. The initial instance

of the first questionnaire also included a series of demographic questions (age range, gender identification, location, primary language spoken, and ethnicity), which were used to help classify and identify patterns within the responses. (Table 3.1).

3.7.5.2 **Interviews**

Semi-structured interviews were held between March and April 2021, in May 2021, and again in June to August 2021. A scripted question set (Tables 3.8, 3.9, and 3.10) was used to guide the opening of the first interview. These interview questions were aimed at eliciting relevant information surrounding the student's experiences as an online learner and as a student with a brain injury. Subsequent interviews used a staged explanatory sequential design approach (Creswell & Plano Clark, 2007) where questions gleaned from the analysis of prior interviews with individual participants and the larger group informed the design of the later round of interviews. Time and participant health permitting, each participant had an opportunity to guide a segment of their interview period based on preferred discussion topics, allowing them to tell their stories in their own words. During each round of interviews, the sessions were opened with a set question and evolved from there based on each individual participant's experiences and needs. All interviews were completed using the participant's preferred VM platform and were recorded for transcription. The participants' and the researcher's web cameras were enabled during each interview. Occasional technical difficulties resulted in camera or audio interference. When this occurred, the affected individual had the option of continuing off camera or rescheduling the session. The number and duration of the interviews were determined by participants' accommodation requirements and modified on an as-needed basis.

The interviews provided participants with space to reflect on what it means to be a HE student with ABI in online learning environments. Questions explored students with ABI experiences when enrolled in online courses and were focused on what challenges they faced in an online environment, what support they received (or failed to receive), what benefits they experienced by not

attending brick and mortar classrooms, and how the physical and cognitive symptoms they associated with their injury impacted their experiences. Tables 3.8 through 3.10 provide examples of how I operationalised the research questions by identifying relevant concepts embedded in the research questions and offers examples of how these concepts were probed through interview questions.

Research Question

RQ1: In what ways do students with ABI experience learning opportunities in an online context?

Concepts	Sample Interview Questions

• Access (physical and technical)
• Authentic self
• Development of trust (disclosure)
• Discrimination, prejudice, and microaggressions
• Faculty relationships
• Personal relationships
• Sense of belonging
• Social interactions
• Student motivations / purpose
• Student support
	• Were you already enrolled in higher education at the time of your injury?
	• What prompted you to choose to attend / remain in higher education?
	• Why did you choose online coursework?
	• Does (did) anyone in your course know you have an acquired brain injury? (why/why not)
	• Recall the first time you wanted [for Covid participants – change this up to “were notified you would be taking an…] to take an online course
	  ○ What did you consider before taking the course?
	  ○ Tell me about your expectations of the course(s)?
	• What impact do instructors have on the course?
	• Tell me about your interactions with other students in your program.

Table 3.8 Samples of operationalization of RQ1 research questions

Research Question

RQ2: In what ways do students with ABI experience encounter barriers in an online context?

Concepts	Sample Interview Questions
• Access (physical and technical) • Accommodations • Authentic self • Development of trust (disclosure) • Engagement • Faculty relationships • Help seeking • Safety • Sense of belonging • Social interactions • Student motivation / purpose • Student perseverance / resilience • Student support	• Did you disclose your injury to the school disability office? • Did you disclose to faculty / tutors? • Do you tell people when you're struggling? • What types of challenges do you encounter in your online program? • Have you requested accommodations for your online coursework from the disability office or faculty? • What efforts are made by the administrators and faculty to resolve the challenges? • How do you feel about the level of interaction with instructors in your program? • Did the course include a variety of support resources and materials to support your learning? • Did your interactions with the [course instructor | other students] help you reach the course objectives? • What's the easiest/hardest part of the online learning experience? • Do you require specialised technologies (software, hardware, etc.) to work in an online environment?

Table 3.9 Samples of operationalization of RQ2 research questions

Research Question

RQ3: What mitigation strategies (if any) do students with ABI experience use?

Concepts	Sample Interview Questions

• Access (physical and technical)
• Accommodations
• Authentic self
• Development of trust (disclosure)
• Engagement
• Faculty relationships
• Help seeking
• Safety
• Sense of belonging
• Social interactions
• Student motivation / purpose
• Student perseverance / resilience
• Student support
	• Do you use adaptive technologies to assist you?
	• What do you wish the [teacher/tutor/course designer] knew?
	• Recognizing that everyone's brain injuries and subsequent symptoms vary widely, what advice would you give to a new student with an acquired brain injury, intending to enrol in an online course in your program?
	• Describe what the ideal online course delivery process would be like, considering the current delivery process in place in your university.
	• Given the opportunity,
	  ○ What changes would you suggest for course content delivery? Why?
	  ○ What changes would you like to make regarding student-instructor interactions? Why?
	  ○ What changes would you like to make regarding student-student interactions? Why?
	  ○ What changes would you like to make regarding student-content interactions? Why?

Table 3.10 Samples of operationalization of research questions for RQ3

3.7.5.3 **Participant journals**

The third element of data collection, ethnographic artefacts, was generated via remote journaling methods of the participant's choice. These artefacts were collected from participants between February and September 2021. Due to the significant distance between researcher and participant pool, my own potential fragile health, and consideration for the participant's health, the decision was made to allow participants to choose their preferred method of artefact creation. Participants had the choice of creating written, audio, or video artifacts based on their ability and preferences. This allowed me to meet my research access needs, as they related to finances, physical constraints, and travel limitations resulting from COVID-19 outbreaks worldwide, while ensuring the needs of the participants remain respected. In each case, participants chose to submit a written document. Six of the eight participants submitted participant journals with undated entries. Three enhanced their written submissions by including photographs of their workspaces, assistive technology, or of manual methods they used to mitigate their challenges with assignments, memory, or time. One participant, Michelle, did not submit a journal.

3.7.5.4 **Researcher journals and data artefacts**

In addition to the personal journal sporadically maintained since the early 2000s, wherein I documented parts of my educational journey, I also kept a handwritten research journal from 2020 through 2024. Initially serving as an occupational therapy exercise, providing opportunities to practice executive functioning skills relating to concentration, recall, and time management along with practice renewing fine motor skills and handwriting, my research journal provided an outlet for documenting random thoughts on the project and processes. I also maintained Excel files containing notes and observations made during the literature review, data analysis, and case study write-up.

Transcription was also enabled during advisory sessions with my PhD supervisor. Enabling transcription during these sessions facilitated my ability to focus on the conversation rather than on notetaking. During these sessions, I made note of VM

timestamps relating to (a) discussions of research methods, data collection, and analysis, research findings, (b) notes or questions included in the comments of my draft thesis file, (c) attempts to articulate my thought patterns behind decision-making or data analysis interpretation, and (d) advice provided by my supervisor in a blank Word file. After our sessions, I transferred the session date and timestamps to comments in my draft thesis file or to my research journal. When scheduled under my supervisor's university-supplied VM account instead of my own, post-session transcription files were shared with me for download.

These materials were supplemented by digital comments in draft versions of this thesis, email correspondence with fellow students and friends written between 2020 and 2024, notes from research completed during the coursework phase of my PhD program, and the paper published from that research in the *International Journal of Online Graduate Research* in 2020.

3.8 **Data analysis**

Building upon Braun and Clarke's (2022) six- phase guide to reflective thematic analysis, I followed a staged process which included (1) transcribing and member checking interviews, (2) reviewing data and initial coding, (3) preparing for subsequent interviews, (4) transcribing and member checking additional rounds of interviews, reviewing and coding data, and prepping for next round of interviews, (5) collecting and coding journal artefacts, and (6) developing themes and findings. Stages one to three in my process align with elements of Braun and Clarke's (2022) first two phases, "familiarising yourself with the dataset" and "coding" (p. 36). Stages four to six in my process align with phases three to five of Braun and Clarke's (2022), which include "generating initial themes", "developing and reviewing themes", and "refining, defining and naming themes" (p. 36). Their final phase, "writing up" (Braun & Clarke, 2022, p. 36), takes place at various points throughout my process, with a focus on writing up the themes that become more prevalent in my sixth step. My process is outlined in further detail in Figure 3.2 and in the following paragraphs.

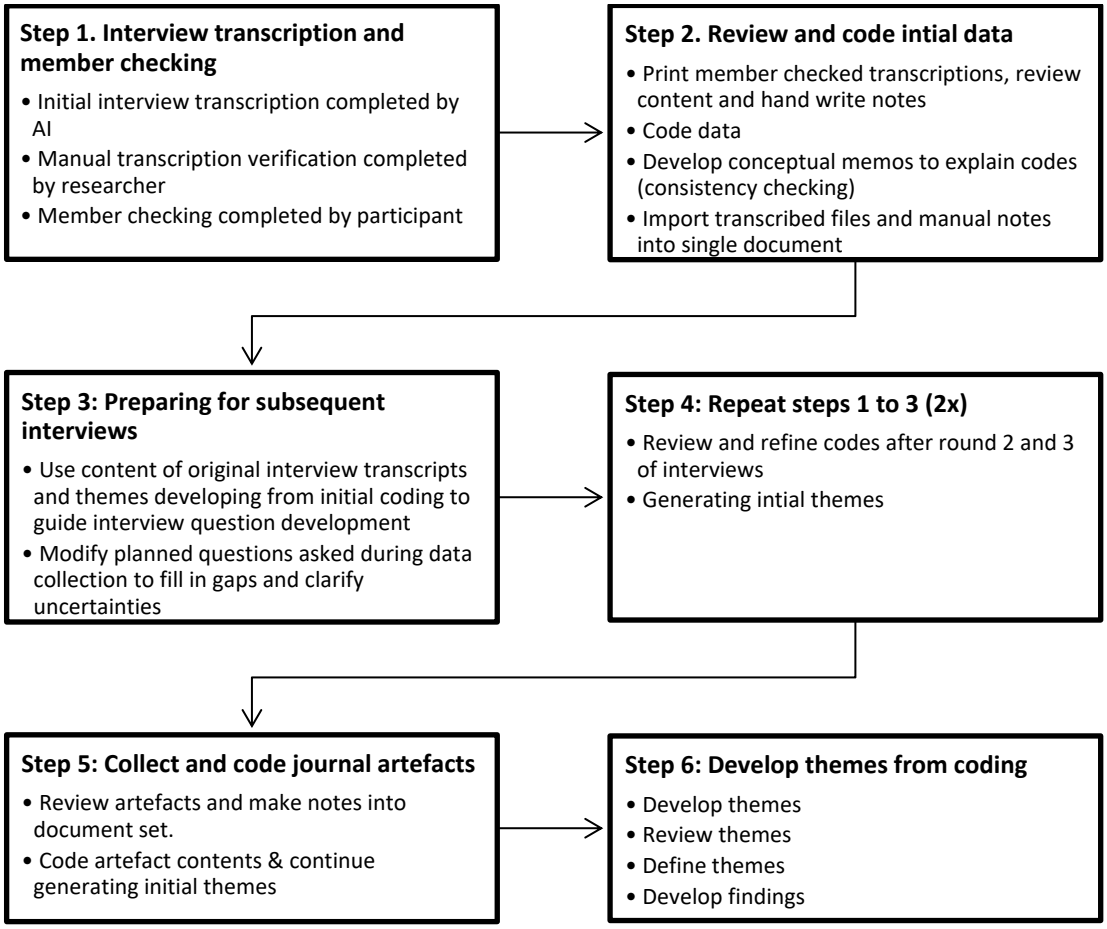

Figure 3.2 Six-step data analysis process, based on Braun & Clarke's "six phases of reflexive thematic analysis" (2022, p. 36).

3.8.1 **Step 1: Transcribe interviews.**

All interview data was transcribed verbatim; a lengthy process for anyone dealing with auditory challenges and poorly functioning closed captioning AI technology. Immediately following each interview session, I downloaded a copy of the session transcription from within the VM software. This initial transcription was AI-generated and, in some cases, produced an unreliable written record of events. While all of the AI-generated transcripts contained errors, the AI registered significant difficulties recognizing Henry's speech patterns and word choices due to his Scottish accent. Using the interview recordings, I manually corrected each transcript to ensure accuracy.

Once the recording was manually transcribed, the resulting documents were forwarded to the participants to check for accuracy and ensure that the data

transcribed resonated with their experiences (Birt et al., 2016). As Brinkmann and Kvale (2015) noted, the “interviewee’s statements are not collected – they are co-authored by the interviewer” (p. 218). Member checking provided participants with a chance for sober second thought regarding their initial responses. Each had the option of editing the transcripts to remove any content they were no longer comfortable with sharing, correcting errors in the transcriptions (e.g., incorrect spellings of place names), or expanding on any topic by adding additional comments. While some participants did offer additional comments for inclusion or used the transcripts to springboard off in their journal entries, no participants chose to remove content from the transcriptions. This validation process allowed participants an opportunity to review the information shared prior to its inclusion in the analysis, but also increased the overall timeframe required to complete this phase of the data collection.

3.8.2 **Step 2: Review and code initial data**

To complete my thematic analysis, I used a combination of the steps outlined in Charmaz’s (2014) constructivist vision of grounded theory and Braun and Clark’s (2022) guide to completing thematic analysis. This combination of mechanics allowed for a flexible and iterative review of the data gathered in multiple formats from February 2021 through October 2021, which fits both with my pragmatist nature and suits the need to co-create knowledge from within disability community.

Charmaz’s (2014) technique of constant comparative analysis of codes assigned to the data was used to help me become familiar with the data, to provide suggested areas for future discussion and data collection as the project proceeded, and to generate initial themes. The “formula’ I was following to code and seek out themes in the data was reflective of the mechanics outlined by Braun and Clark (2022).

Due to the challenges encountered with reading and encoding information into memory since my injury, I found it easier to print each interview and handwrite notes than it was to read the interview transcripts in electronic format and use the

comment feature to add notes. Using the list of relevant concepts derived from my research questions as a starting point (see Table 3.8), I attempted to devise a list of potential terms or phrases that might correlate to the concepts. This larger vocabulary list acted as triggers for me to pay closer attention to the text and provided a map to help me identify when a participant might be speaking about the wider research concepts. For example, for “access”, I made a note to look for statements that might include “I needed”, “I couldn’t”, “I didn’t know how”, or “I was(n’t) able to”. Then, I reviewed the transcript of the first of the completed interviews and began initial coding of the text. Codes relating to software, tools (e.g., calendars), learning strategies (e.g., printing), references to scheduling, time, costs, or cognitive or physical symptoms relating to their brain injuries (e.g., poor memory, fatigue, headache, etc.) were the easiest to identify and categorise. Others were more challenging, involving more judgment to tease out the patterns within the data.

After completing a review of the first participant’s interview text, I had an expanded and refined set of codes to work with. As I moved through each subsequent interview set, I revisited the previous participant’s transcripts to verify how I had coded similar content, comparing the old with the new, and determining if the different pieces of data shared similar elements, or if a new code would need to be generated. Throughout this iterative process, I was constantly reading and re-reading participants’ interview transcripts and journal texts, in an attempt to validate my interpretations of the text and code assignments, asking myself, “are they saying the same thing?” and “is this new, or just a different way of phrasing something someone else had already expressed?”. As I progressed through the documents and became more familiar with the data, I’d recognise patterns within it that allowed me to collapse some of the initial codes into a broader category.

I used coloured pens to represent the different codes and looked for common themes in the responses. Along with the colour coding, I wrote conceptual memos in the page margins to outline my thought processes in the moment. As my memory is unreliable as a result of the ABI, these memos allowed me to establish a form of external memory upon which to rely, supporting consistency throughout the process.

Upon completion of the handwritten coding on each document, I imported my codes and memos into an Excel file to assist with pattern recognition, search ability, and to account for my unreliable memory. By being able to review my notes on what I was thinking and learning, what *spoke to me*, and the reasoning behind decisions I was making during the coding process in a single location, I could more easily identify emerging themes. Additionally, it enabled me to set aside and return to the documents at later stages in the analysis.

As I was reviewing and coding participant data, the code categories, data, or handwritten marginal notes would trigger a vague memory or feeling of familiarity. This spark acted as a cue to initiate a review of my personal and research journals, transcriptions of supervisor sessions, and draft file comments, examining the contents to determine if and where my own data mirrored or contradicted those of the participants. I added my data to the Excel file under the initial codes developed, for inclusion in the development of overall themes and for comparison against the data collected from the participant pool.

Table 3.11 provides an example of how codes were developed and analysed. This manual process was repeated during all review and coding stages during the project.

Research Question	Interview Question	Participant Response	Analysis | Memo Notes	Initial Codes
RQ1: In what ways do students with ABI experience learning opportunities in an online context?	What impact do instructors have on the course?	“I think that it helped with both of my programs, because like I said, the programs were Psychology and a kind of therapy, Recreational therapy. So the instructors for those it was different than like an Econ class or some of like, the basic or English to them agenda and stuff because the instructors for this maybe I did another reason that I didn't have as much trouble getting accommodation or help that I would have needed. I think also because of what background the instructors had also. I'm I think mine are a little more empathetic and willing to work with it. Because of like, even if they didn't have the personal experience, their academic background, what they were supposed to be working towards, they were a little more open.” [MICHELLE]	Felt supported and that needs were better understood based on the instructor’s academic field.	• Empathy • Support • Assistance • Accommodation • Academic program
RQ2: In what ways do students with ABI experience encounter barriers in an online context?	Did the course include a variety of support resources and materials to support your learning?	“They were all set up the same way. Well, the, I mean, it was very limited. They were all discussion forums. So we had things to read and then we typed in text responses to questions.” [LOUISE]	Standardization in course design can be a barrier. Limited modes of delivery & course activities may not meet all needs.	• Barriers • LMS • Standardization

Research Question	Interview Question	Participant Response	Analysis | Memo Notes	Initial Codes

RQ3: What mitigation strategies (if any) do students with ABI experience use?	Do you use adaptive technologies to assist you?	“There's lots of toolbox applications. Microsoft Word or Pages are all different system or Tiny PDF. They're all systems that I work into work round the same system. Basically, I incorporate my system into their systems so that I can work better… I used to take tape recorder, iPads, I use them to record stuff. And when I'm in lectures, I used to draw a mind map of the lecture.” [HENRY]	Adapting the adaptive technology to meet their needs.
			
			Using technology to work around (systemic?) barriers in delivery, then using systems (preferences?) to improve the usefulness of the technology as it relates to their learning process.
				Accommodations
				
				Preferences
				
				Systems & Tools
				
				• Software
				  ○ Word | Apps
				• Hardware
				  ○ Audio recorder
				  ○ iPad
				• Systems
				  ○ diagramming (mind maps)

Table 3.11 Example of the relationship between Participant response, memo notes, and initial codes.

3.8.3 **Step 3: Preparing for subsequent interviews.**

The codes and memos also facilitated the development of questions to use in the subsequent interviews with participants. They helped identify gaps in both the questions I had previously asked and in the responses received, providing an opportunity to modify questions and clarify uncertainties in future interviews.

3.8.4 **Step 4: Repeat steps 1-3 (2x)**

During this stage, I transcribed the interviews, provided participants an opportunity to edit their records, reviewed the interview contents, and completed initial coding for the second and third rounds of interviews. Once the third interview sessions were coded, I reviewed and refined the codes used in all interviews and began to seek out themes within the data.

3.8.5 **Step 5: Collect and code journal artefacts**

Participants had the option to turn in their reflective journal artefacts at any stage in the process. Two did not submit journals. Of the six remaining, all but one opted to submit their journal entry 10-30 days after their final interview was completed, with three submitting draft versions periodically throughout the process. Bill submitted his journal record immediately following his first interview. Both participant and my own artefact contents were reviewed and coded using the same process as the interview data.

3.8.6 **Step 6: Develop themes from coding**

In the final stage of data analysis, I used my notes and codes to organise the data into larger categories. I then reviewed the data to seek out common themes emerging from participant interview responses and journal artefacts.

3.9 **Researcher's point of view**

In a remote ethnography, the researcher’s point of view is an integral piece of the final product, brought into the project through the process of reflexivity (Heath, 2006). Neither the data collection nor analysis can escape the influence of the

researcher, as they are “created from the shared experiences and relationship with participants and other sources of data” (Charmaz, 2014, p. 239). Braun and Clarke (2022) assert that “Researcher subjectivity is the primary tool for reflexive TA” (p. 9) and is a resource when completing research analysis. As such, it is best to both acknowledge and recognise the part my own life experiences will play in the research (Ramalho et al., 2015).

During the data analysis and coding process, I made observational notes on both the study participant data and on the research processes as a whole. At times, these notes appear to be a side conversation with the data – or perhaps with my own internalized (un)conscious bias – supporting the iterative and interactive process of inquiry. I included transcript memos in my own case study write-up (Chapter 4: Findings, section 4.1.1), and excerpts from my journals and personal communications appear throughout this thesis.

3.9.1 **Recognizing and accepting the gift of grace**

In working through the research design and data collection phases, I drew upon the influence of the Crip theory perspective of critical disability theory to carefully consider the physical, cognitive, and emotional states of the study’s participants.

> I know that a PhD is supposed to be a challenging process; that people struggle with it no matter their background or field of study. But I can’t help wonder how many others have to work naps into their schedules? Who else needs to spend hours in a dark room to recover from migraines or experiences overwhelming nausea related to staring at computer screens? Does it take them 2-3 hours to read a few pages of text and code it too? Do they find themselves re-reading the same few sentences in a paragraph or jolting awake because they’ve fallen asleep (again!) when they were supposed to be analysing their data? (Research journal, March 12, 2022)

I intentionally built accommodation into the bones of the research design. Along the way, I began to recognise that adaptations – to activities, timelines, and expectations – would be required for me to be successful in completing the project. My research journal entries during this period were filled with statements of self-doubt and of cognitive and physical exhaustion.

I discovered that my concept of the time required to complete activities post-injury also required significant adjustment. In my initial research project plan, I had anticipated these activities would only take a few weeks to complete. During our initial conversations, I had cheerily informed my participants that I would have their transcripts ready for them to review weeks before our next planned interview. In reality, I spent 4 months transcribing the interview data. Returning to my participants to ask for more time to provide them with the transcripts for review was a lesson in humility and acceptance. These conversations were also the first steps in letting go of “old me” and learning to acknowledge and accept “new me”.

After spending some time reviewing participant transcripts, I noted in my research journal

> When you have an ABI, you find you can no longer trust your memories. Your brain becomes your enemy. You start second guessing everything because you can no longer trust your own mind. For some, this seems to lead to the development of mitigation strategies to assist in manoeuvring through their day-to-day activities. For others, it contributes to a sense of shame, or a lack of trust in their own abilities. (Research journal, June 7, 2022)

For me, it was a combination of all three. To mitigate challenges with my physical and cognitive functions, I had to lay out a clear process to follow. Something I could return to and refer to over and over. It functioned as external, retrievable memory, helping me to recall why I had made the decisions I had. It also provided a job aid to guide me through steps I had forgotten how to do as I moved from one phase of the data collection or analysis to another. And, perhaps most importantly, in the end, these documented processes provided the road map for any other researcher to follow in the future. Because the elephant in the room is large, and likely, I may not remember what I did from day to day.

It wasn’t enough to document processes and create memory aids. I also needed to find ways to support my physical, emotional, and cognitive needs as I progressed through the project. Once again, I needed to acknowledge the requirement for, and pay, my own “crip tax” (Blanchard, 2020; Emens, 2021) to exist as a disabled researcher. I had to learn to build naps into my work schedule to set realistic (and reasonable) goals for completing different project phases. I

also needed to learn to “meet myself where I was at”, to learn to recognise that it wasn’t just my participants that required accommodation at all stages of the project. As a student with ABI, I too required accommodation and grace.

3.10 **Summary and next chapter**

This chapter began with an introduction to the research project’s methodology and underlying theoretical framework. It continued with an overview of the study design, location, population, and sampling procedure, then described how the participants and I worked together to co-construct data collection processes, identified the data collection instruments, and outlined how the resulting data were analysed. The chapter ends with a review of ethical considerations for research when partnering with disabled individuals. The next chapter will provide an overview of the findings from the data analysis process.

Chapter 4: **Findings**

4.1 **Overview of this chapter**

This chapter introduces the individual study participants, described in accordance with their comfort level with sharing their personal information. While each participant has ABI, the characteristics of their injuries and their impact on daily life are unique to the individual. Expanding our current understanding of the experiences of students with ABI in online learning environments through the lens of their insider perspective, these student profiles demonstrate how multiple students within the same disability classification, ABI, can encounter and mitigate markedly different barriers to their online learning experience. The chapter ends with an exploration of my own experience as a student with ABI in online learning.

4.2 **The data**

As described in the methods chapter, participants completed a survey that collected information relating to their injury and symptoms before attending a web-based interview. They ended their data-collection cycle with the submission of an ethnographic artefact.

To address the individual nature of the impacts of their injuries, I have decided to present the findings as individual case studies. Names provided are pseudonyms self-selected by participants, allowing them to quickly recognize themselves and their contribution to the research. Results are outlined in relation to the three research questions:

> RQ1: In what ways do students with ABI experience find learning opportunities in an online context?
>
> RQ2: In what ways do students with ABI experience encounter barriers in an online context?
>
> RQ3: What mitigation strategies (if any) do students with ABI experience use?

When discussing how students with ABI experience online learning, conversations centred on their injury and how it impacted their time as a student. Participants spoke of the opportunities and challenges of online learning, as well as reflected on what worked well, what barriers they faced, and what might have made their learning experience better.

Study participants hail from Canada, the UK, and the USA and were not members of an established cohort of students enrolled in a single course at a HE institution. While all were students in online courses offered at accredited HE institutions, they did not share a common level of education, years of experience within the level of education, or programme of study. Participants reflected on their personal experiences with course online learning environments, technology, course materials and activities, instructors, support services, as it related to their personal context and past educational history.

Based on cultural norms, students in each country may use different terms to refer to their instructors within their HE institutions. Titles such as tutor, facilitator, instructor, and professor appear throughout the case studies based on participants' preferred word choice during their interviews and in their journal artefacts. At times, participants would use more than one term interchangeably.

Honouring the inherent value and richness of disabled experiences as championed in Hanebutt and Mueller's (2021) depiction of the holistic nature of Crip theory, I strived to respect the participants' voices and used their expressed terminology at every opportunity. I chose not to make use of [sic] to denote spelling or grammatical errors when including participant quotes from their interview of their journal entries. While [sic] is typically used to indicate that the quotations are being provided in their original format, unaltered by the writer, I found its use called undue attention to the mechanics of *how* participants expressed their thoughts, as opposed to ensuring the focus remained with *what* they were saying. While it can be a bit jarring for some readers to see quotations with grammatical and spelling errors, this method best preserves the integrity of the participant voices and is less discordant than seeing a sea of [sic] throughout their contributions.

4.3 Case Study 1: Bill (England)

When he was 13 years old, Bill was involved in an MVA, which left him hospitalised with an intracranial hematoma and skull fracture, which damaged his left parietal lobe. Bill's injury impacts his ability to recognise words, which decreases his ability to imprint verbal material to his memory. He has difficulty learning and retaining new information and experiences impaired factual and long-term memory creation and retrieval.

At the time of this study, Bill was an Engineering PhD researcher in his early thirties, studying at a university in England. He has since completed his PhD and is now an associate researcher at a UK university with several first-author papers to his record.

4.3.1 Learning opportunities

Having had experience in both environments, Bill expressed a preference for online learning options over learning within a physical classroom. He advised that overall, it was a better use of his time, allowed him to complete his learning anywhere and at his own pace, and reduced distractions.

4.3.2 Barriers encountered in an online context.

In Bill's experience, his greatest challenges with online learning stemmed from decisions made during course design and implementation as opposed to cognitive impairments ensuing from his injury. He had long since learned to accommodate his needs using simple personalization options offered in existing technologies, such as changing the display resolutions on screens and adjusting font types and sizes. He had also developed systems to help him encode and retrieve information that had served him well over the years. He could not overcome design decisions and institutional network administration policy decisions that limited or removed his ability to access and manipulate course content.

4.3.2.1 **Individual impairment(s)**

Bill indicated that he experiences no physical or emotional symptoms as a result of his ABI. He does not suffer from headaches, visual or auditory challenges, or motor skill deficits. His impairment relates to a reduction in previous cognitive functions and in encoding information to, and recalling information from, memory.

4.3.2.2 **Dis/abling (system) barriers**

As part of his required coursework to meet the tutoring requirements at the university, Bill enrolled in a course that was only available for delivery online. Elements of the course included self-contained eLearning modules that used a combination of pictures, text, audio, and video to convey information. The content within the screens could not be manipulated, and no transcriptions of the audio or video components were included in the course site.

> I remember that there was parts of it that were audio and there was parts of it where were only in writing, but they weren't consistent across so there wasn't sections were you could listen to the whole thing or you could read back and forth. (Interview)

Bill noted that these accessibility limitations are not just limited to the self-contained elements of the teacher prep course.

> I haven't see this only in this course. It's in other courses as well. You know, particularly in a course about engineering. It's like, to make it more engaging they put a big picture of whatever and only a small bit of text at the bottom. I think the thing for me, is not the right way of doing it. (Interview)

This lack of consistency impacted how much Bill was able to learn from the materials. In his journal entry, Bill wrote "sometimes it was difficult to follow, especially those screens with a big picture at the top and the need of scrolling down to see the text at the bottom."

Sections of the course had suggested times for completion, which added a layer of pressure to complete the content at a set rate of speed. Bill believed there was value in the quizzes and reflective activities within the course, but felt pressured

to have an immediate response ready for delivery when these activities arose. He would have preferred an opportunity for additional time to reflect on the questions asked and return to the course to provide his answers. Unfortunately, the current course design did not allow for this to occur.

During his coursework, Bill discovered elements of course design that reduced the level of accessibility of the course content or made sections of the course inaccessible to him. He described his inability to change the background colour, font colour, or increase the font size of on-screen text.

> I tried to change the colour. I wanted to change the colour, or you know, even if they read aloud. I like it, but you know, probably the thing that helps me the most is bigger text. Bigger sized labels. (Interview)

Had a downloadable transcription file existed as part of the course materials, he would have been able to manipulate the font size and colour on his computer to meet his needs.

The barriers Bill experienced in his online coursework were specific to the system being designed in a manner that could not accommodate Bill's needs. His individual symptoms related to his injury required minor accommodations; access to written transcription of audio and video content, ability to manipulate font size of background colour, and adjustment to time to completion requirements, yet the course had been developed in a manner that made it impossible to manipulate to provide him with equitable access to its content.

4.3.3 **Strategies for online learning**

Bill was quick to note that the areas where he struggled may not match those of other students. He enjoyed watching videos and listening to audio tracks. These delivery methods made it easier for him to focus on and recall the content therein. He struggled with reading text on screen and retaining the information long enough to be useful during the quizzes and reflective activities. Whenever possible, Bill downloaded copies of course materials, enabling him to re-read and review the materials as well as making individual notes relating to his interpretations of the material content, in an effort to improve his recall abilities.

4.4 **Case Study 2: Michelle (USA)**

Now in her mid-forties, Michelle works as a recreational therapist in a medical clinic located in the USA. At 21, while at university studying English, she was involved in an MVA. As a result, Michelle spent months in the hospital recovering from an intracranial hematoma and skull fractures. Impacting her frontal, parietal, temporal, and occipital lobes, her injury resulted in visual issues, difficulty concentrating, difficulty remembering, and constant fatigue. At 25, she returned to school, changing her degree program to a Bachelor of Science in Recreation Therapy and Psychology; a field selection influenced by her own experiences.

Michelle's degree program was delivered primarily in a traditional face-to-face classroom environment. Her cohort was small, and there was long established trust among the students. However, the final two courses in her undergraduate program were only made available to students as online courses. Michelle described her experience as "a weird one, because it had not been planned."

> They threw together last-minute courses. The only interaction with each other was a little bit of discussion board type things. There was not a whole lot of interaction time with the instructor or the others. The instructor would post a few things for us to like, watch, then it was submitting the assignments and stuff. (Interview)

4.4.1 **Learning opportunities**

The future of online learning offers promise and opportunity for Michelle. In recent years, she has continued to enrol in certificate and professional development courses offered online and cheerfully declared during our first interview that "there's a lot more opportunities out there now" than there were when she was completing her degree. New and updated technologies have opened additional paths to communication between students and their instructors. Michelle observed an important shift in awareness among instructors that discussion activities need to be carefully curated; regardless of whether they happen in-person or online, to increase their value to students as a learning tool.

While lacking direct interaction with her peers, Michelle enjoyed the flexibility that online learning provided. The risks of missing lectures or important assignment

information when suffering from a migraine were reduced. She had more control over more of her physical environment, including lighting and noise levels. The trade-off for working at her own pace and as her health allowed was a need for "more time management and initiative to do the online one than just show up in class at a set time" (Interview). Along with opportunities to continue her studies and flexible hours to focus on her studies, online learning offered Michelle additional opportunities to embrace distraction and procrastination.

4.4.2 **Barriers encountered in an online context.**

Michelle's experience with online learning presented unexpected challenges relating to social isolation that were not present in her face-to-face courses. Despite being part of a small cohort of students who had been together for years, she expressed a sense of disconnect between herself, the materials, her instructors, and fellow participants during her online coursework.

She described a change in mindset after moving to online learning.

> I think it was easier to focus in class because even though the other people were present, what was going on was just class, as opposed to when I was at a distance. Being at home and having just some just like silly basic distractions. Easier to put on my student hat like going into school versus go sit on the couch and do it. (Interview)

4.4.2.1 **Individual impairment(s)**

Michelle regularly experiences strong bouts of fatigue, which increase after cognitive activities such as reading, problem-solving, recalling information, and active listening. She struggles with drowsiness during activities where she is expected to focus her attention, such as during lectures or while reading. Visual stimuli and motion can result in mild bouts of nausea and moderate headaches.

> one of my big problems during school had been I would get really bad migraines that would affect class like I might have to miss classes because I would get bad enough migraines to like, have horrible, like nausea and vomiting and horrible and not being able to think so I might have to miss classes because of that from school. So, but it wasn't something that happened like every day, but I couldn't happen randomly during the week at any time. (Interview)

Since her accident, Michelle also struggles with concentrating, encoding information into, and recalling information from memory.

> Memory was, like my biggest challenge from the injury that I had to deal with in school, so I had to always take extreme copious like notes on everything and review back to them. So that part was the same for the online class versus in person. I just always had to take tons of notes and study extra and do stuff for both. (Interview)

She also noticed changes in her emotional stability. During an interview, Michelle self-identified as “more nervous and less sure of myself” post-injury. Perhaps this is why she offered contradictory statements in her responses throughout her participation in the study. One example of this inconsistency includes Michelle stating that visual stimuli can induce nausea and headaches during interviews and indicating that she did not experience any visual symptoms, auditory-related issues, or motor skill deficits in the brain injury symptom description section of her survey responses.

4.4.2.2 **Dis/abling (system) barriers**

There was an element of the familiar in Michelle’s online learning experience. Her program continued to use print textbooks as the foundational resource for the coursework.

> We still used a textbook. Yeah, we still have the same normal textbook that we were just told to refer to like, the lessons and the things that were given, were just referring to what to read it within the book and stuff. And then there was some supplemental stuff that was given also on the computer, but like through sent out through emails and stuff, but it was that kind of stuff was stuff to print and read like articles and additional stuff to print and read. (Interview)

Michelle’s ability to print the supplemental materials made their content more accessible to her. She had a printer at home and access to others at the school lab, approximately a 15-minute drive by car.

At her university, there was no additional cost to use the computer labs to print materials.

> You did not have to pay anything to use the computer lab or print that was just, you could walk into the computer lab and print or the library, either one, and just openly print whatever we need to. If I did not have printers, that would have been a problem. (Interview)

Audio and video-based materials presented in the course had limited accessibility features. While chatting about technology used in her online courses, Michelle described the video components as containing “no transcripts or captioning. It was just audio.” She noted that these elements would not have been the accommodations she would have needed in a course, but having deaf and blind friends, she knew their value before enrolling in the course. The ability to pause the media file, take notes, and then restart the file to continue met her requirements.

Access to computers and a dedicated physical space to participate in her coursework also played a part in how Michelle interpreted her experience.

> I didn't even have a laptop at that point. It was like just like the bigger computer and monitor and everything. So, I got a computer cabinet where I could sit and do stuff. And so, when I had to actually do typing, watch videos, things like that it had to be done at this specific place. But anything that was not the actual have to be on the computer I did not do there. Reading printouts. That was done informally, wherever in the house. (Interview)

Despite having accommodations in place to address class absences from her Disability Accommodations office, Michelle noted that individual instructor policies relating to attendance would often ignore her accommodations in favour of a blanket policy for all students. She explained

> if I was really out of it because of a horrible migraine like and I couldn’t let her know in advance that I was going to miss a morning class she wasn't willing to excuse the absence. She was very inflexible. Who knows a day or two in advance that they are going to have a migraine or be passed out? She wouldn’t let me make up what I missed. It wasn’t just my body that punished me. She did. (Interview)

An instructor's knowledge, skills, or classroom management policies within their online learning environments also impacted how course activities translated into meaningful learning events for Michelle. In an interview, she described how in one course, student participation on discussion boards was graded, yet there was no structure provided for using the discussion board tool. Instead of her instructor posting activities or questions for guided discussions, cohort members were left to treat the discussion board function as more of a "coffee house" which devolved into "more of a free-for-all than a learning tool" due to the lack of meaningful cohort interaction. This left Michelle frustrated and feeling like she was missing a crucial element in her learning process. She explained

> A lot of the things I missed from not being in class kind of centred around peer discussion. There was not a whole lot of back and forth, not nearly as much bouncing around of ideas as if you were in a class and discussing things. (Interview)

Overall, Michelle didn't believe she'd received the same level of deep learning that she might have received in an in-person course. There was an element of "teaching yourself as opposed to learning from others" in her online experience. She speculated that this may have been due to the last-minute decision to run the course online, and that there had perhaps been little thought to offering anything more than "the bare minimum" when designing the course.

> There was more that we were expected to do alone. I also think not as much was covered. I think it was just the basics that were covered, but I feel like, in person, more could have been because in person discussions could have been led and new topics brought up by others…I feel like less was touched on because of the format. (Interview)

4.4.3 **Strategies for online learning**

To address her processing speed delays, Michelle arranged to have additional time to complete assignments and exams. She did not make use of her university's accommodations department. Rather, she spoke to each new instructor at the beginning of the semester and disclosed her injury. These in-person accommodations continued during her online coursework.

> A lot of times I think of stuff kind of like delay, like, after the fact like, oh, that should have been added. And the same thing, the way I process I tend to process better like, well, I think better in writing then, like verbally answering and stuff. So, a lot of the times I think back and then I'm more clearly able to answer. (Interview)

While Michelle was able to work at her own pace to meet her professor's assignment deadlines, she did not have as much flexibility when it came to where she accessed her online learning courses. Without access to a laptop or tablet, Michelle was tied to her in-home computer desk to complete online activities such as watching videos or posting on the discussion boards. She relied heavily on access to a printer to make paper copies of electronic materials, mitigating the impacts of the invisible chain to her desk. Along with supporting the reading of course content, print copies helped her continue with her long-standing and comfortable routines established while she attended in-person classes.

4.5 Case Study 3: Henry (Scotland)

When he was eighteen, Henry was involved in an MVA, which left him hospitalised with an intracranial hematoma and skull fracture. Damaging his frontal and temporal lobes as well as his cerebellum, his injuries impacted his balance, causing him to experience numbness and tingling throughout his body, and left him with slowed speech, a stutter, and aphasia. Henry experiences significant fatigue, auditory processing issues, has difficulty concentrating, and struggles to recall past knowledge or encode new information into memory when fatigued. Henry's service dog, Painter, aids with physical and emotional support tasks.

Henry spent years teaching English overseas before returning to the UK in his thirties in pursuit of a degree in Education. At the time, he wanted to be less reliant on visitor visas and to pursue access to a longer-term work permit and he needed to obtain a degree to achieve this goal. Returning to the classroom as an adult with a strong understanding of his physical and emotional impairments suited Henry. Over the years, he has developed strategies to improve his focus, learned to manage his memory deficits through external organization, and used tools such as task and calendar apps on his phone to assist in triggering recall.

While participating in this study, Henry was enrolled in a Master's of Arts (MA) program at a university in Scotland. He was a full-time on-campus student whose courses were moved to online delivery because of COVID-19. Post participation, Henry completed the requirements for his MA in Psychology and has since enrolled in a Master of Science program.

4.5.1 Learning opportunities

Henry described his academic achievements as a traditional classroom student as "distinctly average". His interactions with fellow students were often limited to scheduled class time within the physical classroom. Meeting others on or off campus was dependent on his physical or emotional state on any given day and fraught with mobility-related challenges. Once his classes moved to online delivery, Henry noticed that his "grades improved significantly". In one class, students made use of opportunities to meet regularly online, providing each other

with much-needed academic and emotional support. Attributing this to the group's "tight-knit" nature, he described how the students built their own program mini-cohort, enabling them to continue with their student-built community long after the course had ended.

Henry found comfort in online learning spaces. His ability to control his environment enabled him to decrease his level of distraction during lectures, improving his overall learning experience. In the physical classroom, Henry's auditory processing issues we more pronounced and added additional cognitive load to attending lectures.

> When I was when I was abroad, I would have people talking lots of people talking and it was just generally white noise because I couldn't understand what they were saying. Over here lots of people talking, I can't understand anything because it's, I could hear because I can hear and understand every single word of what I'm saying. So, it's very distracting. Especially in big, especially the big computer classrooms. I just couldn't focus on anything because everyone was talking. (Interview)

Online learning helped Henry get the most out of peer learning opportunities. Previously, the source of frustrating jumbles of incoherent auditory input, the question and answer (Q&A) component of lectures and small group work became venues for knowledge sharing. By enabling the Lecturer or group participants to mute those not in an active speaker role, VM technology reduced ambient noise and limited distractions, circumventing the tendency of fellow students to disrupt Henry's focus by participating in off-topic or side conversations.

4.5.2 **Barriers encountered in an online context.**

Many of Henry's challenges with online learning revolved around accessing and using course sites within his university's LMS. Course design and management were completed on an ad-hoc basis with no established or enforced standards.

Like Michelle, Henry described a sense of isolation during his online learning experience that he was unable to overcome by the end of his program.

> I've always wanted to do one, but then through this experience, I've learned that I couldn't do it. The isolation was overwhelming because there'd be no support. There could be the same sort of thing we're talking about, but because we don't know the students personally anyway there was no sense of connection with others. (Interview)

4.5.2.1 **Individual impairment(s)**

Henry's balance decreases, and his levels of fatigue and sensitivity to noise increase with physical and cognitive-based activities. He has trouble concentrating and remembering, which have become his biggest challenges in navigating life inside and outside of the classroom. Henry mentioned he is more emotional and is quicker to experience feelings of irritation and frustration. Based on what he remembers of his state prior to his injury, he does not experience any significant changes in the frequency of headaches, nausea, or sleep disturbances.

In an online learning environment, Henry's auditory processing issues become less of a factor than they are in face-to-face classroom environments.

> When I came out of rehabilitation. I couldn't differentiate between people talking. I couldn't filter out. So anytime I heard a noise or someone talking, I automatically tuned into that and it became very overwhelming. But I have since wound my mind in that way and now I can totally focus on something. To a degree. It depends on how big the classroom is. If the class is 60 people, no, but if the class is 20 people, then yes. (Interview)

As Henry's levels of fatigue increase, he begins to stutter and experience difficulty expressing himself verbally. When this symptom presents itself, Henry tries to remove himself from the situation. He may opt to disengage cognitively, such as ceasing speaking or paying attention to spoken words, "zoning out", or physically, such as leaving a room to take a nap.

4.5.2.2 **Dis/abling (system) barriers**

In his in-person classes, course sites were often used as an electronic document repository for resources. Online activities were limited and ungraded. With the accommodations provided by the university's Disability Office, Henry had not needed to access or interact with the online course sites at the beginning of his program.

> There was not very much online activity, classes went on as normal. I should add here that as the university took into consideration my special needs, all readings for all the modules were already provided to me. I did not need to access the different modules web pages and was unaware that they all used different menus, filing systems, and were accessed differently. (Journal)

Henry's level of interaction with his LMS course sites changed once all his classes moved online. Based on his experiences, he concluded that there was "no uniform design or template for the modules to display their core module information". This became a constant point of frustration for Henry as he attempted to work through his assignments and assessments. Participating in the day-to-day activities of being an online student required him to complete additional cognitive and emotional labour, resulting in increased levels of physical and cognitive fatigue.

Struggling to find information resulting from the lack of consistency across courses, in his journal, he describes the experience of navigating the course sites as "digging further into the mire that was the unfamiliar portal that I did not understand". Later, in his journal, he wrote

> Groups within the various modules were accessed by various pathways, none of the group's menus and access pathways conformed with others. This caused frustration and was an irritant because my brain could not handle the extra stress of learning these new avenues of information access. Eventually I just gave up on access readings etc from the modules and sought out my own information and readings/articles/journals etc. (Journal)

Asked to expand on this concept during a later interview, he explained

> Lots of the technology, lots of the software and stuff is very, very intuitive, but it's actually accessing it that's the tricky part. The university website might be state of the art but accessing anything on it is bloody difficult. (Interview)

Ultimately, poor design of the course sites resulted in Henry's inability to make the most use of approved resources in open-book assessments, negatively impacting his grades in one of his courses.

> information's not accessible or inaccessible, but the decisions people made about where to put information or how to put the information on the site make it so. It is like trying to describe the colour purple if you're colour blind. Makes no sense. (Interview)

In a physical classroom environment, Henry required the assistance of a transcriber to take notes for him. Online, artificial intelligence (AI) transcription services built into VM software performed this task for him. Assuming it was (1) enabled, (2) accurate, and (3) shared with him. While enabling recording and transcription of online lectures in VCs seems like common sense, these do turn out to be some exceptionally large assumptions for many disabled students. In Henry's case, he wasn't aware of downloadable videos in many of his courses. AI transcription was enabled in some of his courses, but the AI software had difficulty interpreting the speech of many of his fellow Scottish students, especially if they were speaking Scots. The files were posted, unedited, to his course sites. Garbled transcripts can be mitigated if video recordings of the lectures are made accessible in the course site. Lecture files in an alternate format can be shared with a human scribe for more accurate transcription. When lectures are not recorded or the recordings are not shared with students later, the lack of accurate transcripts can become a barrier to accessing and understanding the content of any lecture.

While an LMS can provide online Lecturer with efficiencies such as automatic assignment marking and standardised testing, these same qualities can become dis/abling for those with impairments resulting from ABI. In Henry's case, his nemesis was multiple-choice quizzes, on which his ability to pass his statistics

course hinged. In his journal, Henry described a time when he was under a visible time constraint and unable to manipulate the Q&A content using his preferred methods. The questions set in his mind “like a blank slate”. His frustration mounted when his tutor remarked, “this stuff is easy, you've shown me you can do this”, but wasn’t able to offer an alternative method for assessing his skills, knowledge, or ability, such as a verbal or handwritten assignment. Henry noted that unless manual interventions are in place to offer alternate assessment types based on student accommodation plan requirements, students with ABI cannot be accommodated in “one size fits no one” formats.

In addition to facing challenges navigating the LMS and completing course assignments, Henry believed that the level of learning in many of his courses was lacking in depth.

> You might get it, but when you figure out how to do it properly, I'm not there yet. Most of the learning I've been doing, fair enough, I was great, and I enjoyed it, but a lot of it did seem quite superficial. Whereas if you're in the seminar and you're actually having discussions, you can do some really deep dives with the topics. (Interview)

Additionally, he felt disconnected from the sense of learning that helped keep him engaged.

> Even if you're sitting in the cafeteria, you're at a place of higher learning and that kind of emanates from especially the library. But online, you get none of that. You can see your friends and you can see your colleagues and stuff and you can still learn but there's no feeling of learning. (Interview)

Lecturers who could convey information in an interesting or memorable way, or who clearly organised their content with consistent labels in plain language, helped improve the learning experience overall. Henry recognised the importance of an engaged Lecturer in effectively delivering online content at the appropriate level, commenting, “to my mind, the instructor would make or break it. They have that much power”. (Interview)

The lack of consistency across his program's course sites was Henry's biggest concern regarding his online experience. His description of his journey through these sites is both beautiful and disconcerting.

> It's like walking through a maze that you've walked before. So, you know roughly how to walk it but then sometimes after a corner or turn I'll miss a turn, so you have to look up to the directions and just get lost. Yeah. And that's probably the best example. Actually, Alice in Wonderland, the cartoon, there's a point Alice is going through a maze, and she writes down the arrows to follow. But then every time she turns her back, a goblin pops up and then turns the arrow around and puts it back down again. That's the sort of experience it's like for me. (Interview)

Despite these systemic barriers, self-advocacy can and does generate results for Henry. When comparing the state of his online course sites three months after beginning his online learning journey, he revealed

> it has improved tenfold since I joined, probably because I was complaining about it a lot. But yeah, it has improved an awful lot. But the website is still made for normies, not people like me. (Interview)

4.5.3 **Strategies for online learning**

Upon program enrolment, Henry connected with his university's Disability Office to arrange for assessment and accommodations. He later discovered that having an accommodation plan on file was not sufficient to ensure that his course Lecturers read the document. As a result, he made an additional effort to speak to each Lecturer early in his courses to advise them of the plan and his need for additional time to complete tasks.

Henry credits his Disability Office's mental health mentorship program with keeping him on track once he shifted from in-person to online learning. Initially, he thought the service was "too wishy-washy" and rejected the idea but later came to believe that it provided a method for decreasing the sense of isolation he felt as an online learner.

To help him focus, Henry uses three computer screens to segregate content in his online coursework. Due to the inconsistent deployment of meeting room technology, he initially found lectures delivered in VCs hard to follow. Layouts

varied based on the program in use (e.g., Zoom, Webex, MS Teams, etc.) and the functions enabled by the university's IT departments or lecturers. Once Henry learned how to decouple components of the lecture software from the main screen and spread them across multiple monitors, he had an easier time following the lectures.

> I can use these to differentiate between the different activities. The speaker of the group here, the lecturer there, and the chat room up there or the other whiteboard. Basically, they were very complicated. But then I figured out how to make them simpler, how to simplify it. (Interview)3

Along with discerning the relationship between how VC components appear on screen and his ability to focus on the lecture's content, Henry found that the option of accessing lecture recordings and transcriptions after the session decreased feelings of frustration resulting from his reduced ability to remember and recall information. Unfortunately, this option was not always available in all his courses.

Throughout our interviews, Henry notes his distinct preference for digital copies of readings, a frequent component of online learning coursework, over paper "because you can highlight them, you can underline them, you have the application packages, which makes reading easier". When not hampered by digital rights management (DRM) software or the inability to copy and paste the written word from content delivered through a website into a word processing program, Henry uses "the traffic light system" to facilitate his ability to make meaning out of what he's reading.

> It's really quite straightforward. Something that I think should go at the beginning becomes red, the yellow for the for the midsection, and the green for the ending…I've become quite adept. I can read and highlight at the same time. I can go through a whole PDF quite quickly. And I find I can read the whole thing. All the trimmings are cut away immediately because of because of just the highlighting system. I'm taking up the salient points. (Interview)

[3] Henry, describing his three-monitor configuration, lifts his laptop to show me how his system is laid out.

Henry then organises the content based on the assigned colour order, moving sections around the document as it makes sense to him. He later deployed this method to assist him in writing assignments and his dissertation, dubbing this portion of his process “traveller system”. This system becomes doubly important as Henry has noticed he tends to “go down rabbit holes”. He can’t recall if this is something that pre-dates his accident, or if it’s a result of it, but he does make a concerted effort to avoid it while working on classwork.

> on one of the screens, I've always got my research question or whatever the research is about all the time, so I never lose track of it. So, I don't go down any rabbit holes. Because I do, I would do. I have a lot of fun doing it. I actually enjoy doing that and I had to untrain myself from doing that at university. (Interview)

Along with digital resources and lecture transcriptions, Henry relies on written instructions to successfully complete his coursework.

> Conversations might help me understand it better, but I need a written instruction to continue. To even begin what I'm going to do, I need it written down. I can forget a conversation by the end of the conversation. I can totally forget what's been said entirely so I'll have it written down. (Journal)

Henry also depends on his phone’s calendar app to counter his challenges with memory and recall. He initially learned to employ this technique using analogue technology shortly after his accident and has adapted to digital technologies over the years.

> Before the mobile phones came out. I used to have a personal organiser and I used to call that my memory. So, I will put all my stuff in it and if I didn't put it down there, it wasn't going to get remembered. (Interview)

4.6 **Case Study 4: DJ (Canada; enrolled in HE in Australia)**

Now in her late fifties, DJ was thirty-five when she experienced her first head injury as a result of a fall. After magnetic resonance imaging (MRI) and computerized axial tomography (CAT) scans, she was left with short-term memory deficits, the vague diagnosis of “Traumatic Brain Injury – cause unknown”, and no course of treatment. Twenty years later, DJ was involved in an MVA, damaging her occipital and parietal lobes. After this secondary injury, DJ experienced poor visual processing skills, began struggling with reading, had a reduced ability to concentrate, and noticed she increased sense of nausea when moving her head or body. Unrelated to her ABI, DJ is also hard of hearing.

DJ previously completed three HE diploma programs as an on-campus student. Her first was prior to her initial brain injury. The second and third were completed 4 to 7 years post-initial injury. At the time of the study, it had been 2 years since DJ’s second ABI. Participating in undergraduate courses in an Open Studies program at an international university from her home in Canada, DJ observed that she is now at the stage in her life where she is more interested in completing general studies based on topics of interest, rather than obtaining an additional HE degree in a set program of studies. Post study participation, DJ continues to register and participate in online learning opportunities.

4.6.1 **Learning opportunities**

Upon deciding to return to university in 2019, DJ intentionally chose online learning as the delivery method for the variety of course offerings, flexibility in course completion timelines, and ease of enrolment in courses.

4.6.2 **Barriers encountered in an online context.**

While online courses offer significant learner flexibility regarding to time, place, and space, they can result in unexpected challenges for distance learners. While a student may no longer be required to attend a lecture at a specific time, opening the possibility of attending programs in other parts of their country or at international institutions to students unable to physically move to the location, DJ

points out that there is much more that online students may forget to consider when planning to attend an online program.

> There's different holidays, there's different time zones, there's a lot of different lag on getting responses, even in discussion groups. Your peers could be from anywhere in the world. Or your instructors. There's an element of cultural competency that's required to participate in online courses. (Interview)

Absent or unresponsive instructors, incomplete assignment directions, and difficulty developing inter-personal connections with fellow students and instructors sometimes hampered DJ's ability to proceed in her courses. She found the lack of communication and connection frustrating but did not equate it to feelings of isolation.

> When you don't have any relationship with anybody, you can't see them. You're not talking to them. You're not having that interaction, I'm finding that very, very tricky. (Interview)

With online learning, she experienced a feeling of "not knowing what you don't know" more often than she had in her on-campus classes. This was true for both understanding the course content

> The hardest part can be just conceptualizing things that, I don't, I've never had any sort of connection to. I'm one of those people that definitely bounces off ideas and really gets other ideas and insight from other people. Then I can understand them better. So yeah. I missed that part online. (Interview)

and in interacting with technology.

> And sometimes you don't, you don't realise what you need because you just don't even realise that you need something. In the online courses, anything to do with accessibility was mostly things I learned from others. And sometimes they would just be in another, maybe Zoom meeting or lecture that I'd be attending, I sort of get "Oh, well, that would have been really handy". And I'd go from there. (Interview)

4.6.2.1 **Individual impairment(s)**

Since her second ABI, DJ experiences an increased sense of nausea when moving her head or body, or when exposed to flashing lights or quick movement

on screen. Along with impacting her visual processing skills, she has also begun struggling with reading.

The short-term memory loss she experienced as a result of her first ABI was compounded by her inability to attend to multiple inputs or tasks at a single time.

> When I was going in person, I did take advantage of many things like bringing a laptop in and doing my notes. I'm a fast enough typist to do my notes, sort of as the lecture was going on. But I find doing online and trying to do notes at the same time is just sort of one too many things for me to be doing at the same time. My brain can't splinter that far. (Interview)

DJ is also hard of hearing. This makes her preferred adaptation for learning, auditory, more of a challenge when she is unable to control the volume of her environment.

4.6.2.2 **Dis/abling (system) barriers**

Despite making use of disability support services during her time as an on-campus student in the past, DJ did not approach the disability office while working on her online courses, unaware that these services were also available to online students. Her online student intake welcome package contained no information regarding disability services. Upon reflection, DJ mused

> that's interesting, because, you know, when I was at university taking full time, I did connect with students with disabilities, and they were a huge help. They gave me extra time to do things, being able to do it in a private space so that I wasn't necessarily overwhelmed with other sounds and people. For my online courses, I didn't, because I wasn't aware. (Interview).

A self-described auditory learner, DJ preferred to listen to lectures while taking notes. Having access to recorded lectures helped her learn, but it was also mentally and physically taxing. When it came to reviewing lectures, she advised, "I had to do it in smaller doses; it's not like I could sit down and do for hours, I did find it harder to concentrate for that long time." (Interview)

Her preference for audio components in courses was tempered by her need to balance her difficulties with concentration, fatigue, and encoding new information into memory.

> I like to read things myself. I sometimes can miss it just listening. It's easy to sort of drift off for a second even though I'm trying to follow it as it goes through. I find it can be a little easier for me if I can actually read it myself. I think it's a backup method for me to conceptualise things. (Interview)

Inconsistent application of captioning technology in pre-recorded lectures also posed a challenge for DJ. Noting that few of her courses had a downloadable transcript for audio content, she recalled that what was included in the closed-captioned text changed from course to course.

> In my current class, when you're listening to the lecture, it kind of like, does a light highlight as it's going along. However, it’s not verbatim to the lecture, whereas in another one it was verbatim. Like whatever the lecture was, that's what came out in the text captions. This class I found I've had to repeat different parts of the lecture. You know, I've had to do them two or three times before I've gotten certain concepts. (Interview)

The quality of the captioning was important as well. DJ noted that when it comes to AI captioning for synchronous lecture components, there is still a long way to go. At times, she’ll find

> I'm having trouble figuring out what they're saying and it's like, “what? That's not even remotely close!” I may not know what they said, but what’s written in the captions is not on topic or makes no sense. (Interview)

DJ highlighted that captioning videos or offering transcriptions may not solve accessibility issues for everyone experiencing “hearing issues”. Expressing frustration with current technology, DJ mentioned that “those with hearing issues are still discriminated against”. She went on to explain

> the other side is captioning doesn't solve the issue for deaf people. It only solves the issue for someone who's hearing impaired who speaks English, or French, because somebody who's deaf who wasn't hearing before or wasn’t raised in a hearing culture might not even speak English. Somebody who's deaf may have learned ASL. Which is a whole other language. And there's this assumption that captioning is the same as ASL. For those who lip-read, poor captions can be very confusing! (Interview)

Background music included in lecture files posed an additional challenge for DJ; especially when she had no control over the music's volume. This design was implemented in more than one of her courses and added an additional level of complexity when attempting to complete her coursework.

> Some of the lectures always seem to have music as part of the lecture. It can be very, very loud. I find the music can be a little bit distracting. I just find too much noise just gets into the chaos in my head that's going on sometimes. It always seems to be louder than it. It is. And my brain doesn't handle that kind of stuff well. (Interview)

> It would be better if the option to change the volume settings on things existed. Or if you could separate the background music from the lecture. If the assignment requires that you also have to hear the music, there should be a way to modulate that. Separate it from the lecture component rather talking over it. Sometimes when they're just reading stuff can be a little a little boring. Perhaps it would be really handy if they had not necessarily visual clues, but something to back up what they're saying. For example, if they're talking about an artifact, then show what the artifact is. Not everything needs to have music added to make it interesting (Interview)

DJ also found accessing course materials a challenge in many of her course sites. Content was either outdated, included broken links to internal and external resources, or was locked behind paywalls. She remarked that in one of her courses,

> There is no reading material that's embedded in the course. You have to go out and download different reading materials. It is a little trickier at times too because I'm finding some of the hyperlinks they don't work or it's protected material. (Interview)

> I think sometimes the courses get built and then they're built like 4 years ago, and nobody goes back and checks them. They're just left out in the wild, but there should be a responsibility before it goes out to constantly check to make sure because when you link out to these outside websites, they do constantly get updated, and things move around all the time. And maybe that responsibility shouldn't fall on the student. Before enrolment starts somebody should go review it. Somebody with knowledge of how the course works. Could be a TA, could be the instructors. Someone should go back and look at it and make sure that it's still functional and still relevant (Interview)

As an online student, DJ recognized that her access to library resources was not the same as that of an on-campus student. A regular assignment in one of her

courses was to find the original source reference for readings. Her library's licenses for online materials did not always include the resources incorporated in the assignments.

> Because unless they're a UN paper or something like that, trying to find resources that are from print materials or would be in the national library that aren't digitised, is a bit trickier. Sometimes I can find enough of the excerpts to use Google to get the references. Or I can get help at a local library. I'm struggling with that one a lot more. (Interview)

Initially unaware that she could apply for visiting student access to local university libraries, she later learned that reciprocal visiting student programs exist between her university and local institutions from fellow students. While the local university would allow access to its resources, including digital databases, usage was limited to in-person visits, creating physical and temporal barriers to resource access.

As with other study participants, DJ noted the impact an instructor can have on student success in online courses. Unclear assignments and unresponsive instructors can quickly derail a student. In one of her courses, DJ had an assignment that required students to draft short papers, then review their peers' work. A typical assignment in many programs. However, in DJ's program, the assignment was missing clear instructions for students to proceed. There were no guidelines for the paper other than word limits and topic areas. No methods were provided to allow students to sign up to review a peer's work, and she was not provided with dates when the assignments were due to be turned in for redistribution to peers.

> In one course I still need to kind of complete my first peer assignment. And then I have to assess somebody else's. And I'm, I'm really struggling with that. And just looking at the forums, I think a lot of people are. And I'm a writer, so I should be better. But it's very, very hard to get to what you want to say and convey it correctly. I don't find the instructions overly clear, I printed them out and tried to like, do it, how I would do previous University assignments, like, you know, okay, come up with this and do that, and that it's just not working for me for whatever reason. (Interview)

Without pre-existing personal connections to her peers or instructor, DJ found it hard to reach out for help. Describing sending an email to her instructor as

sending something to the “dead letters file”, she noted that some of her peers resorted to starting topics in the course discussion boards asking for clarification.

> people have queried things and looked for clarification, and there does not appear to be certainly a timely response. Because you'll see the same person, repeat, “can somebody please answer? Can somebody? Please?” The instructor does not appear to. It seems to go, you know, two, three, four, or five weeks, and there's just not an answer. (Interview)

> If you've done the course two or three times, and you're seeing the same issues, then surely you could start tailoring it to answer those, you know, frequently asked questions, queries, that sort of stuff. And be responsive when it happens. (Interview).

4.6.3 **Strategies for online learning**

DJ prefers print materials to assist in both her reading and recall abilities. She says she

> “kills a lot of trees, unfortunately. But I just find then again, I will look to it and I will highlight parts that I need and do all kinds of little side notes if I need to just kind of reinforce an idea. Definitely, digital doesn't work for me as well. (Interview)

Manual notetaking is also employed to help with encoding and recall. DJ has found that repetition helps improve her memory and will replay audio and video lectures repeatedly. She remarked, “I'm one of those people that takes lots of notes. So when I'm listening, I'm still taking notes. And then I will look back at my notes to sort of reinforce that.” (Interview)

Setting schedules and goals helps keep DJ on track when working on her coursework. She noted that while this was “very important, not done as often as I should have”. (Interview)

> I try and set specific times to do things. Notice I said I try. It's really easy to be side-tracked by other stuff. But I try and set hard deadlines, but then I've tried to place with myself and go okay, but it's fine. If you don't meet it because of x, y, z. It becomes a little too easy to find those excuses sometimes. So, I have to set hard deadlines for myself. (Interview)

4.7 **Case Study 5: Louise (Canada)**

Louise's ABI stems from neurofibromatosis-related tumours and lesions. At age 11, she developed an optic nerve glioma. Between 1993 and 1997, Louise underwent a series of four brain surgeries to address the optic nerve glioma and a recurring tumour on the right side of her head and neck. Left visually impaired and sensitive to light, the focal injuries to Louise's occipital and temporal lobes also impacted her speech and mathematical processing abilities and have left her with regular bouts of fatigue to contend with.

Inspired by the actions of a close family member, at 27, she enrolled in a Master of Adult Education (MEd) program to improve her employment opportunities. An early adopter of online learning, Louise completed her MEd in 2007 and has been employed as an adult educator, technical writer, and office administrator at an Engineering firm over the years. Louise developed a CP Angle tumour in 2016 and now works part-time (under 30 hours a week).

4.7.1 **Learning opportunities**

Louise's choice to enrol in online courses had seemingly been made for her, as it was the only delivery format available for her MEd program at that time. She speculates the format may have been chosen to accommodate the needs of her fellow students, improving its overall accessibility to increase student enrolment numbers.

> I think most of the Adult Education stuff was all online because it was all with people who weren't free during the day. They had regular jobs. With the online stuff somebody over their lunch hour could go in online and, say they posted something the night before, they could go in and look and see whether anybody made had made any comments, and they could read it and make further comments. And the way our courses were set up was you could go on any time of the day you want to do and read through posts and post your comments, read somebody else's comments. (Interview)

She notes that her online coursework was completed a number of years ago, and that things have changed significantly since she participated in online learning as technology continues to improve.

She compares her experience in online learning with a course her mother was enrolled in at another university in 2021.

> Technology is totally different today than it was. The platform they use - there's more options. Because the people didn't have iPads and stuff in 2004. Right? So, to do anything live, everything was auditory. You couldn't do visual live with the technology. So today the face of online learning is much different I would think. Because you can have Zoom meetings and stuff. (Interview)

Unlike other study participants, Louise did not equate online learning with isolation.

> I like being alone. I don't have a problem being alone. I don't like conflict. So, I like being alone, where it's peaceful and quiet and not noisy like in the classroom. And there's not really any distractions where you can actually sit and think about what you're doing. So, I didn't find it isolating at all. (Interview)

She differentiated between social isolation and interpersonal interaction when describing her experiences, noting, “In several courses, we didn't really interact with people. I liked the interaction with people. I think I would have liked to have met some of these people.” (Interview)

Louise also found the quality of discourse higher in her online experience than it had been in her undergraduate in-person courses.

> the people that were in the courses were all very keen to share their knowledge and experience and listen to yours and provide feedback and stuff. Everybody in the online education stuff, is all people extrapolating experiential learning whether that is positive or negative. So, there's a lot of sharing of personal experiences. There was a lot of a lot of deep sharing. Which obviously doesn't happen face-to-face learning at a university level. (Interview)

Scheduling flexibility and being able to work around her physical, cognitive, and medical requirements remain high points of her experiences as an online learner. Louise remarked, “I really like the online learning when I did it because I had exclusive control over my time.” (Interview)

Louise returned to the concept of time in her journal.

> Working in an online format at the time I was doing it, all discussion boards, meant that I had a ton of flexibility to work when I wanted to. I had no scheduled times I was expected to be online. As part of the course, I was expected to participate in the discussions that were taking place online which sometimes included little activities. (Journal)

4.7.2 **Barriers encountered in an online context.**

In hindsight, Louise has few negative things to say about her experience as an online student. She's less convinced she would have the same opinion if she enrolled in an online course today.

> If I were taking a master's course today, there may very well be zoom classes set up in the evening, which I wouldn't necessarily have liked. For me in the evenings, I'm just spent. I don't know I would have liked the courses as much if there had been a bunch of video classes that we had to attend. (Interview)

> Something I forgot to mention during our conversation is that the online format with its discussion groups allowed me to work when I wanted to. With the technology today, there may be scheduled times that a student is expected to be online, participate in 'live' conversations. If I were to be participating in adult learning today, I would likely not find it as 'flexible' as it was when I did it in the mid 2000's. (Journal)

Louise believes instructors play a large role in a disabled student's success or failure. Their flexibility in adjusting pre-designed course activities and timelines to meet the needs of the students strongly impacts the overall learning experience. While being interviewed, Louise mused that "instructors have the ability to make the student feel like an imposition" and "unworthy of assistance".

> I think instructors/professors need to understand that they have a student in their class who has learning 'obstacles'. Professors need to be aware (I certainly hope they have sense enough to) that every student with learning challenges is different. This, making accommodations for students with disabilities, IS part of their job. I have had professors act very 'put out' or inconvenienced, by having to do something as simple as enlarge an exam or alter its format. (Journal)

Or they can become the disabled student's partner in achieving their educational goals.

> When I was doing my undergraduate degree, I had a professor who noticed I did much better on my essay questions than on multiple choice, so he and I spoke, and he modified my final exam. I think one of the best ways to help a learner who has barriers is to keep an open dialogue. (Journal)

Accommodation work does not all fall on the shoulders of Instructors. Louise remarked that students also need to be able to articulate their needs and advocate for themselves.

> I think as a student with a disability you have to understand your limits and convey them to the instructor. So, if you're only able to focus for two or three hours in the morning, or you can't understand audio files or complete multiple-choice questions, you have to be able to have flexibility from the instructor to help you manage. And sometimes disclosure is harder online, or the instructors don't read your accommodation plans. (Interview)

Louise observes that an instructor's ability to accommodate any student rests on their being aware of the student's disability. Not all instructors are guilty of ignoring a student's institutionally supported accommodation plan, as not all students will have gone through the process to obtain one.

> Some people might not feel comfortable disclosing their disability. I think there is a responsibility of the learner to inform the instructor/trainer that they have difficulty with whatever their challenge is. (Journal)

4.7.2.1 **Individual impairment(s)**

Along with visual impairments, Louise's injury left her with difficulty processing numbers and with maths; she struggled with these subjects throughout her primary and secondary school years. For a period of time in her earlier years, her injuries also resulted in speech impairments, which were surgically improved in 2004.

Describing her memory and recall abilities as “very good”, she explains that she is better able to recall information when it is presented in a fill-in-the-blanks format than when prompted to select information from multiple-choice responses.

> I had this assessment done. And the assessment basically said that I read and write much more slowly for someone with my level of education. So, working with my professors, we talked about it, and I've been filling in the blanks. So instead of saying, asking a question and providing for four answers which I choose, one will ask the question, provide blank and then fill in the blank. (Interview)

Louise noted how the impact of her injuries varies throughout the day(s). The time of day can result in changes to behaviour in order to mitigate symptoms.

> Fatigue, more so eye strain, has always been a challenge since I became visually impaired. I’ve always done better in the morning when I haven’t been using my eyes. As a result of my neurological condition and the side effects of drugs, treatments (prolonged side effects) and other ‘conditions’ I’ve been diagnosed with, often times I’m spent by the time 6:00 rolls around. Being in a class from 6:30 to 8:30 would be very challenging. (Journal)

4.7.2.2 **Dis/abling (system) barriers**

A lack of consistency in how online learning platforms are used was a frequent barrier Louise encountered during her program.

> We had discussed the discontinuity between classes, meaning one prof posted their materials one way while another posted them another way. I think that if institutions are going to move to an online presence, they need to devise a platform that is easily used and that restricts instructors from using it ‘differently’ (Journal).

Training in how to use their platform also needs to be available to both instructors and students. It’s not enough to develop standards for use if the instructors don’t know “how it is used or is meant to be used.”

In her journal, Louise wrote

> I think it would be helpful for instructors to understand what is helpful to students with learning challenges, such as providing a syllabus with dates of events (quizzes, project due dates). I'm not sure how much control a higher learning institution has over its instructors. Institutions have to make institutions barrier free, so a learner can get in the building, but once inside, that's a whole other story. (Journal)

For Louise, improving instructor access to disability supports and professional development opportunities focused on disabilities and how they might present in a classroom is as important as providing instruction in how to use software systems.

> I think it is important for all educators to understand how the learning needs of each student is different. In some respects, everyone has a disability, things they are good at and things they struggle with. As part of an education degree or professional development educators should be taught about different disabilities and what types of accommodations may be helpful for a given learning challenge. I think it would be greatly beneficial if educators, at whatever level, had connections to a resource person who could steer them in the right direction when there is a disabled learner in their classroom. (Journal)

4.7.3 **Strategies for online learning**

Having exposure to her first computer at an early age, Louise was comfortable with computers and technology long before she enrolled in her MEd program. She did not use JAWS or Zoomtext, adaptive technology for the visually impaired; rather, she adjusted font text size on her screen.

> If I needed something enlarged, I could enlarge it myself. If I need something a little bit bigger, I can copy and paste it into Word and make the font text larger. Or using a browser, I can make the zoom bigger or smaller. (Interview)

She also frequently printed online materials to make sense of their content.

> I would have found writing a paper using my iPad to display articles difficult. I would print things then highlight stuff I wanted to quote in my paper...I'd say "so and so" meaning the authors have indicated that and then I'd quote it and then add some more feedback. I would write all over those papers. (Interview)

Understanding your own limitations and how to best work within them is important to Louise's understanding of student success in HE. This sense of self-awareness, partnered with the ability to self-advocate and willingness to disclose, is crucial to being able to thrive in an online learning environment.

> Meeting the needs of learners with learning challenges has to be a partnership. Instructors need to be flexible. Learners who have neurological function loss because of a brain injury may need help in discovering what strategies and helpful. This is a process that for some could take years. I think learners need to have a good grasp on what their needs are before delving into a higher education journey. I don't know that it is fair to ask an instructor to meet your needs when you can't elaborate what works (Journal).

4.8 Case Study 6: Matt (England)

Currently a PhD student at a UK university, Matt was injured on the field hockey pitch when he was 20 years old. Hospitalised in a stroke ward post-injury, he was diagnosed with a closed head injury impacting his frontal lobe. He did not experience any bleeding in the brain, which he described as “surprising” to his medical team. His ABI is thought to have been impacted by the pressure from a “snapped (not broken)” neck vein during his injury. Half of his body didn’t seem to be functioning properly, and he had a sensation that it “wasn’t a part of him” and he “couldn’t see straight”. Post-injury, Matt experiences intense headaches, visual processing issues, and fatigue. Describing his challenges with concentration and focus as a “mental fog”, this state becomes more difficult for Matt to navigate when experiencing physical or cognitive fatigue.

Matt completed the final year of his undergraduate studies as an online student. At the time of his participation in the study, Matt had recently embarked on PhD studies as an on-campus research student. Interrupted by COVID-19, his courses were moved online. Now in his mid-twenties, he continues working towards completion of his PhD in Chemistry.

Diagnosed with autism, dyslexia, and Irlen syndrome as a child, Matt is cognizant of how his brain injury has changed how he interacts with the world around him and how he sees himself.

> It's almost like the autistic part and then the new brain injury part kind of a directly at odds with each other. Because autism wants to do the same thing forever. But with the head injury, I can't do that anymore. Like I used to when I was young, before the injury, I could just focus on one thing, but now you have attention deficit. And it's like, this is a weird warring part of my head, which, again, that sounds very dramatic. But it's a weird new experience for me that I've had these last 4 years since the head injury, because it's very much had changed the way that my brain works. (Interview)

> I was lucky, it wasn't anything personality related. I don't think it was just my, the things that I value in myself in terms of productivity. Focus, strength, all that sort of thing. Resilience to other things got weaker. And that for me, was quite upsetting initially. But it's been a little while now. And I'm kind of getting used to the new normal as everyone else is. But it's just one of those things. You just kind of got to think, okay, it exists. Let's figure out ways to to deal with it. (Interview)

4.8.1 **Learning opportunities**

Online learning offered Matt a way to continue his studies while in recovery from his ABI. It also addressed his need for more flexibility when it came to when and where he studied.

> I have never been at my most effective when trying to adhere to the conventual 9 to 5 working day. This behaviour became more pronounced following my head injury, so one benefit of working remotely it that I am not constrained to usual hours and can perform tasks in the time window that my brain is at its most efficient. (Journal)

Presentation of lectures in a recorded video format not only allowed Matt to review the materials at his own pace, pausing and replaying materials as needed, but it also allowed him the flexibility to modify the pace of content delivery. Having access to recordings took some of the pressure off Matt as a student and allowed him to focus on his health when necessary. They ensured that he didn’t fall behind in his classes if he was away due to illness or needed to repeat lectures before proceeding to the next task.

> having all lecture content presented in video format made the process of initial understanding and revision easier. I was able to pause and replay sections of the presentation as many times as I liked, ensuring I took in all the important details. It also allowed me to move through the content at a pace that was best for me as all the lectures were made available to us from the start. This meant that I could take advantage of days where I was not experiencing the effects of my head injury and not have to worry about bad days forcing me to miss any important teaching sessions. (Journal)

Automation options within the LMS allow Matt to meet assignment deadlines while still working to his preferred schedule.

> Say I need you to submit something for a deadline, I can tell the computer to automatically do that whilst I'm asleep. Like it can submit that at the right time. And then I can wake up and do work in my optimal hours to get the most done. (Interview)

Matt acknowledges the impact of instructors, IT, and support staff on an online student's success.

> I've had a good time of it comparatively, because our department and our faculty are always like, super on the ball. And they made everything easier. But if it hadn't been that case, I imagine it would have been an absolute nightmare, because any organizational problems with this system would have made it all fall apart (Interview).

Overall, Matt remarked that his online learning experiences to have had a positive impact on his mental health as a student, noting that he quality of the instruction remained consistent regardless of method.

> Learning online had a net positive effect on my mental wellbeing: being able to work at a pace I'm best suited for and being allowed to work around the effects of my head injury relieved a lot often usual stresses of a university semester. (Journal)

> I came out thinking I got the same quality of education, from the online teaching to doing it in person. It was just very different in a way, but I felt like it was on the same level of quality. (Interview)

4.8.2 **Barriers encountered in an online context.**

Online learning is both a blessing and a barrier for Matt. It allows him the flexibility to immediately address a migraine episode when triggered.

> Being at home for work holds the benefit of easy comfort. If I feel a migraine coming, I don't have endure a journey home before treating it. One unavoidable downside of working remotely is the effect screen glare has on me. I have notices that the eye strain I get from looking at screens all day for my research appears to act as a trigger for the migraines. (Journal)

However, one of his most frequent migraine triggers is using the technology required to participate in online coursework.

> the things that are going to give you headaches, migraines, nausea, they all come from this screen. I think in the end. it's not good for your health. Being stuck in one place looking at a screen is definitely the worst part of it. Both for the head injury related problems and also, it's doing precisely what I'm not good at which is reading lots of things. (Interview)

Having access to communications infrastructure, most importantly a strong and reliable internet connection, makes a difference in the online student experience as well. In his journal, Matt wrote, “having a less-than-optimal connection to the internet at home (less than 5mbps) makes doing any learning online very difficult.”

Matt found it challenging to interact with others during his online coursework. Organic opportunities for conversation arising from ad-hoc conversations in an office or hallway don’t exist for online learners.

> If you have a problem, you would have to email it. If you had a problem in real life, you could go and find your lecturer or somebody and just talk to them about it. It's a five-minute job where they could explain to you the problem, but now you have to email them, set up a meeting with them. And that whole process could take a whole week. And it's like, “Oh, I can't just get what I want, like, get what I need in that moment.” I imagine it's quite similar for everybody. (Interview)

He also found the lack of spontaneity in communications made it harder for him to request and receive help.

> Online, I'm relying on an email. And that kind of puts a little bit of a barrier in the way. And it might be, it's definitely a personal problem. But I find like, my default is to just if I can't go and just actively speak to someone about it, I'll just keep it to myself, and just have that problem forever, instead of going and solving it. So, being forced to communicate digitally, is not as effective for me as just being able to go and find someone to be like, “hey, can you explain this?” (Interview)

At times, Matt found the technology selected by his instructors to support student learning was not as effective as his on-campus experiences of similar activities.

> One major limitation of online learning that I felt restricted me was the lack of question-and-answer workshop sessions. Earlier in my degree, I found that going though exam material with the lecturer present to explain concepts on the fly was vital my understanding of the course. One of my lecturers attempted to hold a workshop session over MS Teams, but the software was not at all suited to the task and the session was not as effective as a conventional workshop. (Journal)

While these limitations can be related to software design, such as the limited capacity of early VM software to provide automatic closed captioning or written transcription for video and audio sessions, they can also be a result of instructor decisions, such as disabling available captioning or transcription functions for students from within the software's admin functions. Or the function may exist, as in the case of the Q&A feature in MS Teams, but may be disabled at the institutional level by IT services, or the students or instructors may not be aware of how to make use of it.

Online learning was often impractical at points of his program. During our interview, Matt noted that there exist "There's some things you just can't do with a computer. Some practical elements to chemistry that we just can't do anywhere else apart from a laboratory". While it's possible to see videos of experiments or watch animated simulations, it's less feasible for online students to set up a safe home lab to conduct their experiments. Which, in turn, makes it harder for Matt to recall how to apply what he's learned when he does return to the lab. He advised that this division between viewing and doing provides "ample time to forget."

4.8.2.1 **Individual impairment(s)**

As a result of his ABI, Matt has developed severe migraines. When considering how to manage in his day-to-day life, his decision-making revolves around how to reduce migraine incidents.

> I think as well because I didn't want to give myself too many threads in my head to keep track off because I'm terrified that I'm gonna if because if I put too much stress on myself, I'm gonna cause myself a migraine. Well, one of my eyes switches off and I need to go lie down for six hours because of the head injury. So, it's almost like you know, when you have a speedometer, if you hit the red line, you're gonna burn out. That's the kind of same thing with my brain. Like I, I will play if I push it too hard, I'm just gonna lose like a day to a migraine. And that's a that's a disaster if it's something that needs to be done. So, a lot of my life is about organised trying to organise things in a way that isn't going to push me into the red so that I lose time to head injury-related headaches. (Interview)

Along with intense headaches, visual processing issues, and fatigue, Matt has noticed that his brain injury has changed his sleep patterns, decreased in his ability to focus, and increased his distractibility.

> Staying focused definitely is the effort thing. And that's, that is I would entirely attribute that to the head injury. I used to be able to, like just zone in on something and stay locked into it forever. And now ever since I've noticed head injury, I don't. I just feel like there's this the focus is gone. And that might be just because I don't sleep as well, as well. I'm sure. Staying focused is the hardest part of it. Not only because we had an injury but compounded with the fact it's all online means there's loads of distractions for my adult brain to get hooked away from. So, it's kind of like the worst possible situation for that sort of thing. (Interview)

Matt observed that it has become more difficult to recall information from memory and to articulate the information he recalls post-injury.

> I think my brain a bit like a computer filing system and I feel a bit like the files got all jumbled up. So, information that was not neatly organised beforehand is now a bit more or less available for me to pick up on in the form web linking, like connections between ideas. That might just be me being down on myself. But that's the way I interpret it at least. And the I'm definitely not as good. I'm not as quick like I would get things information. Now things take me just a little bit longer because I feel like I've lost a little bit of the stability, like with ideas coming out. (Interview)

After ABI, places of comfort such as the home can exacerbate the tendency to become distracted.

> One negative effect of all learning being online was that it was now to be done at home. Whilst being at home allows me to use my own setup, it also means I am surrounded by the distractions that come with being at home. If I get up for a drink and notice my kitchen countertop is dirty, I think I should clean that whilst I'm here. But no, I should be working. The head injury has made focusing on tasks more difficult than before, so I found this to be a source of stress throughout the semester. (Journal)

As a child, Matt learned ways to reduce the impact of his Irlen syndrome and dyslexia on his studies through the use of specially tinted red glasses. Recent research suggests that the same specialised colour filtration used to support individuals with Irlen syndrome can also reduce symptoms relating to visual stressors, ABI, and migraines (Bansal & Green, 2022; Fimreite et al., 2018). He also has access to software to help him if he doesn't remember or want to wear his glasses. Screen glare and its associated visual fatigue are some of Matt's most frequent post-injury migraine triggers.

> I have a piece of software given to me by disabled students allowance that can tilt, tint the screen, my particular colour, but all the settings are set up. So, I just hit a button, and it goes red. So, if I'm ever in a position where it would be better to have it that I have the option to do that. (Interview)

Reconciling how things used to be with the way things are now is, at times, difficult for Matt. Older coping strategies learned as a child to address his other learning difficulties no longer function as well as they once did, if at all.

> the head injury gets in the way because it's like, yes, changed the whole system, how everything used to work. And it's like the whole balancing act well, but I'm not used to even 4 years later. But we're getting there. (Interview)

4.8.2.2 **Dis/abling (system) barriers**

Matt struggles with reading and prefers to use text-to-speech software to read to him whenever possible. During his time as an online student, there have been significant improvements in AI transcription software. However, not all universities

or instructors have enabled this feature for student use. Reflecting on how his team managed a group project via text and email, he noted

> Normally text is not a good thing for me because it sets off. Like if I'm reading too much intense text, and I forget to wear my glasses. That will be that's normally like a migraine trigger for me. Sometimes it's unavoidable because we need things recorded. We didn't really know that you could record a whole voice conversation and that the recording could be transcribed while the conversations were happening. So, we typed everything. That was the best way to keep it on record. (Interview)

How text content is laid out on screen can be a challenge, depending on how and where Matt is accessing his online courses. At his best when able to manipulate the text to display in preferred fonts and sizes, that's not always an available option. Monitor sizes vary. Text can be locked down within the LMS system, stopping students from manipulating the text in alternate software, printing text, or using built-in browser or system features to change how text is displayed.

> I'm a bit privileged in a sense, because I've got this quite a massive monitor at home that means that all the text is normally laid out in a nice, normally single lines. But if I'm ever at uni, when I've got the smaller monitors, I would take that and put it elsewhere. Like in a notepad document because I find they're really simple Courier New notepad font is much better for my my brain to pick up on. So sometimes I'll switch it over to their tab. So, I can read it quicker and then close that down and finish out what I need to do. (Interview)

Where software programs supporting reading and writing exist, accessing and using them over time can prove challenging. When discussing texthelp's Read&Write software, Matt remarked

> I used to use it, but the problem is, is that particular piece of software was put on my old laptop, and I have yet to do the rather difficult migration on to my new computer. Eventually, I will get around to doing that. Because I know it has all those lovely speech programs in it as well. And I will get around to doing it. It's just things are very busy at the moment. (Interview)

Cloud-based software and easier access to licences to accessible software packages for disabled students can help mitigate challenges encountered when a student is unable to update their computer systems. However, these do not help the student if the pace of change in accessibility software results in software's

minimum system requirements outgrowing the maximum system capabilities of the student's personal technology. Licensing access decisions made at an institution's governance level can have a trickle-down effect on students' finances and technology budgets over the course of their studies.

Having experience as an online learner at two different universities in the UK, Matt noted that accessibility options were not consistently applied across programs or institutions. While many of his current university courses offer content in a number of alternate formats (audio, video, PDF, TXT, and/or DOCX), this was not the case during his undergraduate studies. When describing his experience at his first university, he explained that there was an expectation on the student to make use of the digital materials provided even if they were not accessible.

> when I had to do my exams, digitally, they would just send us a PDF document of the of the paper that I had to complete. And it would have been nice to have that in any other manner. But I guess because we were doing it home if the assumption was that you modify it to your needs. It would have been nice if they had done more on their end. (Interview)

4.8.3 **Strategies for online learning**

For Matt, much of his daily life is now built upon routine. He schedules everything to ensure he forgets nothing.

> I can stay on task more, if I know, like, what I'm gonna do today, this is what I'm gonna do tomorrow. And this is how I'm going to do the day after that. But the minute things start to go a little bit longer out, like, this is what you I want you to do over the course of this month, my brain starts to panic a bit. Because it's like, Oh, that's too much like, I want to think about it by day, not by month, like too long a period of time. (Interview)

To get and stay on task, Matt likes to use flow charts. With an added side benefit of helping him understand how much time tasks take to complete, he can refer to them when he needs to estimate time to completion for tasks and assignments.

He’s found the process so useful that he has expanded it to include daily life chores such as cooking.

> The idea is for a day, I had come up with what I'm going to do, how I'm going to do it, who I'm going to send it to kind of thing for every day. So, it's like, identify the different parts, figure out how to the next step. And that'll be a plan for like two days. So, if I split it up by task, and by job, I can then attribute how long each of those tasks is going to take by day. And then I can get use that to give an estimate of how long it's going to take me to finish. (Interview)

During his online undergrad courses, Matt noted that course content didn’t follow a timed-release schedule. Instead, he said they “just decided to plunk it all down in one go and just said 'here you go". For someone with difficulties managing time and who gets overwhelmed with too much input, this mass release of materials at the beginning of each course had the potential to cause Matt to “freeze in place”. In an attempt to mitigate this, he’d print support materials to help him manage his workload more effectively.

> Right at the start, I would print out all of the handouts to put them into one gigantic booklet. And then plump my big book down and watch through all the lectures making notes as I go. And then if I felt like I missed anything, I would go back and watch it again, or pause, go back, it's like, it's back to the start, listen to it, again, make sure I'm writing down the notes. (Interview)

Matt has adapted the technology he uses to be more successful as an online student.

> High Refresh rate monitor: the monitor I currently use for work has a refresh rate of 165 Hz, putting it considerably above a more conventional PC Screen, which usually have a refresh rate of 60 Hz. The lager number of frames per second make any movements on the screen look significantly smoother, which I find is far less headache inducing. (Journal)

At times, he combines software and hardware to mitigate the possibility of triggering a migraine. In his journal, Matt describes how he uses Microsoft Edge’s screen reader functionality to assist him in reading large amounts of scientific papers. The text-to-speech feature supports him by “letting my ears take some of the burden away from my eyes.”. He then makes use of a mini wireless keyboard

and programmable macro keyboard to decrease migraine occurrence and improve his productivity.

I have found that sitting at a desk for long periods of time may give me migraines and walking around my flat prevents them. This therefore creates a need for a device that allows me to control my PC when I am walking around. My solution to this is a mini wireless keyboard. This device gives me full control over MS Edge whilst allowing me to step away from the desk. (Journal and photo)

Figure 4.1 Matt's mini wireless keyboard, May 2021.

Minimising my use of the mouse when using the PC improves my productivity. I have therefore got hold of a macro keyboard. Every key on the pad can be programmed to play a key sequence, preforming a specific task. For example, I have a key for opening a context menu in all programs, making and closing tabs in google chrome and Edge and other more program specific short cuts. (Journal and photo)

Figure 4.2 Matt's programmable macro keyboard, May 2021.

Matt also makes use of noise-cancelling earphones, helping him focus when listening to journal articles by removing unwanted background noise. In discussing their use, he mentioned that earphones with this technology can be quite expensive and may not be accessible to everyone due to their cost.

Sharing his situation with others was something Matt was quite comfortable with prior to his brain injury. He found it easier to work on group projects and obtain necessary support from both his university and his instructors when he took the time to describe his disabilities and express his accommodation needs in advance.

> Because I have my dyslexia and autism. I just have gotten used to telling people about things. And I just, I kind of feel like it helps me personally, if I just let everybody know what the score is at the start. (Interview)

4.9 **Case Study 7: Elizabeth (USA)**

At thirty, Elizabeth was involved in a single person cycling accident, flipping her bicycle. Not hospitalised post-injury, she was diagnosed by her general practitioner with a concussion. Since her injury, she experiences fatigue, light and noise sensitivity, headaches, and balance issues exacerbated by dizziness. Her sleep patterns have been disrupted, and she now has difficulty organizing thoughts in writing and struggles with concentration, memory, and recall.

Elizabeth is bipolar and describes herself as “disabled and MAD”. While participating in this study, Elizabeth was enrolled in an in-person PhD program at a USA-based institution that moved to and remained online due to COVID-19. In 2022, she won fellowship awards for her work in Disability and Special Education and is currently working on completing her PhD research project.

4.9.1 **Learning opportunities**

Elizabeth sustained her ABI in the period between being accepted into her PhD program studies and when her first course began, moving from an on-campus student to an online one as a result of COVID-19. Three years later, Elizabeth has attempted to find a balance between her gratefulness in being able to continue in her program and her difficulties navigating the world of an online learner. Able to adapt her existing computer system to allow her to continue to work, she struggles to succeed in her studies.

> Luckily, I have, my projector setup now. So, I don't have to be staring at the screen to do what I need to do. So that's really awesome. And that's all, you know, not everything, because it's still exhausting. Cuz there's something about online learning that also like feels more tiring, and then I think just as far as like, sustaining attention or time management, or like knowing expectations, I think that's even harder for me in the virtual world than it was beforehand, if that makes sense. (Interview)

Flexible scheduling has been an unexpected benefit of online learning. With more ability to control what she is doing and when, Elizabeth schedules her activities to best address cognitive and physical fatigue resulting from her ABI.

> I don't do early mornings. I've never been an early morning person, but particularly after my head injury, pretty much before 10, I could be awake, but getting work done is difficult. I could do menial tasks. 10 is really where I would say I hit, not a stride, but where I hit a point where I'm like, okay, I can actually navigate my thoughts enough to put them in order. Then I try to leave afternoons for any meetings because I'm an oral processor, so it doesn't take quite as much energy for me as organizing my thoughts in writing. When I'm saying things out loud, I can usually talk around enough that I get to my actual point. (Interview)

4.9.2 **Barriers encountered in an online context.**

An extrovert who thrives on “bouncing ideas off of others”, Elizabeth found online learning to be an isolating experience. Many of her courses did not have live virtual lectures from her professors or scheduled synchronous discussion components with her peers. She struggled to connect with her program’s content and find motivation to read her assigned readings.

> I don't find online learning, particularly motivating. When I'm like sitting in my room, doing work. I don't like. Being with people and learning with people and talking to you know, it's a lot easier for me to be like, I'm just gonna skim this piece, or maybe I'm not even gonna read this piece, because it's not like I'm gonna have to talk about it. Which is not the best attitude. I know that I'm only taking away learning opportunities for myself in that case. For me, it's a really, it's, it's, I feel like it's harder for me to know, what's the most meaningful component. (Interview)

It's important to note that her sense of isolation is not limited to the online learning component. Elizabeth remarks that working within an academic environment can be an isolating experience for any disabled student at any time.

> For me personally, education is always about being in community. I have a problem with isolation associated with academia, particularly in that a lot of my work focuses on Disability Justice, not just disability rights. And so, I find it particularly problematic that in academia, you're supposed to be like doing work in isolation, that doesn't make sense to me in general. (Interview)

For Elizabeth, online learning is not as effective or meaningful as attending on-campus lectures. In her online courses, she describes a sense of “skimming the surface because of that inability to go into those deeper discourses.”

> I find that in online learning spaces, discussion boards are cool. You can add on to someone's discussion, I guess, and you can see how they're interpreting it. But I find that in discussion boards, there's a lot more of "Oh, yeah, I appreciate your interpretation". As opposed to in person spaces there's more of a dialogue around like, "Oh, that's an interesting interpretation. I actually read it in this other way. Can we talk about that?" Because then there's a back and forth. Often online it’s like one person's posting, and they're just posting to get the assignment done. (Interview)

4.9.2.1 **Individual impairment(s)**

Describing herself as “twitchy”, Elizabeth shares that her neurodivergence displays itself in her inability to sit still. This has become more of a challenge since experiencing her ABI.

> my executive functioning has been a little harder in online learning and like, I have a harder time organizing all of the information in front of me. You know, screen time is a bigger challenge obviously, even with my projector. You know, there are times when it's really too much. (Interview)

For Elizabeth, the body-mind connection works both ways. If she spends time in physical activity, like cycling or yoga, she finds that her cognitive abilities are decreased. Where once these were energizing ways to spur her cognitive function, now they are guaranteed to dull her abilities to generate new ideas or express herself. This is also true when she expends cognitive energy.

> At the beginning, I had to take naps at certain times. I would often get tired around noon to two. And not just tired but needing to take a nap noon to 2 or else I wasn't going to be able to function for the rest of the day. So having to plan and organise my day around of those access needs was really different. (Interview)

Identifying her new limitations was not the same as understanding (and accepting) that there were physical or cognitive consequences when those limits were ignored.

> I had to make sure writing a paper, either I had to write it over time, which made it more difficult in some ways because I wouldn't retain information all the time or I'd have to sit there and write for four to six hours and the next day I couldn't do anything. So, there was a give and take that I had to be ready. I had certain natural consequences, and continue to have certain natural consequences, when I didn't attend my access needs. (Interview)

> In any educational environment, final exams are to be expected. And for some disabled students with ABI like Elizabeth they can become a thing to dread. Not just because thoughts can be scattered and disjointed at the best of times, but also because of the toll they take on the body and mind well after the exam ends. Reading digital content, focusing thoughts and attention, and at times scheduled to occur when our bodies or minds would prefer to be resting. For Elizabeth, “Finals mean late nights, more writing, and increased pressure. Finals mean that my head throbs and I experience extreme fatigue. Finals means preparing for at least two days of recovery.” (Journal)

Time management is challenging when you must re-learn how to estimate the amount of time an activity might take to complete. With the help of her PhD supervisor, Elizabeth has developed a strategy to help her improve her work task estimates for scheduling.

> I have difficulty knowing potentially how much time has passed. I've always kept a calendar, it's always helped me stay organised, but a strategy that my advisor taught me was to very explicitly time track. In my time tracking, I have how long I actually spent on each thing. It both helps me gauge realistic timelines for myself because I'll be like, “oh, on my written calendar, I only allotted one hour for that but when I look at my time jacking calendar, I actually spent three hours on it.” So that's telling me that when I go to, fill in the blank, when I go to write, I should probably allot three times what I think or what I thought it would take me. (Interview)

Also challenging is learning to accept that you are no longer able to do all the things you once could.

> It's kind of funny that after it's been, it'll be 4 years in July, so almost 4 years, and I still sometimes gauge my time as if I didn't have a brain injury. I think it's because I keep wishing. Maybe if I plan it that way, suddenly it will be that way. (Interview)

4.9.2.2 **Dis/abling (system) barriers**

Technology and the digital world were more difficult for Elizabeth to function within since her accident.

> Reading online was the worst, so it slowed me down a lot. Font size is difficult when reading on screens, and I hate not being able to see everything on one page. I felt like I had a lot of conflicting access needs, which was hard to explain to professors. (Journal)

Many of Elizabeth's courses are designed to function asynchronously. There are recorded lectures, discussion board posts, and written assignments that can be completed at the student's convenience, as long as they are completed within the LMS's preset time limits. In this course design, "you're surrounded by people and yet, you're alone." In her cohort, some of the students have been attempting to connect for virtual study sessions and conversation; "we've been finding ways to create or hold space for those things. It's just been challenging." She finds the breakout room functions of VM software used in synchronous course activities to be more conducive to learning with and from others.

Elizabeth described an activity that she thought was a "cool idea but I couldn't do.". She thought it provided online students a way to examine the materials more deeply and spur more dialogue than a typical discussion board post. In the end, she found it both time-consuming and energy-sapping.

> You have like an uploaded reading and then people can comment on certain quotes or certain lines and it's like a shared annotation page. Then you can respond to people's annotations as well as make your own. And then what I liked about it was that if someone responded to something you said, they emailed you. And then I would often go back and maybe respond to that person. So, it felt more like a conversation. Anyway, the first time I did it, it took me so long. I'd read the article on paper and had made my notes on paper. So, in my mind I was like, this should take half an hour, maybe an hour to go through and just put my notes that I have here onto this document. And it took me four hours! (Interview)

Describing program requirements to complete a specific number of courses in a set period to retain her scholarships, Elizabeth was concerned she would be unable to retain her funding. Attempting to push herself beyond her limits to meet

these requirements increased the appearance and impacts of her symptoms, and she found herself falling into a cycle of heroic efforts and burnout.

4.9.3 **Strategies for online learning**

Unable to read digital content from a screen and facing challenges affording printed texts, Elizabeth arranged with her university to obtain printable PDF versions of assigned readings. While this worked well during her time as an on-campus student, when the program moved online, she no longer had access to the library printer to obtain print copies of her materials. To address her inability to read content on screens, she projected her monitor output to display on her walls, blowing it up in size, changing the background colour, removing the impact of the monitor's refresh rate and lighting, making content easier to read.

> I can't look at screens for long periods of time without my head hurting, so I use a red filter on all of my screens and a projector to do work. Before using my projector, I didn't think I was going to be able to continue school when everything went online. My head was hurting all the time, and I was having difficulty focusing. The screen doesn't solve everything, it feels bright at times too, so I have to be careful about how long and how much work I do. I often push myself until I can't focus and then I have to take off extra time later. Also, because we weren't allowed on campus, I couldn't print all of my materials as I'd done for the first 3 years of my program. (Journal)

Figure 4.3 Elizabeth's desktop setup, Sept. 2021.

4.10 **Case Study 8: Kelly (USA)**

Kelly is epileptic and experienced a brain injury to her left temporal lobe at age 4. She has since suffered multiple ABIs. At times, injuries were caused by severe seizures. Others resulted from fall-related concussions or from neurosurgery designed to treat her epilepsy. Her most recent ABI occurred in 2017. As a result of her injuries, she experiences lapses in concentration, grapples with word recognition and aphasia, and struggles with her balance. Her impaired memory has made it challenging to learn and retain added information, and she has difficulty recalling encoded information from long-term memory.

Kelly began her undergraduate program as an on-campus student and later moved to online course delivery to better balance her medical requirements with her course schedule. At the time of this study, Kelly was 36 years old, had finished her bachelor's degree, and was enrolled in a Master of Public Policy focusing on Health Administration, designed to be delivered entirely online. Now forty, Kelly is currently working toward completion of her program.

4.10.1 **Learning opportunities**

Online learning offered many practical benefits for Kelly, facilitating her participation in HE. From not needing to arrange for an in-class note-taker, removing transportation requirements, to reducing medical costs and stress, Kelly found many positives to participating in an online program. Removing the need to attend a physical space granted Kelly access to HE and had a strong influence in her decisions surrounding program selection.

> one thing that I love about taking classes online is the ability to not worry about missing class due to seizures, transportation problems (I can't drive), doctor appointments, etc. Staying home not only saves me some energy and avoids much stress, but it also is safer for me to have a seizure in. Having seizures in public places is more likely to attract injuries than at home; when at home, I can run to furniture or lay on the floor if I feel a seizure coming on to avoid falling. There's also the cost of an ambulance if I have one in public which is extremely expensive here in the United States. (Journal)

Rather than finding her online learning experience isolating, Kelly observed that it opened the doors to HE for her. She explained that online classes are better "adapted to my brain damage, specifically short-term memory," and that access to recorded lectures ensures she both understands the content and doesn't fall behind when she's medically unable to attend class.

> We have one live Zoom lecture per week. I love that they record the lecture. My short-term memory is so horrible that I have always struggled with taking notes, so I love having online lectures that you can listen to over and over again online. If I didn't hear something, I can rewind it, pause it, etc., which my brain frequently needs. (Journal)

Kelly also appreciated that online learning was able to accommodate location transitions "without any educational complications". Due to illness and medical complications, Kelly is taking more time than anticipated to complete her degree and valued being able to remain enrolled in her program while moving between Illinois, Missouri, and California.

4.10.2 **Barriers encountered in an online context.**

Despite her pro-online learning stance, Kelly noted there is a distinct lack of community building and interpersonal relationships between students in online courses.

> It has been much easier to build networks when taking classes in person rather than online. I'm curious if it would help for the classes to have an assignment or two that involved online conversation through a Zoom/Skype type of program. (Journal)

According to Kelly, it's not just the student-to-student interactions that fall short in an online environment. She feels there is also something lacking in the quality of the student/teacher relationship.

> I do miss human-to-human interaction. That's really the big one for me. It seems like it's more... I don't know if empathetic is the right word or not, but any professor is going to see you. They're human, they're going to see you as more of a person, if you're speaking to them face to face, rather than through email. (Interview)

Like Matt and me, Kelly has participated in online learning at multiple universities. In her eyes, discussion board activities can be useful to develop a deeper understanding of topics and may even provide opportunities for community building, but their success or failure rests on the course designer and instructor's classroom management skills.

> Discussion board activities need to be presented in a way that makes sure students more participatory. The expectations about what is and isn't considered an acceptable response should be clear. When people know that a "me too" answer doesn't count towards their grades, I think it helps make the responses more conversational. Have some students assigned to create the question that get asked, then the other students can answer and comment on each other's answers. It seems more conversing rather than, you know, just meeting the assignment requirements. (Interview)

Multiple methods for distributing information can be useful if they all contain the same messaging; however, when different avenues are used to share different content, it can become confusing and overwhelming.

> The school's website and classes have a large amount of announcements in different locations. Some are from the school, some from the classes, some from the emails, etc. It is taking so much time for me to adapt with this, I'm extremely relieved that I already have experience with this type of learning, otherwise it could have taken much longer. My memory is so out of focus that I have to go over things several times. (Journal)

4.10.2.1 **Individual impairment(s)**

Along with poor concentration, Kelly had difficulty with planning and executive function. She becomes overwhelmed and has difficulty moving forward with work assignments.

> Looking back at the past few weeks or so, I sit down to do my homework (very motivated, determined, ready, etc.), but then I become overwhelmed when I ask myself, "what assignment do I want to do first?" because it leads to me having a list in my head of everything that needs to be completed, and then I can't decide which one to start first. I'm really behind on my semester-long assignments. (Journal)

Kelly's challenges with encoding information and recall also make note-taking difficult when she's attending lectures or group project meetings. Transcriptions

and recorded content provide her with the tools she needs to overcome her short-term memory impairment.

> I've never been able to remember what they just said. Like I can't write down without forgetting. I will have to stop you every other sentence and say what was that again? So, when you have it recorded, I can click rewind as many times as I need to. I can have it repeat again and again and again. It's just wonderful. It's just so much better. I'm like, man, if I had only had this during my bachelor's, kids are lucky right now. This is wonderful. (Interview)

It takes Kelly more time to complete tasks. When describing her biggest challenge with her course task assignments, she remarked “a lot of times I can do something that I can do things it just takes me longer than the average person.” (Interview)

4.10.2.2 **Dis/abling (system) barriers**

While online learning may remove barriers relating to place and space, a poor internet connection can disrupt the student’s learning experience. Kelly noted her internet connection can be unreliable, and at times stops her from attending her scheduled lectures. She doesn’t have the option of switching service providers, and attending a class in a public place, like a coffee shop, isn’t an option for her due to her seizure risk.

> If something is due and you can't get your internet to work, or the line is shut down or something. You know, you're like, man, I need to turn this in tonight. But you can't, you don't have your professors phone numbers. You can't call him and say my Internet's not working. So, what do you do? (Interview)

When describing issues with course content design, Kelly focused on how challenging it can be to complete graded online activities with short-term memory issues.

> The hardest part is when I read a question with at least two words in it that I need to look up in the dictionary. By the time I look them up, I forget what the question was, then I read the question again and forget what the definitions were. I have to do it several times to understand the question, rewrite it in my own words, etc. If we have a final that is not open book, I’m not sure how well I will do. (Journal)

For both disabled and non-disabled students, access to funding can hamper their ability to attend. Kelly notes that for students like her, it is not just a case of being able to gain admittance to a program; she also needs the funding to cover her tuition, adaptive technology, software programs, print materials, and internet connection. Cost savings from reduced travel to on-campus courses may be minimal in comparison. Each county, city, state, province, or country may have different rules surrounding student funding or access to student loans, bursaries, or scholarships designed to assist disabled students. Kelly described her challenges in obtaining tuition support.

> As an out of state student, I didn't qualify for county funding. For county funding, they have rules as to how many courses you take in order to qualify. There weren't any scholarships at the school for out of state disabled students. In other schools I attended, there were only scholarships for full-time students, not part-time courseloads. But as a disabled student, a part-time courseload is easier to manage. So, you have to get a student loan, but if you're on disability payments, no one will give you a student loan. (Interview)

Disabled students may have more access to programs in more cities, states, and countries, but if they can't afford to pay their tuition or access needs, the door remains firmly closed.

4.10.3 **Strategies for online learning**

To keep herself on track with her studies, Kelly makes use of Google's digital calendar and handwritten to-do lists. Before beginning her master's program, she used a paper calendar to track her activities.

> I would get a little worried because it's like, okay, well what if I don't have one on me? And I need it. That gave me more motivation to get into the Google Calendar and just have it on my phone and my laptop and stuff. But I have my to-do list on paper. The calendars are a lifesaver. I don't know what I'd do without them. And it's nice too, because on the Google calendar, you can move things over. If there's a delay, you can just say, oh, I'll leave that over to next day or something like that. Good for reminders. I got hooked. (Interview)

The biggest selling point for Kelly when she switched to a digital calendar was the ability to add notes to the entries. On her previous paper calendars, there was

less space to capture pertinent details relating to her assignments, group work activities, synchronous lectures, or meetings with professors. In her digital calendar, she can add text, web links, files, and photos.

Relying on her computer's file system to keep her coursework organised, she appreciates the increase in digital filename size character limits that has developed over the years. To help her manage her coursework and assigned readings, she renames files to contain a "long title that thoroughly describes it to remember what it was." (Interview)

> it's the same with having my stuff all my files organised, and my class files instead of just throwing all the documents in there, I have to, like, go in there and organise them. And so, I have my 501 file, and then I'll have all the reading materials that we had to download, and then another sub folder of the assignments and another sub folder for notes. And I might just have two in one folder, but in order for me to stay in line, then I got to be really intricate like that. (Interview)

Offline, she keeps everything in a designated spot. She can't rely on her memory to help her find things. Kelly admits her organization system has a temporal toll, remarking that "it takes me more time to get things done than the average person because of that." (Interview)

Learning to recognise your limitations is the first step towards success. Learning she did better in a quiet room with no distractions, Kelly turns off all media before focusing on her coursework. She also requires frequent breaks.

> I'll study a chapter and then I'm like, "my brain is fried. I need a break." I'll get to the point where I'm reading something over and over and over again and my mind is just not taking it in. (Interview)

For Kelly, the next step was learning to accept that when it comes to attention span, memory, and recall, and physical energy, she no longer has the same abilities she once had.

> and I know it's like hard for everybody but since I have less brain, less spoons, so to speak, I have to try harder to not let it get to me but it's like you just, you can't. So sometimes you just got to accept that you can't handle everything you want to handle. (Interview)

4.11 **Case Study 9: Sheelagh (Canada, enrolled in HE in England)**

Unlike most participants, I have chosen not to use a pseudonym. After disclosing so much throughout this thesis, it seems disingenuous to attempt to hide now. And yet, the urge to conceal my brain injury and its impacts on my academic and work life remains strong.

My first brain injury at age 19 was the result of an MVA. While I had damage to the temporal lobe, my medical team focused on my recovery from physical injuries sustained in the crash. After the first injury, I had difficulty filtering information inputs and outputs. Often, things I saw or read would be blurted out, with no regard to my environment, and often no awareness that it was happening. I experienced some minor memory issues for the first year. I was left with minor difficulty accessing episodic memories without a prompt, such as someone telling a story or sharing a photograph, but overall, my short-term and working memory returned to a reliable functioning state within the first 24 months post-accident.

At 44, I experienced a medical event while driving. I awoke to find my car embedded in a tree. While I have a vivid memory of the events that took place prior to the accident, my ability to form new memories has been severely impaired due to damage to my frontal, parietal, and temporal lobes. I have difficulty focusing on tasks and recalling data from long-term memory. Information does not easily move from short-term or working memory into long-term memory, or, if it does, it becomes difficult to retrieve. I struggle with reading, a previously beloved pastime, as words and letters move about the page, and attempting to attend to the task of reading results in significant cognitive and physical fatigue. I experience challenges with word finding, word recognition, and audio processing.

At the time of this study, I am a doctoral researcher in my late forties in the E-Research and Technology Enhanced Learning stream at Lancaster University. Attending at a distance from Canada, I work full-time for my Provincial government as a Learning and Development Specialist.

4.11.1 **Learning opportunities**

When it comes to HE or online learning, this isn't my first rodeo, nor is it the first time I've written about my experiences in online learning (Semper, 2020). Over the past 30 years, I have participated in or completed professional development and academic courses, certificates, diplomas, and degrees at seven different accredited colleges and universities in Canada; twice as an on-campus student, once as a student in a blended learning program delivered in a mix of on-campus and online courses, and the remainder fully online. For over 20 years, my career has focused on the development or delivery of in-person and online professional development courses for private industry, academic institutions, and the public sector.

When I was exploring options for a doctoral programme, I didn't limit myself to reviewing those available within my city, province, or country. Based on past experience, I was confident I could successfully juggle part-time online coursework and full-time employment. After considering a number of on-campus and in-person programs, speaking with staff and students at multiple institutions, reviewing current and future career requirements, and discussing familial commitments and financial ramifications of my decision, I chose to apply and accept a place in the E-Research and Technology Enhanced Learning PhD programme delivered part-time, online at Lancaster University.

4.11.2 **Barriers encountered in an online context.**

Although online degrees are often advertised as providing students with an opportunity to learn anytime, anywhere (Daniel, 2016; Naidu, 2017a), I learned that this was not always the case in practice. When describing my experience in my online master's program, 22 years post-experiencing my first brain injury, and 2 years prior to experiencing my second MVA-related TBI during my doctoral programme, I noted that the anticipated flexibility inherent in the delivery method was not always present (Semper, 2020). Lecture and assignment scheduling, access to and the reliability of technology, shifting time zones, juggling school and

work commitments, and access to anticipated support services quickly became barriers to successful completion (Semper, 2020).

4.11.2.1 **Individual impairment(s)**

How we experience brain injury can change over time. In some cases, our somatic, cognitive, emotional, or behavioural symptoms may improve, decreasing their effect on our daily lives. We may learn how to mitigate the impact of our symptoms through the use of assistive technology or behavioural strategies. In my case, my initial struggles with filtering information received from visual inputs after my first ABI did become more manageable as the months and years progressed. As with my balance, my ability to focus and concentrate improved, and my physical and cognitive fatigue reduced to manageable levels and occurred with less frequency. I learned techniques to help me improve my memory. What took longer to improve were my ability to focus and executive function.

My second ABI has introduced new symptoms to the mix. I now experience light sensitivity and audio processing issues. Reading is challenging with words and letters merrily jumping around the page and screen, impacting my ability to absorb written information and make sense of it. Audio-processing challenges impact my ability to focus or retain new information.

> I struggle to focus and make meaning of anything I hear now. I know my hearing is fine; we've had it tested. It's a deficit in audio-processing. In a room with multiple people, voices all sound like Charlie Brown's teacher. It's frustrating that if something diverts my attention for a millisecond, I've lost the plot and need to restart from the beginning. So many starts and stops and restarts in my day-to-day work and research life these days (Research journal, March 2, 2020).

Cognitive tasks increase levels of physical and cognitive fatigue, which in turn increase my levels of reading and audio-processing impairment. My episodic memory frequently requires support in the form of outside triggers (e.g., photos) to access, and my semantic and working memory are highly sensitive to fatigue. Pain is a constant companion; instances of migraine increased from a few times a month to a near-daily experience and were reclassified to chronic status.

Challenges encoding and recalling information from memory have impacted my ability to navigate between work, student, and social realms, as well as managing day-to-day tasks and learning new skills. Reflecting on something Henry said during one of our interviews, regarding how difficult it can be to relearn how to navigate new systems and software, I can't help but dwell on how confusing learning new things can be when you have ABI. In the margins of his interview transcript, I wrote

> Like when there's no consistency and it's not laid out properly and it's not explained how to get to places. Because it does take so long to relearn software and people take it for granted that it's really easy. But if it's changing every single time you go in, it is like a little goblin that pops up ahead of you on a path you're walking on and just changes the arrow to face in a different direction. (Transcript memo, November 6, 2021).

Learning how to use new software and hardware systems was such a challenge during my research project that I specifically included a reference to it in section 2.4 of this thesis. A topic of discussion with my supervisor during draft reviews, one of the versions included the following comment.

> I had tried using document management software such as Mendeley to manage my documents, but I just found it too difficult to learn post injury. I have been using the Excel system described for years prior, which made it easy for me to continue in this manner for my research. Should I be mentioning that here? (Thesis draft comment, September 14, 2023).

Ultimately, I chose to include this as part of the final record because, as previously mentioned, I am aware that I am an unreliable narrator as a result of my memory impairment post ABI. I feel obligated to explain my actions and decisions at every turn, in an attempt to prove that my work is equally valid as that of my peers.

This feeling of inadequacy, or perhaps imposter syndrome, underlies my past history of hiding my disability during my earlier degree programs. I did not want to be perceived as being different from any other student or unworthy of being accepted into HE on my own merits.

When reflecting on the study participant's comments surrounding disclosure, I had written

> you're going to always judge me based on something that you have in your head about somebody with a brain injury. And because you don't know me in any other way, you are going to have this mental picture of me from now on. (Transcript memo, June 23, 2022).

Not unrelated to this fear of being judged as incapable by fellow students or instructors, I was unaware of the supports available to students with ABI through disability services. I had incorrectly believed that a student needed a visible, physical disability to receive accommodations.

Unlike my previous experiences in HE, my second ABI occurred while I was an active student in an online course. Unless I was willing to withdraw from my program – which was never a choice I considered – I had to disclose the accident and the resulting impacts of the brain injury to my department, the course tutor, and my fellow students in the cohort. We were relying on each other to co-create knowledge, understanding and to complete peer reviews of each other's work. I had to explain why I was missing sessions, not participating as I had been, struggling to do simple tasks, and why the quality of my work post-injury no longer matched the levels they were used to seeing. I needed everyone's support in order to continue moving forward, and I am thankful each day for those who helped me find my way during that time.

4.11.2.2 **Dis/abling (system) barriers**

At the time of writing, Lancaster's IT department supports the use of MS Teams for VMs. While transcription is a standard Teams function, it can be disabled at the instructor level. Experiencing difficulties with audio processing and reading, I found the inconsistent use of captioning and transcription frustrating, as it rendered synchronous course activities inaccessible. Live captions moved off the screen too quickly to be read in full, and AI transcription services did not always generate accurate content. Both options routinely produced garbled or wildly inaccurate results if the speaker had a heavy accent, spoke quickly, spoke at a lower volume, or had a speech impediment.

Captioning and transcription of pre-recorded lectures, presentations, or selected online resources (e.g., YouTube video) were not always available, and when they were, they offered similar challenges described above. Some video content used open captioning, where text is displayed directly on the screen. While this made those videos accessible to me, they were inaccessible to anyone reliant on text-reading software. When captions are directly incorporated into videos there is no text available to be read by screen readers (AccessibilityOz, n.d.).

AI transcription services are often limited in how many minutes of input they will transcribe, or in the type of files they will accept for transcription. At the time of writing, both Otter.ai and Microsoft's Word M365 (web-based) have a limit of 300 minutes of audio or video per month. Others limit the length of the recording within the transcribed file (e.g., 30 minutes) or the size of the upload files. At times, I needed to use audio and video editing software to convert file types (e.g., from WAV to MP3) prior to uploading the files to the service providers. When additional transcription was required outside of account limits, a choice would need to be made between paying for service upgrades within the account or going without access to the service. As an unfunded student, accessing human transcription service providers was not an option due to the cost.

There was a 7-hour time difference between my home and the university. Attending scheduled synchronous seminars often meant logging into class at 5:00 AM. Accustoming myself to the time difference was not an insurmountable task, especially when mixed with the insomnia experienced post-ABI, but it did pose challenges when attempting to determine due dates for assignments.

My instructors had significant power over my ability to access accommodations. On three occasions, instructors refused to enact the accommodations outlined in ILSP developed by my university's disability office.

In one course, I contacted the instructor to inform them of my ILSP, requesting that live lectures be recorded with transcription enabled so I could follow along with the lecture and Q&A segment. Refusing the request on the grounds that the European Union's General Data Protection Regulation (GDPR) did not allow for recording of live seminars at universities, despite the university's IT department confirming ILSP's accommodations fall within the boundaries of GDPR. For the first 4 weeks of the course, I struggled to follow along using the live caption feature, unable to understand everything that was being said, and I couldn't read quickly enough to follow along using the captions. It wasn't until the instructor was personally inconvenienced that I received partial access to my accommodation.

> Last week a student had a horrible audio connection. Her voice kept cutting out. When asked to type her question into chat because the instructor couldn't hear, she refused. This week he's announced that he's enabling transcription to help make it easier when people have poor audio connections. You'd think I'd be thrilled with this turn of events, but I am so angry that he decided to enable it now. I didn't have access to 4 weeks of lectures, but now that he's been inconvenienced, it's OK to enable it! (S. Semper, email to co-worker L.S., March 6, 2021).

In the second course, the instructor emailed registered students requesting permission to record sessions as an accommodation need, an action unrelated to university policy. While the second instructor did not identify me in his message, the third required me to personally ask the other students, none of whom I had previously met, for permission to receive my ISLP accommodation. I was informed that all students in the session must agree, or she would not honour my ILSP. While all of the situations were upsetting, only one negatively impacted my ability to fully participate in my courses.

My course sites offered resource materials in multiple formats, making content easily accessible. Accessing library resources was not as simple. Once logged into the library, each item took a minimum of five clicks to access. Specific library resources linked within a course site required three. While I do not experience fine motor skill impairments, a student who does would have difficulty navigating the site structure. Additionally, I was often limited to digital library collection resources. When licenses for digital copies of physical resources held within the

library's collections were unavailable, I had the option to request a loan of print materials. Print resources, typically shipped through standard mail services, can take weeks to arrive at an internationally based student's home.

Like Elizabeth, I experienced unanticipated financial stressors as a result of being injured during my program. My ABI left me with significant physical and cognitive fatigue, which increased the amount of time it took me to complete readings, projects, and assignments. While the disabilities office was able to build accommodations relating to due date extensions into my ILSP, the university's policies surrounding tuition payments offered no accommodations to address the increased financial impacts associated with requiring more time to complete the work.

4.11.3 **Strategies for online learning**

In the past, I had developed systems to keep me on schedule, for researching new materials, note-taking, and file keeping. These systems required adjusting after the second ABI. In my research journal, I wrote

> It wasn't until this second accident mid-stream during the final course in my programme that everything began to fall apart! I'm determined to finish, but the end result of this injury is so much different than my earlier one in the 1990s. My previous systems don't work so I've had to develop new ones. Everything moves at a much slower pace than what I want it to (Research journal, November 16, 2021).

In an effort to reduce reliance on memory, my file naming conventions became more explicit. Documents were split between aptly named folders to make them easier to find. I made use of audio transcripts to supplement my poor notetaking and returned to using handwritten notes to capture fleeting thoughts, ideas to explore, and generate to-do lists to validate when tasks were complete. These notes were kept close by on my desk, as object permanence had become a concern. "Out of sight, out of mind" was not a cutesy catchphrase, but rather a stark acknowledgement of the limits of my short-term memory. Every due date and activity were added to Google Calendar, which was tied to both my laptop computer and my phone. Multiple reminders were set in each calendar entry, sending notifications to my phone and email by the week, day, or hour, to keep

me on track for assignment due dates, research project activities, and supervisor sessions.

As with many of the study participants, I struggle with reading and prefer to read print materials over digital content. Like Matt and Elizabeth, I made use of coloured filters to improve my ability to read text in print and on screen and had a red tint added to my eyeglasses. Along with reducing eye strain and fatigue, these filters helped my eyes focus when reading text and reduced light and motion sensitivity when watching videos. The eyeglass tint also reduced my overall sensitivity to light, reducing migraine instances.

Live captioning and live transcription helped mitigate the challenges inherent with my audio-processing impairment. Whenever possible, I make use of them during synchronous sessions. Of the two options, I have a distinct preference for transcription. Unlike captions, which can quickly scroll off-screen, transcription displays a full record of the audio from the time it is enabled, allowing me to read along at my own pace. It also includes an option to scroll backwards in the text to revisit discussion comments and provide a written reminder of topic questions. At the end of each session, the system generated a downloadable transcription file, which I used as a notetaking device.

For recorded audio and video content, I reviewed the transcription or enabled closed captioning when available. When not provided, I used cloud-based AI transcription services. For the first 2 years post-ABI, I purchased a student license to access Otter.ai services. When Lancaster adopted Microsoft's M365 suite of web-based software, I shifted to using Word's transcription function, included as part of Lancaster's student software license. The license limitation of 300 minutes, or 5 hours, of transcription per month posed challenges in months where I was interviewing participants or wanted to make use of the Dictate function for notetaking, during data analysis, or when writing up results.

4.12 **Summary and next chapter**

This chapter introduced the individual study participants, described in accordance with their individual comfort level for sharing their personal information. Each case study described the characteristics of their injury, outlined the opportunities participants experienced while participating in online learning, and provided an overview of their individual impairments, the systemic barriers they encountered as a student with ABI, and a description of the strategies they used to mitigate these impairments and barriers. The chapter ended with an exploration of my own experience as a student with ABI in online learning. The next chapter will provide an analysis of the findings in relation to the research questions.

Chapter 5: **Discussion**

5.1 **Overview of this chapter**

This chapter provides an analysis of the findings in relation to the research questions, introduces themes prevalent across the participant case studies relating to how students with ABIs find learning opportunities, encounter barriers to learning, and what mitigation strategies they may use to navigate their online learning experiences. The final section of the chapter considers the possibilities generated from the findings as viewed through the lens of critical disability theory, highlighting (1) the unique position of the student with ABI within the disabled student community, (2) the impact of technology and user's skill level on student experience, (3) impact of power dynamics between instructors and students with ABI, and (4) potential for UDL to address students with ABI's accommodation requirements and disability disclosure.

5.2 **RQ1: In what ways do students with ABI find learning opportunities in an online context?**

Two main themes emerged from participants' descriptions of the opportunities they discovered when participating in an online learning environment: (1) establishing and maintaining control and (2) flexibility and access. Sub-themes within the "establishing and maintaining" control theme included: (1) learning at their own pace, (2) control of their physical environment, and (3) time management. Sub-themes within the "flexibility and ease of access" theme included: (1) scheduling, (2) program design, and (3) self-care.

5.2.1 **Theme 1: Establishing and maintaining control**

Throughout their interviews and journal entries, participants emphasised their ability to establish and maintain control of their learning experience and environment. This element of control was highlighted in their ability to choose when and how they interacted with their course materials. Asynchronous course elements, such as discussion board responses, assigned readings, and recorded video lectures, were favoured over synchronous online lectures or seminars.

While asynchronous activities often had a deadline for completion, participants were able to work within these structured due dates to determine how to best meet timelines associated with assigned activities. Online coursework provided students with ABI an opportunity to complete required coursework in locations and on a schedule personalised to their needs, reducing distractions. Having the choice to work in short bursts, take breaks to nap or attend medical appointments to address physical or cognitive needs, and working at the time of day – early mornings, mid-afternoons, or even in the middle of the night – that suited their individual needs, allowed them to mitigate known symptoms associated with their ABI. This, in turn, provided participants with an additional sense of control over their interactions with fellow students or instructors, at times alleviating internalised feelings of guilt, shame, or inadequacy.

5.2.2 **Theme 2: Flexibility and access**

Participants treasured the ability to manage the impact their disability had on their day-to-day life and their responsibilities to their student selves through the use of flexible scheduling, adapting their workload to their physical and cognitive impairments as they arose. Course activities were prioritised for completion when they were most able to perform at their best, and expressed relief that they did not suffer losses from “missed classes” when unable to be physically present. Online learning presented additional flexibility and ease of access through program design decisions surrounding enrolment, course selection, and location independence. Participants had more options to choose from, reduced transportation costs, and improved pathways to manage their medical care while continuing as active students.

5.3 **RQ2: In what ways do students with ABI encounter barriers in an online context?**

Students with ABI experience barriers to online learning based on their individual impairments related to their ABI and dis/abling (system) barriers resulting from interacting with educational systems and tools outside of the student with ABIs control.

5.3.1 **Individual impairments**

Participants' individual impairments fell within the following themes: (1) misfiring brains, (2) navigating in a different body, or (3) emotional upheaval. However, a fourth theme, fatigue, fell outside of these three main themes, impacting and influencing the degree of impairment associated with them. Sub-themes within the "misfiring brains" included: (1) memory, (2) concentration, and (3) communication.

5.3.1.1 **Theme 1: Misfiring brains**

Cognitive impairments were the most common across the participant experience. This sense that our brains were somehow "different to us" was common to all participants. Shortly after my second ABI, I had begun describing these differences between my recollections (erroneously, perhaps) of how my brain used to behave, and my new reality, as being the fruits of my "misfiring brain".

Acknowledging that their brains now functioned differently than they had previously, participants had to relearn how to learn. They expressed challenges encoding new information into and recalling details from memory. They had difficulty concentrating, which impacted their ability to read, often overwhelmed them, and reduced their executive function. Half of the participants reported speech-related communication challenges, including aphasia, word recognition, and speech impairments such as slowed speech or an increase in stuttering behaviour. Audio processing impairments impacted some participants' ability to follow and recall oral communication. All of these impairments increased in impact if the participant was fatigued.

5.3.1.2 **Theme 2: Navigating in a different body**

Participants expressed challenges interacting within the world around them within new limits placed by their bodies. Physical limitations, including light or sound sensitivities, visual impairments, migraines, and balance and mobility issues, left participants feeling as if they were "navigating in a new body" akin to "a ghost possessing someone else's body and attempting to make it work, which the

previous inhabitant is watching everything from within, but unable to steer the operation" (Kelly, Interview).

5.3.1.3 **Theme 3: Emotional upheaval**

Frustration, irritability, and uncontrollable rage were not uncommon emotions expressed by participants. In the early days post-injury, participants noted that feelings of being "angry", "numb", "confused", or "frustrated to the point of tears" were constant. Anger, how quickly it was to arise, and how powerless participants felt in the moment, was of particular concern. In the early days of my journal, I noted "being overcome with so much anger, I could feel it coming but was powerless to stop screaming at others". Over time, participants indicated that the sense of being overwhelmed by emotion decreased. Outside of time, there was no common thread expressed by participants in achieving this improved sense of emotional regulation.

5.3.1.4 **Theme 4: Fatigue**

Fatigue, and its impact on participants throughout their post-injury life, recurred across all individual impairment sub-themes and was, at times, cyclical and self-perpetuating in nature. Participants reported multiple sources for their fatigue and noted that the source and prevalence were subject to change from day to day. Disrupted sleep patterns left participants suffering from cognitive and physical fatigue and decreased their sense of emotional control. However, participants reported that these symptoms were not always present at the same time; at times, disrupted sleep would leave their "body feeling shattered", while their minds felt "alien" or even "fine". Other times, they felt unable to speak or think due to lack of restorative sleep, but noted a lack of physical symptoms on display, such a stumbling or tripping when walking.

From a cognitive standpoint, fatigue decreased executive function abilities and the ability to read, comprehend, and encode new information. The more "mental work" or focus required to complete cognitive tasks such as reading, audio-processing, and word recognition, the more quickly participants reported experiencing a "sense of exhaustion" and "being bone-tired". As fatigue

increased, participants reported feeling less able to rely on how their brains were interpreting inputs (e.g., reading or listening to words) and the resulting outputs (e.g., aphasia or sense making during speech). For those experiencing motor control issues, fatigue often resulted in more difficulties with walking, carrying items, typing, or manipulating a computer mouse. Migraines could be triggered by cognitive or physical fatigue, light, or sound, as well as stress and cognitive overload. Fatigue also decreased participants' emotional stability, making them more prone to outbursts of anger, frustration, or tears, and disrupted participants' sleep patterns.

5.3.2 **Dis/abling (system) barriers**

Dis/abling (system) barriers were categorised under the following four themes: (1) accessibility includes access, (2) need for community, (3) instructor impact, and (4) technology matters. Sub-themes within the "technology matters" theme included: (1) course design decisions, (2) hardware, and (3) software.

5.3.2.1 **Theme 1: Accessibility includes access**

Access-related barriers included increasing costs related to disability and access to funding. Students with ABI pay a "crip tax" resulting from a combination of: (1) their individual impairments, (2) a requirement for additional time to complete learning activities, emotional and social consequences of constant disclosure, (3) institutional policies surrounding individual learning plans, (4) requests for legally provisioned accommodations, (5) scholarship funding, and (6) tuition payments. Additional access barriers described included challenges accessing reliable internet connections, experiencing limited access to library resources, and those related to activity management across multiple time zones.

5.3.2.2 **Theme 2: Need for community**

Community-related barriers were represented in descriptions of feelings of social isolation and disconnection from peers and instructors. Some participants mourned the loss of spontaneous communications that often accompanied in-person learning, and the shared meaning-making and learning that often resulted

from these hallway sidebars. Others noted that the fear of being othered or outcast by peers or instructors as a result of stigma relating to ABI and invisible disabilities hampered their ability to be their authentic selves and build connections with others in their courses or programs.

5.3.2.3 **Theme 3: Instructor impact**

Instructor behaviour was frequently identified as the most difficult barrier to surmount. Participants described instructors who were unresponsive to requests for assistance or who ignored formal accommodation plans provided by the institution's disability services offices. Poorly designed activities, with limited instructions or a lack of interaction from the instructor in class activities, were often associated with an instructor's lack of training in both sound pedagogical techniques and in how to use the technologies employed in online course development and facilitation.

5.3.2.4 **Theme 4: Technology matters**

The role technology plays in the experiences of students with ABIs is an interesting one. Many participants shared how they had adapted existing hardware and software systems to assist them with typical activities related to their daily lives. They discussed using mobile phones or laptop calendar apps to assist with keeping appointments and tracking medication or using external journals or files to record information and act as external memory banks. Yet many of these same technologies had the potential to act as barriers to student success with online learning. Participants struggled with the pace of change, including frequent software updates or institutional decisions to change their licensing agreements from one application to another (e.g., Zoom to MS Teams, Blackboard to Moodle). An integral part of their learning equipment, some noted their physical and/or cognitive symptoms increased as a result of prolonged exposure to screen glare from monitors or the act of typing or using a mouse.

Participants with experience across multiple educational institutions or degree levels noted how course design decisions varied from institution to institution, and at times from faculty to faculty or instructor to instructor. Design decisions that

were identified as barriers to learning included: (1) a lack of established design standards and the employment of ad hoc course designs, resulting in a lack of consistency across courses within the same program or institution, (2) inability of students to control course elements including turning sound on or off, or changing font sizes, and (3) lack of regular review policies, resulting in inaccessible course resources due to broken file links.

Technology plays a strong part in both enabling and denying access to learning for disabled students. Along with challenges relating to cost, participants described challenges with obtaining reliable internet access at home, and outlined the part access to, or use of, software played in their experience. They described communication barriers arising from both the lack of access to, or use of, audio or video transcription during live and pre-recorded virtual lectures, and the inability of AI transcription software to recognise and transcribe spoken language due to the speaker's accent.

5.4 **RQ3: What mitigation strategies (if any) do students with ABI experience use?**

Students with ABI employ strategies in order to capitalise on their opportunities and mitigate the barriers they experience in online learning environments. Themes for these strategies include: (1) it's all about your attitude, (2) figuring out what works, and (3) making use of technology.

5.4.1 **Theme 1: It's all about your attitude**

Participant attitudes played a large part in their ability to continue learning post-injury. They emphasised the need to recognise and accept their limitations before being able to learn to work within them. This enabled them to become more confident when articulating their support needs and often preceded their willingness to disclose their disability to others. This attitude of self-acceptance facilitated the students with ABI's ability to manage their physical care needs, described by Elizabeth as "giving yourself permission" to take frequent breaks, reschedule due dates, or take naps as needed. These concepts of self-acceptance and permission align with my own realization that, as students and

researchers, we need to give ourselves “grace” and be willing to “meet ourselves where we are at” in order to succeed in our new reality.

5.4.2 **Theme 2: Figuring out what works**

Using a variety of different activities, participants addressed their individual and systemic barriers to learning through repetition, printing support materials, time tracking during tasks to improve future estimates for task duration, and scheduling learning activities to coincide with when they were best able to manage them. Participants were consciously choosing to work at times of day when they knew they would have less fatigue, or work to a set schedule each day to reduce the chance of symptoms worsening.

5.4.3 **Theme 3: Making use of technology**

Participants used a combination of hardware and software, most often selected through trial and error, and adjusted it to suit their individual challenges and preferences. Electronic and paper calendars were used to support scheduling activities. Closed captioning and audio transcriptions were used, when available, to improve accessibility of audio and video content and facilitate note-taking activities. Some participants used specialised colour filters or tinted eyeglasses to reduce light sensitivity or screen glare associated with increased instances of migraine, while others used specialty monitor configurations to achieve similar goals. Those with sound sensitivities or who indicated a tendency to become distracted made use of noise-cancelling headsets to improve focus and concentration, while others addressed their visual impairments and reading challenges by adjusting the content display settings on their computers relating to colour filtration, refresh rates, fonts, and font sizes.

5.5 **Possibilities: Key findings**

The previous sections of this chapter have focused on the commonalities that exist between the participants’ experiences; the shared themes teased from their interviews and journals. Influenced by critical disability theory’s Crip theory and “crip tax” concepts highlighting inseparability of the state of disability from the self,

and the unique and multifaceted challenges experienced by individuals with disabilities, the key findings outlined in the following section expands the current body of knowledge relating to the unique nature of the student with ABI in the wider disabled student community, and the impacts design, delivery, and accommodation support decisions made at the individual and institutional levels have upon online learners with ABIs. Calling attention to the key role instructors play in opening doors or placing barriers in the way of a student with ABI's progress as an online learning, UDL is explored as a potential solution to address students with ABI's accommodation requirements and disability disclosure.

5.5.1 Students with ABI are uniquely positioned within the wider disabled student community

Researchers have previously discussed how students with ABI may be unique when compared to other groups of disabled students. A student with ABI has the potential to experience multiple cognitive, physical, and psychological impairments (Goldman et. al., 2022; Kent, 2016; Williams, 2017) while also containing the potential to have been previously diagnosed with a chronic illness, physical disability, learning difficulty, or mental health disability (Kent, 2016; Williams, 2017). Polinder et al. (2018) further noted that students with ABI present unique combinations and levels of symptoms not only when compared to other disabled students, but also in comparison to one another.

Despite sharing some common symptoms across a wider array, participants' modes of injury, symptoms, and how they interact with the world as a result of their symptoms varied greatly. Study participants' descriptions of their internal impairments and dis/abling (system) barriers to online learning demonstrated how this variance impacts their online learning experiences and provides a window into the fluid nature of disability. Relating how their day-to-day physical symptoms can be impacted by navigating an instructor's or an institution's classroom policies and procedures, or by accessing and using online learning technologies, participants remind us of the importance of flexibility when supporting a student with ABI's successful navigation of their online learning experience.

Unlike students with hearing, speech, or visual impairments (Pickup et al., 2024), study participants highlighted the lack of standard technologies, pedagogical techniques, or institutional accommodations that can be relied upon to provide support for the majority of students with ABI. Additionally, access to, and knowledge of, accommodation requirements and available supports is often unique to the individual and learned through a process of trial and error.

Accepting the premise that no two students with ABI experience injury or interact with their online learning environments and materials in the same way challenges researchers to explore whether options exist that might concretely improve the overall learning experience for these students. It reminds us of the value of inclusive research practices within the disabled community and how, in giving voice to members within the community, we increase our opportunities to learn from one another.

5.5.2 **Instructor and student access to and use of technology impacts the student experience.**

Technology, and online learning, are often connected with the ideals of decreasing barriers to access (Gardner et al. 2021; Semper 2020), yet both student and instructor's ability and skill levels correlate to technology's impact on an online learner's experience (Chang & Kang, 2016; Fossey et al., 2017; Gardner et al., 2021) and on disabled student's self-perceptions (Pickup et al., 2024).

The use of technology in our daily lives has become ubiquitous. A number of assistive technologies are now included by default in many mobile phone and computer operating systems and applications (Hart & Vaccaro, 2017; Wong et al., 2019). In-built features such as closed captioning and dictation have the potential to decrease barriers to learning for disabled students. Additionally, adoption of assistive technology by a wider audience of non-disabled students can help decrease the potential for disabled students to feel excluded or stigmatised during their learning experiences (Pickup et. al., 2024).

Limiting technology research to adaptation to physical symptoms associated with disability supports a medical model of disability, upon which most educational

accommodation programs are founded (Katzman et al., 2024; Singleton et al., 2019). It is not sufficient for these features to simply exist at the platform level; they must be enabled for student use. Study participants reported being denied access to accessible technology features by their instructors, negatively impacting their learning experience. Ensuring equitable access to assistive technology in online learning may require modifications to existing institutional IT and accommodation policies and the provision of education and support for instructors in their use.

5.5.3 **Instructors wield considerable power over the student's learning experience**

Participants identified absent or unresponsive instructors, incomplete assignment directions, and difficulty developing interpersonal connections with fellow students and instructors as factors that hampered their ability to proceed or succeed in their coursework. Instructors played a large role in a study participant's perceived success or failure with their online coursework. An instructor's attitude towards and flexibility in adjusting pre-designed course activities and timelines to meet the needs of the students strongly impacted their overall learning experience. Participants revealed that instructors have both the ability to make the student feel like an imposition and unworthy of assistance, or to become the disabled student's partner in achieving their educational goals.

As students with ABI, participants described being unable to overcome instructor classroom policy, course design decisions, or institutional IT policy decisions, which limited or removed their access to course content, on their own. They explained how "poorly implemented" participation in day-to-day learning activities in an online environment requires additional cognitive and emotional labour, resulting in increased levels of cognitive and physical fatigue. This can lead to a domino effect, as fatigue impacts a student with ABIs ability to focus on learning, encode new information for later recall, complete assignments and activities in a reasonable timeline, and their physical and mental wellness. The resulting delays in assignment completion impact overall program completion and create an additional financial burden on students with ABI, risking current or future access

to available financial bursaries or scholarships, and or student withdrawal from programs as funds are no longer available to them.

5.5.4 UDL offers potential to address barriers related to a student's accommodation requirements and disability disclosure

While reflecting upon the content of my discussions with participants, it struck me that perhaps we need to reframe how we think about accommodating disabled students in online learning environments. Our goal should not be to wait for a student to self-identify as disabled and in need of support before we provide alternate ways to access and interact with course materials. Rather, we should focus on equal access and accessibility from the planning and development stages.

Inclusive teaching practices typically involve the instructor adapting their teaching methods or resources to meet student needs as they become aware of their existence (Black et al., 2015; Cumming & Rose, 2021). Online learning environments, by design, place barriers of time, space, and technology between instructors and their students. Less exposed to observing student behaviours than they would be in a classroom environment, instructors may lack the opportunity to notice subtle cues that a student is struggling. This places the onus on the disabled student to disclose their needs, assuming they are aware of them, to instructors in order to trigger shifts in delivery methods or resource format.

UDL, with its focus on designing the learning environment to be accessible to most students from the onset, offers a proactive approach to supporting all students regardless of their needs or abilities (Cast, 2024). UDL 2.0, focused on the provision of accessible materials and systems as a base standard for online learning courses, provides multiple avenues for students to engage with course materials, instructors, and fellow students, and to express their understanding of course content (Cast, 2024). UDL 3.0 acknowledges a learner's intersecting identities (the "who") as an element of variability in how learners engage with (the "why") and act upon (the "how") learning materials (the "what") (Cast, 2024). These new guidelines may help increase equitable access by addressing "barriers

rooted in biases and systems of exclusion for learners with and without disabilities" (Cast, 2024), reducing reliance on prior student disclosure of accommodation needs or instructor knowledge of accessibility tools and techniques for resource development and provision.

In addition to shifting the responsibility of making learning accessible from the disabled student to the learning institution, UDL removes one of the barriers study participants noted impacted newly disabled students; that they be aware that accommodations exist, how to go about requesting them, and which accommodations best meet their support needs.

Building upon challenges and suggestions for improvement expressed by participants, course designs could be improved upon through the use of a consistent course structure and file naming conventions, the provision of materials in a variety of formats, including transcription of all recorded audio and video files, and live captioning or transcription of live audio and video presentations. Employing accessibility functions such as ALT Text on graphic files, enabling print functions in PDF files and web pages, and moving away from timed release of materials can improve a course's accessibility for non-disabled and disabled students alike.

Students with ABI are unique. There is no "one true way" to navigate an online learning environment as a student with ABI. Certainly, we should not assume that a universal design would support the needs of every student, but through its employment, it might reduce the cognitive load associated with online learning environments. Unpredictable and specific issues would continue to require to be addressed on a 1:1 basis.

Properly implemented, UDL may reduce or remove opportunities for individual instructors to raise barriers to participation for online students with an ABI. Barriers resulting from instructor technical skill level, instructor classroom policy, course design decisions, or institutional IT policy decisions can be reduced through the provision of multiple pathways to access and participation from the onset of the course. UDL also removes reliance on instructor goodwill for students

to receive required accommodations through the use of a common standard and consistent design for courses.

One thing does appear certain: we should not wait until we have solved the issues associated with equitable and accessible course design before moving on to tackle the more difficult aspects of disability and accommodations in education involving human interaction, power, and stigma.

Accommodation plans within HE find their basis in the medical model of disability, requiring students to initiate contact with disability support services and disclose their disability (Cumming & Rose, 2021; Dolmage, 2017; Singleton et al, 2019). Once an ILSP has been generated for the student, they must continue to disclose their disability to each new instructor they encounter in order to access the recommended accommodations (Cumming & Rose, 2021; Dolmage, 2017).

Unfortunately, staff access to an ILSP does not guarantee that the recommended accommodations are implemented (Griful-Freixenet et al., 2017; Kent, 2016;). Instructors may choose to ignore the ILSP and continue to deliver their courses exactly as they have always done so in the past. They may not have sufficient training in assistive technologies or alternate delivery methods to provide support (Cumming & Rose, 2021; Griful-Freixenet et al., 2017). They may misunderstand the limitations and requirements of government regulations, such as the European Union's General Data Protection Regulation, refusing to implement a disabled student's accommodation needs in favour of the preferences of other students within a course, citing privacy legislation (Chang, 2021). Participants recounted instances of instructors requiring them to disclose their disability and accessibility needs to their peers in an attempt to gain permission via group consensus to execute the required accommodation.

Absent training in instructional design, effective teaching methods, and the needs of disabled students, some faculty members challenge the notion that disabled students should be provided reasonable accommodations in the name of fairness to other students (Cumming & Rose, 2021; Griful-Freixenet et al., 2017; Nario-Redmond, 2019) while others struggle with understanding their role within the

accommodations process (Cumming & Rose, 2021; Singleton et al., 2019). This leaves disabled students struggling with whether or not there is value in disclosure if accommodation plans can be ignored.

Why go through the trauma of disclosure if any instructor can override your required accommodation?

Disclosure can be challenging. Students not only need to understand their limits and be able to articulate how to work around them, but they must also have a level of trust in the institution and in their instructors to be willing to disclose their disabilities and accommodation needs. Invisible disabilities, such as ABIs, are much easier to hide from ourselves and others than physical disabilities. In an online environment, where activities may be asynchronous, or cameras and mics left off, it may be easier to hide a disability than it might be in an in-person classroom environment (McManus et al., 2017; Nario-Redmond, 2019).

Increasingly, institutions and instructors are working to balance privacy preferences and legislation with student accessibility needs (Chang, 2021). Accommodations outlined in an ILSP should take precedence over another student's personal preference. But that also means there needs to be an element of trust in the disabled student. Both Kelly and Elizabeth noted that establishing this level of trust can be more challenging in an online environment, where the lack of physical connection with an instructor may reduce students to a name or number, and where “out of sight, out of mind” may come into play when making course design or accommodation decisions.

5.6 Summary and Next Chapter

This chapter provided an analysis of the findings in relation to the research questions, introduced common themes across the participant case studies, and introduced potential impacts that design, delivery, and accommodation support decisions made at the individual and institutional levels have upon online learners with ABIs. Expanding our current understanding of the experiences of students with ABI in online learning environments, this chapter demonstrates how multiple HE students within the same disability classification, ABI, can encounter and

mitigate markedly different barriers to their online learning experience. The next and final chapter will revisit the aims of the research project, key findings, and reflections on the process and results.

Chapter 6: **Conclusion**

6.1 **Overview of this chapter**

This chapter begins with a reflection on the project's research process from the perspective of a student with ABI, explores the place of advocacy within research, revisits the original aims of the research and key findings, and reviews potential implications for policy, practice, and future research. Study limitations are reviewed prior to presenting final reflections at the end of the chapter.

6.2 **Reflections on the process**

Like many of the study participants, I started my PhD studies with other plans in mind. And then life got in the way. In my case, it was in the form of an MVA. For other participants, cars, bicycles, participation in sports, and medical events impacted their HE experiences. For all of us, finding a different way of interacting with our instructors, peers, technology, materials, and the surrounding academic environment was critical to our being able to continue onward as students with ABI.

I began my research journey without a unified theory of experience. The lack of established literature led to the adoption of an iterative data analysis and literature review process. While the first round of interview questions were drafted based on the initial research questions, patterns within participant responses drove the development of additional questions and guided future conversations with study participants. This, in turn, led to subsequent searches through the literature for new avenues of exploration.

Taking a critical disability theory approach to the recognition of the unique experiences of my participants facilitated their provision of invaluable insights into research design, inclusion, and the representation of disabled voices in the literature, as well as the online learning experience for students with ABI. Participants' individual stories are distinct, yet the themes that emerged may resonate with broader populations, offering relevance and applicability of their experiences beyond the immediate context of online learning as a student with

ABI, with potential benefits to improved instructional practice and the development process for accessible tools that benefit a wider audience.

In embarking on this study, I admit to having a very naive view of research involving disabled students. I believed it was far more inclusive than it was; that the structures the academy built took into consideration the needs of disabled students as well as non-disabled students. Yet I should have known better. I'd already spent years hiding my brain injury. If society, academia, and systems surrounding them were truly a safe space for students with invisible disabilities, such as brain injuries, we wouldn't go to such efforts to hide such a fundamental part of ourselves from our peers, instructors, admin, and support staff, and, perhaps, even ourselves. Even now, years after the accident and at the tail end of the project, I continue to struggle to differentiate "old me" from "new me" and publicly acknowledge the limitations resulting from my ABI.

Early in the project, I expect some part of myself still believed that by the end, I'd produce a checklist or some sort of guide that other students with ABI would be able to pick up and use to help them navigate the world of online learning. Instead, I am left hoping this record of students voicing their experiences navigating their online learning coursework is more valuable to students with ABI and those who support them in their educational journeys than any checklist could be. May we all see a little of ourselves in each other.

I am encouraged by the possibility that other researchers may see value in the framework employed for data collection and use it as a starting place for their own work to develop more inclusive research designs. I look forward to the day that more researchers, instructors, designers, and developers invite disabled students into lead roles in discussions and projects that impact them directly, stepping back from the role of "researching on us" or "speaking for us", and moving towards a process that allows us to be co-researchers and co-creators, sharing our own stories, using our own voices.

In all my planning, I hadn't anticipated how often I would be forced to revisit and revise my project schedules. I did not anticipate how much extra time it would take

for me to make it to this point, how often I would lose planned participant interview days to a participant or myself needing to reschedule due to ABI symptoms, or how often one or more of us would forget a session had been planned at all! I hadn't accounted for how many planned readings, data analysis, or writing days would be lost to managing ABI symptoms, and how easily a migraine would derail the best of intentions. I did not anticipate how mentally and physically exhausting the process would be, how often I would find myself "ranting to the ether" or frustrated to tears at my unreliable memory and issues triggering recall. I hadn't expected that I would spend hours or weeks revisiting my original notes, interview recordings, transcripts, and the literature just so I could make sense of what I had written in previous iterations of this project document.

I learned that spite is an excellent motivator – for me at least. The suggestion, even one self-inflicted, that my injury might somehow hinder me from completing the journey seemed to propel me forward. More importantly, I have learned to give myself grace. For me, providing grace to others was easy. Learning that there is joy and relief in asking for patience and support is my hard-won parting gift.

6.3 **Limitations**

While the sample size for this research project was double the size of initial projections at the time of ethics approval, limited responses to the international call for participants resulted in a sample that was not representative of the larger disability community. For example, none of the participants experienced significant upper-limb motor impairment, severe hearing loss, deafness, severe visual impairment, or blindness post-injury. Additionally, the study's participant pool does not account for differences in race, gender, medical treatments, and cultural norms originating from outside of a Western Eurocentric perspective.

Most participants were actively enrolled in online learning courses at the time of the study. Two had previously completed online learning coursework. The other seven participants were actively enrolled in one or more online classes. Three had completed online courses at both the undergraduate and graduate levels. Although all were students in online courses offered at accredited, HE institutions,

their current level of study (e.g., undergraduate vs. graduate), years of experience within their level of study (e.g., first year vs fourth year), and field of study varied across participants. As did their reasons for enrolling in online courses over in-person classroom-based options, and prior exposure to HE coursework within online learning environments. How their previous successes or failures during earlier educational pursuits might have impacted their views of their experiences, or their behaviours when encountering barriers to education, were not examined in this study.

Participants self-identified as Caucasian, cisgender, and all but one were native English speakers. Three self-identified as male, while six self-identified as female. While not reflective of the higher instance of ABI experienced by males in the general population, the sample size does mirror the higher rates of female enrolment in online learning.

As a result, there may be limited applicability of the research's results outside of a Western Eurocentric perspective. Consider instead that this research is the beginning of the conversation, raising awareness of the students with ABI's online learning experience rather than providing a concrete blueprint or checklist for students with ABI, educators, or disability support staff to follow to support learning within the online course environment.

6.4 **Contribution to scholarship and practice**

Limited prior research has been conducted from the perspective of the online learner with ABI, and even fewer have paid consideration to their barriers to participation in research design. This thesis provides a valuable and useful contribution to the knowledge and scholarship relating to ABI in the fields of online learning, disability in HE, and disability research by increasing the existing body of knowledge surrounding the experiences of

- students with ABI in their role as online learners,
- disabled students as participants in research, and
- disabled researchers as designers and leaders of research projects.

This thesis makes three original contributions to knowledge:

1. Insider perspective.
2. Data collection framework.
3. The importance of the Instructor's impact on student experience.

By offering an insider perspective on individual and dis/abling (system) barriers and expressed support needs of students with ABI, this thesis expands upon the predominantly outsider perspective represented in the existing body of knowledge. Exploring how this student population perceives and responds to individual and systemic barriers to their learning better equips instructional designers, course developers, and instructors to plan for and address challenges students with ABI experience face in online learning environments.

Investigating the online learning experience from the perspective of students with ABI provides insight into the distinct aspects of ABI within the realm of disability, online learning, and online accessibility research. Students with ABI experience multiple disabilities unique not only from other student populations, but also from one another. This provides students with ABI both a shared frame of reference to build community and a sense of separation from others sharing their diagnosis. Recognizing these unique and intersecting experiences highlights the need for more research into how these multiple disabilities interact and impact the lives of students with ABI, which may lead to improved support, resources, and higher completion rates in HE programs for students with ABI and the wider disability community as a whole.

The thesis also introduced a practical four-phase inclusive data collection framework for research designed to support each participant’s unique requirements. Outlining the process of working together with research participants to co-construct data collection processes that acknowledge and support their needs, the Data Collection section of Chapter 3 (Methodology) provides guidance to future researchers for “working with” participants with disabilities or other marginalised identities rather than “researching on” them.

In acknowledging instructor impact on courses delivered in online environments, we recognise both the potential of instructors to guide their students with ABI towards successful completion of their programs, or to (re-)traumatise disabled students. As the only barrier completely outside of a student with ABI's ability to control, instructor behaviours and classroom management decisions stemming from attitudes towards technology, accommodation, disability, or a combination of the three, are often identified as the most difficult barrier for the disabled student to surmount.

6.5 Original aims and key findings

In exploring how university students with ABI experience online learning, this research sought to expand instructional designers, curriculum developers, and online course instructors' ability to recognise potential dis/abling (system) barriers, identify and implement mitigation strategies, and consider how these elements might influence design and/or delivery decisions when implementing technology-enhanced instruction.

Key findings of this research project include:

1. Uniqueness of the student body. Despite sharing common symptoms across a wider array, students with ABI are different from one another within their shared categorization. How they interact with and succeed in online learning environments is often unique to the individual and learned through a process of trial and error.
2. Instructor and student access to and use of technology impacts the student's learning experience. Both students' and instructors' ability and skill levels correlate with technology's impact on an online learner's experience.
3. Instructors wield considerable power over the student's learning experience.
4. UDL offers potential to address barriers related to a student's accommodation requirements and disability disclosure. Focusing on equal access and accessibility from the planning and development

stages shifts the responsibility for making learning accessible from the disabled student to the learning institution.

6.6 Implications for policy, practice, and research

The four-step inclusive research framework introduced in this study provides guidance for other researchers considering projects involving members of marginalized communities. In addition to shifting perspective from a position of researching “on” to a focus on researching “with” disabled or other marginalized participant groups, the framework introduced in this thesis encourages researchers to reconsider their internalized concepts of inclusion, participation, and co-design, paying particular attention to how their (un)conscious bias’s might influence the voices chosen for amplification, along with who these choices ultimately serve, as they plan and design future research projects.

With limited existing research relating to the students with ABIs’ experience as online learners, and a continuing growth rate in ABI incidence across the world, more focus should be placed on how to better serve future students with ABIs, and prepare their course instructors, course designers, and disability service providers to support student success.

Students with ABI may not have been disabled their entire lives. They may be less aware of available support options than students who received disability support during their time in primary and secondary education (K-12) schools. References to disability support services should be included in new student welcome packages, and instructors should be encouraged to refer students to disability services when a student discloses ABI without an associated ILSP on file to obtain appropriate support and accommodations.

Undergraduate students with ABI may face challenges relating to their inexperience with higher education’s scheduling norms, which can place a higher emphasis on student accountability for managing their workload(s) within pre-set activity or assessment timelines. Unfamiliarity with online learning environments may be an additional source of stress, confusion, and cognitive fatigue above and beyond learning new theoretical knowledge, methods, or practical skills

associated with their chosen field of study. These students may require more structured support and guidance in navigating online learning environments and managing coursework than a non-disabled student.

Perceived levels of past success may hinder newly injured Master's and PhD students in seeking out or obtaining assistance in (re)developing and maintaining study habits or time management skills. They may experience new challenges with written or verbal communication, reading, or recalling specific words or concepts. New and unfamiliar symptoms may challenge their self-concept and faith in their ability to succeed or may impact peer or instructor perceptions of their ability to contribute to the sharing and co-construction of knowledge.

Alternatively, HE students with ABI who have completed online coursework in the past may find that the tools and techniques that served them well in earlier levels of study are no longer suited to support the advanced research workloads or independent study activities expected of graduate HE students. They may face greater internal or external pressure to perform to a pre-set standard and may benefit from tailored support to manage schedule demands or adjusted expectations surrounding work output while coping with their ABI symptoms.

When considering existing and future HE institutional policies surrounding disabled student funding, including scholarship and bursary programs, consideration should be given to developing funding models for disabled students that account for the potential increased time to successful program completion for these students. Current funding programs may contain course load requirements beyond a student with ABIs ability to maintain without negatively impacting their cognitive or physical wellbeing. Policies that do not acknowledge or accommodate the resulting delayed timeframe to completion increase the disabled student's financial burden by requiring them to pay additional years of tuition to participate in HE. Funding policies and access may directly impact a student with ABI's ability to enrol in, participate in, or complete HE programming. Any reduction in disabled student access to HE diminishes the potential future knowledge base of academic institutions and prospective benefits to society as a whole. We are not better served by continuing to limit disabled individuals' involvement in the development

and continuation of inclusive programs, communities, social connections, and workplaces to being researched “on” versus “with”.

From a practical standpoint, the instruction skills gap in higher institutions needs to be addressed to provide an accessible and high-quality learning experience to all students, including students with ABI. Standardised course design templates and UDL-focused policies for developing online courses have the potential to improve student access to materials regardless of ability or accommodation need. However, if Instructors do not receive regular and adequate training in how to use technologies associated with UDL content, it is unlikely that the course materials or learning activities will be deployed as intended. Access to learning accommodations for students with ABI will continue to be at the mercy of instructors.

The lack of standardised templates for courses is an indication of a wider gap in service delivery to disabled students at some HE institutions. Many disabled students are left to advocate for their needs after systems are designed and deployed, resulting in increased cognitive and emotional costs for the student, and increased financial costs and work hours to improve a course site post-deployment. UDL appears promising and may offer a potential solution to the dilemma of inconsistent deployment of accessible materials, activities, and assessments. While UDL may not be able to address the access needs of all disabled students, it may address student privacy and stigma-related concerns surrounding disclosure of an invisible disability and reduce opportunities for instructors to raise barriers to participation.

When considering the provision of course resources, universal accessibility is within reach. However, when it comes to assignments and assessments, an additional level of complexity is added. This complexity brings with it new questions to explore:

- How do you balance building online assessment options that could address multiple accommodation needs while ensuring that you do not overwhelm instructors with additional work?

- How would you ensure that the method of assessment remains equitable and provides a reliable method to judge student learning?
- If an instructional designer builds these course components on behalf of the instructor, who is responsible for ensuring the instructor knows how to make use of the accessible activities or assessments?

6.6.1 **Avenues for future research**

Students with ABI possess a specific, unique experience of multiple disabilities that differentiate them from other disabled students with visible or invisible disabilities. Their identification of, and with, the trauma associated with the acquisition and/or support received post-injury varies greatly from that of military veterans, separating their self-perceptions of ability, disclosure, and accommodation needs from those of veteran students experiencing ABI. How and when a student acquired their ABI, the physical and neurological symptoms experienced as a result of the ABI, their socio-economic status, and access to acute, short-term, and long-term medical care post-injury can impact both their experience and understanding of disability and their access to or knowledge of available accommodations and support services. These dynamics introduce opportunities to explore how this *uniqueness* intersects within their ABI community and the broader community of disabled students or citizens.

Along with the above, there are many additional avenues that remain to be explored related to students with ABI experiences in online learning and in HE in general. While not an exhaustive list, future research might focus on examining any of the following topic areas:

- How does the source of the student's brain injury part to play in their learning experiences?
- How does the timing of the student's brain injury (e.g., childhood, during secondary or tertiary studies, or between participation in primary or HE studies) impact their online learning experiences?
- How does the student with an ABI's chosen program of study (e.g., sciences, education) impact how they experience online learning?

- How does the level of HE students with an ABI enrol in (e.g., undergraduate, post-graduate) impact their experience(s) in online learning?
- Does the level of prior HE completed (e.g., undergraduate, post-graduate) impact students with an ABI's experience(s) in online learning?
- Do additional gaps in support and resources exist that could be addressed at different educational levels to better assist learners who have experienced brain injuries?
- What role might race or ethnicity play in the learning experiences of students with ABI?
- How might gender socialization impact a student with ABI's experience or behaviour?
- How does the learning experience vary between Home (domestic) and international students with ABI?
- What impact do funding policy decisions, including scholarship application requirements, have on a student with ABI's decision to participate in HE?
- Will implementing consistency across course designs and teaching the instructors how to use the tools associated with online learning be enough to support students with ABI in achieving successful completion of online courses?

6.7 **Accountability: Researcher's responsibility to advocacy**

I am tired.

Throughout the research process, in discussions with participants, reviewing grey literature, and in my day-to-day life, I noted an expressed expectation for disabled people to bear primary responsibility to advocate for their needs, and those of other existing or theoretical disabled individuals, to be met. This has prompted me to question the role this research may play in reinforcing societal expectations that disabled individuals should take a lead role in initiating these conversations.

The assignment of advocacy responsibility to disabled people is problematic in many ways. There is no demonstrated act of allyship in calling upon disabled

people to engage in what can feel like a Sisyphean task; educating the non-disabled while begging to be seen and considered in the planning, development, and delivery of programs, services, and infrastructure with which we interact. I wonder who is being left behind when they are unable or unwilling to take up the mantle of advocate for themselves or the wider disability community. While we cannot disengage from our own experiences of disability within our own minds and bodies, expecting all disabled people to be willing to repeatedly bring attention to all the ways their needs are not met in society is unreasonable and, at times, cruel.

As such, there are no direct calls for specific actions to be taken by course instructors, course designers, disability support services, or technology developers in the key findings of this research. A wealth of literature acknowledging gaps in technology or practice in alignment with participants' experience has already been written from these outsider perspectives. In many cases, suggested avenues for solution development were presented decades in the past. When it comes to resolving barriers to disabled students' access to learning, *knowing* has not always equated to *doing* anything to resolve the underlying challenges.

Instead, this thesis provides a voice to the disabled student with an ABI's lived experience in online learning courses, sharing strategies used to mitigate barriers within their sphere of control. Perhaps highlighting these issues will foster the understanding and support required to shift from *knowing* to *resolving* many of the barriers to equity experienced by disabled students with an ABI.

6.8 **Final reflections**

Brains are remarkable things. They can often help us find new ways of traversing the world we live in. While we may not function as well as we remember – or perhaps don't remember at all – many students with ABI have learned new ways to navigate the world we find ourselves living in. We have learned to recognise and manage the emotional, physical, and psychosocial impacts of our brain injuries. From my own experiences, I have learned there is a vast difference

between returning to school 12 years after experiencing ABI and continuing in a program within weeks or months of sustaining an ABI. Where an individual is in their recovery journey may impact how they experience online learning and how they define success and progress towards accomplishing their goals.

This research provided participants and me an opportunity to give voice to our journeys with dis/ability, accessibility in HE, and inclusion in online learning environments. Researched with, rather than upon, participants identified opportunities and barriers encountered in order to take up space and succeed as online learning students with ABI. I am extremely grateful for their trust and generosity throughout this experience. While we are unique in how our brain injury impacts our lives, the symptoms we experience, and how we have learned to navigate through our education and daily lives, there is comfort in knowing that we are not alone.

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Appendix A: Recruitment package

Letters/emails of invitation to participate

Study Recruitment Message

Do you have an acquired brain injury?

Have you completed a university level course online?

You are invited to participate in a research study to examine how students with acquired brain injuries experience online learning.

The study will take place over a period of 6 – 12 months and data will be collected in three phases: through questionnaires, interviews, and journaling. If you decide you are happy to take part in the study, you will be contacted by the researcher to learn more about the data collection process.

Before you agree it is important that you understand what your participation would involve. Please read the attached study information package carefully, and feel free to ask any questions you might have.

If you have no remaining questions, and would like to take part in the study, please print, complete and sign the attached consent form and send it back as a scanned copy to Sheelagh Semper (**s.semper@lancaster.ac.uk**) on or before **March 31, 2021**. The researcher will then be in touch via email to arrange the details of the introductory session.

If you do not have access to a scanner, a photograph of the completed, signed consent form is acceptable. Please ensure the photograph is of sufficient quality that your name, date and signature are legible.

<attach Participant Information Package, Informed Consent Form, Researcher Introduction & Poster>

Recruitment poster. Invitation to participate

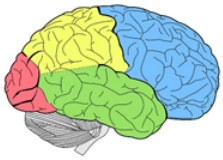
Do you have an acquired brain injury?

Lancaster University

Have you completed a university level course online?

You are invited to participate in a research study to examine **how students with acquired brain injuries experience online learning**.

The study will take place over a period of months and data will be collected in three phases: through online surveys, interviews, and a reflective journal activity in a format and at times that are convenient to you.



To learn more about the study and data collection process, please contact: s.semper@lancaster.ac.uk

This project has been granted ethical approval from Lancaster University

Participant information sheet

Department of Educational Research
County South, Lancaster University, LA1 4YD, UK

Tel: +44 (0) 1524 592685

Exploration of learning online by students with an acquired brain injury.

Participant Information Sheet

My name is Sheelagh Semper and I am a PhD Candidate in the Department of Educational Research at Lancaster University. I would like to invite you to take part in a research project on the **Exploration of learning online by students with an acquired brain injury.**

Please take time to read the following information carefully before deciding whether or not you wish to take part.

What is the study about?

An acquired brain injury (ABI) is any injury to the brain which takes place after birth and leads to temporary or permanent impairment of mental, physical or social function. An ABI can be acquired through a traumatic injury, such as a fall or motor vehicle accident, or through a non-traumatic event, such as a stroke or tumour (Barber et al., 2015; Williams et al., 2018). Head injuries and ABI are being reported at an increasing rate, and the overall number of students enrolling in UK universities with known disabilities increases each year (HESA, 2020), however, little is understood about how their injuries may impact students' abilities to participate in an online learning environment.

This project will examine how students with acquired brain injuries experience online learning.

The data from this study will be used in the completion of a PhD thesis at Lancaster University. The research report will be subject to an internal and external examination review and Viva Voce process. Finally, the data may also be published in journals or presented at conferences. To safeguard your confidentiality and anonymity, all personally identifying information collected during the research process, such as age range or location, provided in responses will be removed during data analysis. Pseudonyms will be used in all data reporting and presentation.

Why might I want to take part in this study?

Currently, there exists little to no research relating to the student with an ABI experience from the perspective of an online learner. As a self-identified student with

an ABI and participant an online course, the researcher would like to gather information from you, and other people like you, to help understand more about how online students with acquired brain injuries experience online learning.

What will happen during the study?

Data will be collected in three phases: questionnaire, interviews, and journals over a period of 6 - 12 months.

If you decide you are happy to take part in the study, you will be contacted by the researcher to learn more about the data collection process.

If you are still comfortable proceeding after the initial meeting, you will be sent a link to a password protected online questionnaire and asked to create a unique participant code.

The questionnaires will include the Rivermead Post-Concussion Symptom Questionnaire (RPQ) and a modified Acute Concussion Evaluation (ACE) which will allow the researcher to establish baselines for cognitive, emotional, and somatic factors for 16 common symptoms found after ABI. Recognizing that brains are remarkable organs and may heal over time, participants will retake the RPQ and ACE periodically throughout the project to check for changes in their perceptions of how they are experiencing symptoms of their injury. This data can be cross referenced with their interview and ethnographic artefacts, and coded and reviewed for emergent themes. The initial instance of the first questionnaire will also include a series of demographic questions (age range, gender identification, location, familiarity with technology, primary language spoken, ethnicity) and will be used to help classify and identify patterns within the responses.

The researcher anticipates that the questionnaires will take approximately 20-30 minutes to complete and will be completed 3 times throughout the project.

Data will also be collected via interviews between Fall 2020 and Summer 2021. Time and participant health permitting, each participant will be provided an opportunity to guide a segment of each interview based on what they'd like to discuss, allowing them to tell their stories in their own words. Each interview will begin with the same opening questions for each participant and evolve from there based on each individual participant's experiences and needs. Interviews may be delivered via phone or web conference, based on participant's preference.

Finally, the third element of data collection, ethnographic artefacts generated via remote journaling methods of the participant's choice, will be collected between Fall 2020 and Summer 2021. Due to the significant distance between researcher and participant pool, the potential fragile nature of the researcher, and consideration for the participant pool's health - collection of remote journals (written/audio/video, based on participant ability, preference, etc.) - allows for both my own research access needs (money and physical constraints plus potential issues relating to COVID-19 travel limitations should they continue), and the needs of the participants to be respected.

How do I give my consent to take part?

Firstly, you are asked to read this sheet fully and make sure you understand all parts of the study. If you have any questions, you can contact the researchers, Sheelagh Semper (**s.semper@lancaster.ac.uk**).

If you have no remaining questions, and are happy to take part, please print, complete and sign the attached consent form and send it back as a scanned copy to Sheelagh Semper (**s.semper@lancaster.ac.uk**) on or before **September 30, 2020**. The researcher will then be in touch via email to arrange the details of the introductory session.

If you do not have access to a scanner, a photograph of the completed, signed consent form is acceptable. Please ensure the photograph is of sufficient quality that your name, date and signature are legible.

What if I do not want to take part, or if I change my mind?

Participation in the study is entirely voluntary. If you do not wish to take part then that is not a problem. You do not need to take any action.

You might wish to change your mind after initially agreeing to take part, and to withdraw from the study. That is fine, and I would simply ask that you inform a member of the research team. If you wish to stop part way through the survey, that is also no problem. Incomplete data will not be used in the study.

You might decide after completing the interview that you are no longer happy for your information to be used. If you decide to withdraw after the study, contact us within **two weeks** of the interview indicating your unique survey participant code, and your data will be destroyed and not used. After this point, the research analysis of the data will have commenced, and your data will remain in the study.

Refusal to take part, changing your mind or withdrawing from the study will not involve a penalty of any kind and will have no bearing on your relationship with the researchers or any institution associated with the study.

How will my information be stored and who will have access to it?

All information collected from you (survey responses and documents) will be stored in a dedicated, password-protected computer folder and will only be accessible to the researchers working on the study. Data will not be stored with any names or other identifying information and will not be accessible to anyone other than the researchers. If, for any reason, you would like a copy of the information you provided after the study is completed then please email Sheelagh Semper (**s.semper@lancaster.ac.uk**).

All information generated by the project will be stored in the secure computer folder, in line with the requirements of the Data Protection Act and Lancaster University Research Ethics Committee requirements.

How will you use the information I have shared with you and what with happen to the results of the research study?

I will use the information you have shared with me only in the following ways:

I will use it for research purposes only. This will include my PhD thesis and other publications (for example, journal articles). I may also present the results of my student at academic or practitioner conferences. Any publications or presentations arising from this project will not identify you by name, with pseudonyms being used instead.

When writing up the findings from this study, I would like to reproduce some of the views and ideas you shared with me. I will only use anonymised quotes (e.g. from my interview with you), so that although I will use your exact words, all reasonable steps will be taken to protect your anonymity in our publications.

When presenting transcripts and other research data in publications or presentations, I shall also strive to limit the excerpts so that you are not easily identifiable. However, the names of the institutions participating in the study may be acknowledged and that does carry the risk that you could be identified by readers with prior knowledge of those institutions, or those who undertake subsequent investigation of student enrolment. I will therefore strive to ensure that you are not easily identifiable, but I should acknowledge that there is a very small risk that your participation in this study could be identifiable.

What are the potential risks or benefits involved for me in the study?

There is a low risk of emotional vulnerability present whenever individuals are asked to share their reflections on past experiences, including impressions and feelings which arise anew in the telling. It is possible that you might find discussing your injury or experiences as an online student embarrassing, frustrating or uncomfortable in some instances.

If anything you tell me in the interview or journal suggests that you or somebody else might be at risk of harm, I will be obliged to share this information with my PhD supervisor. If possible, I will inform you of this breach of confidentiality.

No health records will be collected by the researchers. However, confidential or sensitive information may be disclosed to the researchers by participants. All information that could identify you will be removed before the data is analysed, though I remind you once again that I cannot fully guarantee your anonymity as discussed in the previous section.

I would remind you that you have the right to withdraw data from the project if you feel uncomfortable, so long as you do so within two weeks of the interview end-date. In addition, you do not need to divulge anything you do not wish to during the project. The purpose of our project is not to judge your health or your participation in online courses, but rather to investigate your experiences and to understand the constraints and opportunities shaping your learning.

The benefits of participating are indirect, since it is not possible for us to offer any financial incentive or any expenses for participants for this project. However, participants in this study will be presented with meaningful opportunities to critically reflect on their own educational experiences through their discussions with the project team. Additionally, I wish to keep participants fully informed of the results of the project, which I anticipate may be of interest.

Who has reviewed this project?

Ethical approval for this study has been obtained from the Faculty of Arts and Social Sciences Research Ethics Committee, Lancaster University.

Contact details for the researcher

Sheelagh Semper

Department of Educational Research,
County South, Lancaster University, Bailrigg,
Lancaster, LA1 4YL, United Kingdom
Tel: +1 (780) XXX XXXX

Email: **s.semper@lancaster.ac.uk**

Who do I contact if I am concerned about some aspect of the study or if I would like to make a complaint?

Dr. Don Passey

Department of Educational Research,
County South, Lancaster University, Bailrigg,
Lancaster, LA1 4YL, United Kingdom
Tel: +44 (0) 1524 XXX XXX

Email: **d.passey@lancaster.ac.uk**

Researcher introduction letter

Department of Educational Research
County South, Lancaster University, LA1 4YD, UK

Tel: +44 (0) 1524 592685

Exploration of learning online by students with an acquired brain injury.

Researcher Introduction

My name is Sheelagh Semper and I am a PhD Candidate in the Department of Educational Research at Lancaster University. I would like to invite you to take part in a research project on the **Exploration of learning online by students with an acquired brain injury.**

Before you make your decision about whether or not to participate in this project, I would like to take this opportunity for you to get to know a little bit about me. As a student with an acquired brain injury participating in this study, you will be placing your trust in the researcher to treat you, your experiences, and your potential requirement for accommodations during the study period with empathy and respect.

I felt it best to disclose to potential participants a portion of my own background, so you could make an informed decision about your potential comfort level with the researcher prior to choosing to participate.

I experienced my first acquired brain injury (ABI) as a result of a motor vehicle accident in 1995. Along with multiple physical injuries, I experienced aphasia, audio-processing, and memory issues that required me to relearn how to learn and navigate within the world around me. After many years, I'd settled into a "new normal" and later completed a Master of Education without disclosing my ABI to fellow students or professors. It was a part of my daily life, but it didn't define me. At the same time, the underlying shame of being potentially perceived by peers as brain damaged, different, or other, ensured I was vigilant in my efforts to keep my brain injury concealed.

On Sept 16, 2019 I experienced an unexplained seizure while driving and subsequent reinjury of the brain. Unlike my previous accident, I suffered no physical injury. While I have experienced difficulty processing multiple audio inputs since the initial injury, I am also currently experiencing difficulties with focused attention and may occasionally require someone to repeat what they are saying for me to follow the conversation. I suffer from the pseudobulbar affect, which causes me to randomly tear up and cry for no apparent reason; I find this passes quickest if we ignore this whenever it occurs. My aphasia has improved significantly but does still appear in times of stress or fatigue, and there are times when speech may be slightly slurred or delayed by lengthy pauses while I search for words (15-90 seconds, typically). I suffer from migraines, vertigo,

experience light sensitivity and visual processing issues and as a result, I typically wear tinted prescription glasses, or prescription sunglasses.

I am providing these personal details up front, so that you are aware prior to our initial meeting of some potential communication barriers we might face. I also hope you would understand that should I exhibit these behaviours during the research project that I am in no way mocking your own injury symptoms.

I hope that you will choose to share your experiences as an online student with an acquired brain injury with me.

Appendix B: Recruitment distribution list

Source / Connection	Distribution Method	Result
DISABILITY-FORUM - JISC email group	Email	Posted to group
Disabled Women Academic Professionals	Facebook	Posted to group
Facebook - Friend of Friend Shares	Facebook post	Post shared (x5)
Facebook - Friend Shares	Facebook post	Post shared (x18)
J A - student in PhD cohort	Email	Posted to Class Course site at university where employed
J N - student in PhD cohort	Email	Shared with fellow Tutors & students at university where employed
JISC email group - DISABILITY-RESEARCH	Email	Posted to group (x2)
JISC email group - ONLINELEARNING	Email	Posted to group
Non-profit Org - Acquired Brain Injury Ireland	Twitter	Retweet (x2)
Non-profit Org - Brain Injury Awareness	Facebook post	Posted to group
Non-profit Org - Brain Injury Canada	Email	Retweet (x3)
Non-Profit Org - Brain Injury is Big	Email	Retweet
Non-Profit Org - Different Strokes UK	Email	No Response
Non-profit Org - Headway UK	Email	Posted on Website
Non-Profit Org - Love Your Brain.com	Email	No Response
Non-Profit Org - Silver Lining	Email	No Response
Professional Association - Contact North - Online Learning (Canada)	Email	No Response
Self	Varied	Shared on Twitter, Facebook, Disability FB Group, LinkedIn
Social support group - Brain Injury	Facebook post	Posted to group
Social support group - Edmonton Stroke Recovery	Facebook post	Posted to group
Traumatic or ABI Support Group	Facebook	Posted to group
Twitter - Followers	Twitter	Retweet (x47)
Twitter - Non-followers	Twitter	Retweet (x13)
UK Acquired Brain Injury Forum	Twitter	Retweet
University - Athabasca University - Disability Office	Email	No Response
University - Lancaster University Disability Office	Moodle Board	Posted to disability support Moodle site, Emailed to disability support mailing list subscribers
University - Leeds University Disability Office	Email	Rejected - Office Closed due to COVID

Source / Connection	Distribution Method	Result
University - Manchester University Disability Office	Email	No Response
University - University of Alberta Disability Office	Email	No Response
University - University of Edinburgh Disability Office	Email	Rejected - Office Closed due to COVID
University - University of Glasgow Disability Office	Email	No Response
University - University of Saskatchewan Disability Office	Email	No Response
University - University of Toronto Disability Office	Email	No Response

Appendix C: Rivermead post-concussion symptom questionnaire

After a head injury or accident some people experience symptoms which can cause worry or nuisance. We would like to know if you now suffer from any of the symptoms given below. As many of these symptoms occur normally, we would like you to compare yourself now with before the accident. For each one, please circle the number closest to your answer.

0 = Not experienced at all
1 = No more of a problem
2 = A mild problem
3 = A moderate problem
4 = A severe problem

Compared with before the accident, do you now (i.e., over the last 24 hours) suffer from:

Headaches.....	0	1	2	3	4
Feelings of dizziness.....	0	1	2	3	4
Nausea and/or vomiting.....	0	1	2	3	4
Noise sensitivity, easily upset by loud noise.....	0	1	2	3	4
Sleep disturbance.....	0	1	2	3	4
Fatigue, tiring more easily.....	0	1	2	3	4
Being irritable, easily angered.....	0	1	2	3	4
Feeling depressed or tearful.....	0	1	2	3	4
Feeling frustrated or impatient.....	0	1	2	3	4
Forgetfulness, poor memory.....	0	1	2	3	4
Poor concentration.....	0	1	2	3	4
Taking longer to think.....	0	1	2	3	4
Blurred vision.....	0	1	2	3	4
Light sensitivity, easily upset by bright light.....	0	1	2	3	4
Double vision.....	0	1	2	3	4
Restlessness	0	1	2	3	4

Are you experiencing any other difficulties?

1._____	0	1	2	3	4
2._____	0	1	2	3	4

King, N.S., Crawford, S., Wenden, F.J., Moss, N.E., Wade, D.T. (1995). The Rivermead Post Concussion Symptoms Questionnaire: A measure of symptoms commonly experienced after head injury and its reliability". *Journal of Neurology*. *242*(9), 587–92.

Appendix D: Symptom self-evaluation questionnaire

Did you experience a forcible blow to the head (direct or indirect)?
__ Yes__ No __ Unknown

Did you experience an intracranial injury or skull fracture?
__ Yes__ No __ Unknown

Do you know the location of impact?
__ Frontal __ Left Temporal __ Right Temporal __Left Parietal
__ Right Parietal __Occipital __ Neck __ Indirect Force

What was the cause of your acquired brain injury?
__ MVA __ Pedestrian-MVA __ Fall __ Assault __ Sports (specify) __ Other

Indicate the presence of each symptom (Yes/No) under the following circumstances:

Category	Symptom[4]	Before Injury	Post-Injury	While engaged in coursework
Physical	Headache			
	Nausea			
	Vomiting			
	Balance problems			
	Dizziness			
	Visual problems			
	Fatigue			
	Sensitivity to light			
	Sensitivity to noise			
	Numbness / Tingling			
Cognitive	Feeling mentally foggy			
	Feeling slowed down			
	Difficulty concentrating			
	Difficulty remembering			
Emotional	Irritability			
	Sadness			
	More emotional			
	Nervousness			
Sleep	Drowsiness			
	Sleeping less than usual			
	Sleeping more than usual			
	Trouble falling asleep			

[4] List of symptoms from Figure 1. Post Concussion Scale from Lovell, M. R., et al (2006). Measurement of symptoms following sports-related concussion: Reliability and normative data for the post-concussion scale. *Applied Neuropsychology*, 13(3), 168. https://doi.org/10.1207/s15324826an1303_4 reprinted by permission of Informa UK Limited, trading as Taylor & Taylor & Francis Group, http://www.tandfonline.com.

Indicate if the symptoms worsen (Yes/No) under the following circumstances:

Category	Symptom	Physical activity	Cognitive Activity
Physical	Headache		
	Nausea		
	Vomiting		
	Balance problems		
	Dizziness		
	Visual problems		
	Fatigue		
	Sensitivity to light		
	Sensitivity to noise		
	Numbness / Tingling		
Cognitive	Feeling mentally foggy		
	Feeling slowed down		
	Difficulty concentrating		
	Difficulty remembering		
Emotional	Irritability		
	Sadness		
	More emotional		
	Nervousness		
Sleep	Drowsiness		
	Sleeping less than usual		
	Sleeping more than usual		
	Trouble falling asleep		

This survey instrument was developed using the following reference materials. It is not intended for use as a diagnostic tool.

Boyd, C. R. (n.d.). Post-concussion symptom inventory. Stanford Children's Health. Retrieved from https://med.stanford.edu/content/dam/sm/ppc/documents/General_Primary_Care/Concussion-Symptom-Inventory.pdf

Gioia, G., & Collins, M. (2006). Acute concussion evaluation (ACE): Physician/clinician office version v2. Retrieved from https://www.cdc.gov/heads-up/media/pdfs/providers/ace_v2-a.pdf

Gioia, G. A., Collins, M., Isquith, P.K. (2008). Improving identification and diagnosis of mild traumatic brain injury with evidence: psychometric support for the acute concussion evaluation. *Journal of Head Trauma Rehabilitation*. *23*(4), 230-42. https://doi.org/10.1097/01.HTR.0000327255.38881.ca

Lovell, M. R., et al (2006). Measurement of symptoms following sports-related concussion: Reliability and normative data for the post-concussion scale. Applied Neuropsychology, 13(3), 166-174. https://doi.org/10.1207/s15324826an1303_4

List of Abbreviations, Acronyms, and Initialisms

The following abbreviations, acronyms, and initialisms are used in this thesis:

ABI	Acquired Brain Injury
ACE	Acute Concussion Evaluation
ADHD	Attention Deficit Hyperactivity Disorder
AI	Artificial Intelligence
ALT Text	Alternative Text
CAST	Center for Applied Special Technology
CAT	Computerized Axial Tomography
COVID-19	see SARS-Cov-2
DRM	Digital Rights Management
GDPR	General Data Protection Regulation; European Union
HE	Higher Education
HEFCE	Higher Education Funding Council, England
HESA	Higher Education Student Statistics
ILSP	Inclusive Learning and Support Plan
IT	Information Technology
LSM	Learning Management System
MRI	Magnetic Resonance Imaging
MS	Microsoft
MVA	Motor Vehicle Accident
NASEM	National Academies of Sciences, Engineering, and Medicine
NHC	National Health Corps
OLC	Oxford Learning College
PAR	Participatory Action Research
PC	Personal Computer; computer
Q&A	Question and Answer
RPQ	Rivermead Post Concussion Symptom Questionnaire
RQ	Research Question
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2; virus that causes COVID-19
TA	Thematic Analysis
TA	Teacher's assistant, reference p. 92
TBI	Traumatic Brain Injury

TEL	Technology Enhanced Learning
VC	Virtual Classroom (e.g., course instance within LMS)
VM	Virtual Meeting Software (e.g., Teams, Zoom)
UDI	Universal Design for Instruction
UDL	Universal Design for Learning
UID	Universal Instructional Design
UK	United Kingdom
USA	United States of America
WWL	World Wide Learn